# GENERAL BULLETIN 2009-2011

Undergraduate Programs  
Graduate Programs  
Professional Programs

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GENERAL BULLETIN 2009-2011
THE UNIVERSITY

UNIVERSITY MISSION
Case Western Reserve University improves people's lives through preeminent research, education and creative endeavor.

We realize this goal through:
• Scholarship that capitalizes on the power of collaboration.
• Learning that is active, creative and continuous.
• Promotion of an inclusive culture of global citizenship.

UNIVERSITY VISION
We aspire to be recognized internationally as an institution that imagines and influences the future.

Toward that end, we will:
• Support advancement of select academic fields as well as new areas of interdisciplinary excellence.
• Provide students with the knowledge, skills and experiences necessary to become leaders in a world of rapid change and increasing interdependence.
• Nurture a community of scholars who are cooperative, collegial and committed to mentoring and inclusion.
• Build on our relationships with world-class health care, cultural, educational, and scientific institutions in University Circle and across greater Cleveland.

ACCREDITATION
Case Western Reserve University is accredited at the institutional level by the Higher Learning Commission of the North Central Association of Colleges and Schools:

30 North LaSalle Street, Suite 2400
Chicago, Illinois 60602-2504
Office: 312-263-0456
Toll free: 800-621-7440
Fax: 312-263-7462
http://www.ncalhc.org

In addition, several of the university's individual programs are accredited by nationally recognized professional associations, including:
• AACSB International - Association to Advance Collegiate Schools of Business (accountancy and business)
• Engineering Accreditation Commission of ABET, Inc. (engineering)
• Computing Accreditation Commission of ABET, Inc. (computer science)
• Accreditation Council for Cooperative Education (cooperative education programs)
• American Bar Association (law)
• American Board of Genetic Counseling (genetic counseling)
• American Chemical Society (chemistry)
• American Council of Nurse Midwives (nurse midwifery)
• American Dental Association (dental medicine)
• American Medical Association and Association of American Medical Colleges, Liaison Committee on Medical Education (medicine)
• American Psychological Association (clinical psychology)
• American Speech-Language-Hearing Association (speech pathology)
• Association of American Law Schools (law)
• Commission on Accreditation for Dietetics Education, American Dietetic Association (didactic program in dietetics, dietetic internship)
• Commission on Accreditation of Allied Health Education Programs (anesthesiologist assistant)
• Council on Accreditation of Nurse Anesthesia Educational Programs (nurse anesthesia)
• Council on Education for Public Health (public health)
• Council on Social Work Education (applied social sciences)
• National Association of Schools of Music (music)
• National League for Nursing (nursing)
• Ohio Department of Education, Division of Teacher Education and Licensure (art education and music education)

The university is chartered as an educational institution under the laws of the State of Ohio and holds a Certificate of Authorization from the Ohio Board of Regents.

For further information, contact the university's Center for Institutional Research online at http://www.case.edu/president/cir/cirhome.htm/.

THE UNIVERSITY
http://www.case.edu

Case Western Reserve University is one of the nation's leading independent research universities, with programs that encompass the arts and sciences, engineering, the health sciences, law, management, and social work.

Although its origins date to 1826, the university in its present form is the result of the 1967 federation of Case Institute of Technology and Western Reserve University. The two institutions had shared adjacent campuses since the late nineteenth century and were involved in cooperative efforts for many years. Western Reserve College was founded in 1826 in Hudson, Ohio, a town 26 miles southeast of Cleveland. The college took its name from that of the region, which at the time of the American Revolution, was known as the Western Reserve of Connecticut. In 1882, renamed Western Reserve University and boasting a medical school in addition to its undergraduate programs, the institution moved to the Cleveland site that later became known as University Circle. There it joined the Case School of Applied Science, founded in 1880 through the bequest of Leonard Case Jr., a leading benefactor and Cleveland civic leader. The name Case Institute of Technology was adopted in 1947 to reflect the institution's growing stature in the sciences and engineering.

ACADEMIC PROGRAMS
The academic programs of the university are administered through the College of Arts and Sciences and seven professional schools, including applied social sciences, dental medicine, engineering, law, management, medicine and nursing, with coordination provided by the president and the provost. The major academic divisions of the university are described below, along with a listing of their principal offerings. These units cooperate with each other and with affiliate institutions in University Circle to offer interdisciplinary and joint degree programs at the undergraduate and graduate levels.

The College of Arts and Sciences (est. 1992, but tracing its origins to 1826) offers courses of study leading to B.A. and B.S. degrees. The college houses educational and research programs in the arts, humanities, social sciences, physical and biological sciences and mathematics. Departmental faculty also conduct research and offer instruction leading to master's and doctoral degrees in these fields. The
The Case School of Engineering (est. 1992, but tracing its origins to 1880) offers curricula leading to the B.S. degree in a wide range of engineering disciplines. Departmental faculty also offer advanced instruction leading to the M.S. and the Ph.D. in these fields, conduct a substantial body of research, and maintain close ties to industry as well. The school features a practice-oriented degree, the Master of Engineering (M.E.), tailored for employed engineers seeking to advance their knowledge. The Institute for Management and Engineering or TiME, a joint venture of the Case School of Engineering and the Weatherhead School of Management, confers the Master of Engineering and Management (M.E.M.) degree.

The School of Graduate Studies (est. 1892) confers M.A., M.S., M.F.A., M.P.H., M.M.A., and Ph.D. degrees upon students who have completed advanced study in the arts, humanities and social sciences, biological and physical sciences, engineering and selected disciplines related to various professional fields. The school is an administrative unit, working closely with the deans and faculty in the university's colleges and professional schools who provide instruction and mentoring for graduate students.

The Mandel School of Applied Social Sciences (est. 1916) offers curricula leading to the Master of Science in Social Administration (M.S.S.A.) degree in social work, and to the Ph.D. degree in social welfare. The school also operates a continuing education program for social work practitioners in the community. In collaboration with the College of Arts and Sciences and the schools of law and management, the Mandel School administers the Mandel Center for Nonprofit Organizations. Through the Mandel Center, a fully developed graduate program in nonprofit management, the Mandel School and the Weatherhead School of Management offer a joint program leading to the Master of Nonprofit Organizations (M.N.O.) degree.

The School of Dental Medicine (est. 1892) offers a curriculum leading to the Doctor of Dental Medicine (D.D.M.) degree and postdoctoral training in several dental specialties leading to the Master of Science in Dentistry. In conjunction with its curriculum, the school operates a campus-based dental clinic where dental students provide faculty-supervised dental services to the campus community and to area residents. In collaboration with the School of Medicine (beginning 2007), the school also offers course work leading to the Doctor of Dental Medicine-Doctor of Medicine or D.M.D.-M.D., a new dual-degree program that combines clinical dentistry with primary care medicine.

The School of Law (est. 1892) offers a broad range of courses leading to the J.D. degree. The J.D. is also offered as part of dual-degree programs with the College of Arts and Sciences and the schools of applied social sciences, management, and medicine. The school provides graduate instruction leading to the LL.M. in U.S. and global legal studies. As part of its curriculum, the school operates the Milton A. Kramer Law Clinic Center in which law students, under faculty supervision, provide legal and advocacy services to clients from the community. The school administers several interdisciplinary centers including the Law-Medicine Center, the Canada-United States Law Institute, the Frederick K. Cox International Law Center, and a seminar for federal judges sponsored by the Federal Judicial Center. The law school also participates in the Mandel Center for Nonprofit Organizations.

The Weatherhead School of Management (est. 1967) offers curricula leading to bachelor's, master's, and doctoral degrees in management, accounting, organizational behavior, operations research, and other areas of business administration. The school also offers an executive degree, the Executive Doctor of Management (E.D.M.). Members of the school's faculty also provide instruction in economics for undergraduate students pursuing the B.A. degree through the College of Arts and Sciences. The school offers a wide range of educational programs for professional managers and participates in the Mandel Center for Nonprofit Organizations and the Institute for Management and Engineering (TiME).

The School of Medicine (est. 1843) offers a curriculum leading to the M.D. degree. This curriculum, developed at the school and emulated worldwide, features an interdisciplinary approach to organ systems and introduces students to clinical work and patients as early as the first year. The school's preclinical departments offer instruction leading to the M.S., Ph.D., and M.D.-Ph.D. degrees in the biomedical sciences. Faculty in the school are extensively involved in biomedical research. Full-time faculty in the school's clinical disciplines also have a major commitment to patient care and close supervision of medical students' involvement in patient services in a network of affiliated hospitals and clinics.

The Frances Payne Bolton School of Nursing (est. 1923) offers curricula leading to professional degrees in nursing. The Bachelor of Science in Nursing (B.S.N.) degree emphasizes acute care and clinical practice. The school's practice doctorate, the Doctor of Nursing Practice degree (D.N.P.) is similar in concept to practice doctorates in other professions such as medicine (M.D.), law (J.D.), and dentistry (D.D.S.). D.N.P.-prepared nurses are equipped for leadership roles in nursing practice, business, administration, clinical research, and academia. The school also offers instruction leading to the Master of Science in Nursing (M.S.N.) degree in several nursing specialties, and to the Ph.D. in nursing. The school's faculty members maintain an active research program as well as interdisciplinary projects with colleagues in other schools at the university.

PHILOSOPHY STATEMENT ON EDUCATIONAL OUTCOME ASSESSMENT

Case Western Reserve University commits to a comprehensive educational outcome assessment program, wherein we measure how our students have changed, what knowledge has been learned, and what competencies have been developed. Our educational outcome assessment programs will not only provide information on how well we are achieving our objectives, but also identify what types of programs and experiences have the most powerful impacts. The ultimate goal is to incorporate continuous evaluation into the educational culture for the improvement of programs and for enhancing the distinctiveness of our university.

Education outcome assessments will be based on the core vision and mission of each school and the university as a whole. The faculty, empowered by adequate resources and support to carry out assessment activities, accepts that educational outcome assessment is a part of academic duties. Outcome assessment is embraced as a means that can lead to improvements in teaching and learning, plus provide evidence of teaching effectiveness for institutional purposes.
CLEVELAND
From a settlement that began centuries ago on the banks of the Cuyahoga River, Cleveland has grown into a metropolis of close to 3 million people. The heritage of this Great Lakes port includes industrial achievement as well as cultural and scientific advances. The Cleveland area is headquarters for many of the nation’s major corporations. The city is also a major banking center; the Fourth District Federal Reserve Bank, one of 12 in the nation, is located here.

Health care is another thriving Cleveland industry. Dozens of hospitals and medical centers are concentrated in the area. University Hospitals, the Cleveland Clinic, the MetroHealth Medical Center, and others have attained international recognition for outstanding patient care and contributions to medical research.

Greater Cleveland is dotted with shopping malls, theaters, and opportunities for sports and amusement. The latter include Lake Erie, the 17,000-acre Metropark system; professional baseball, football, and basketball teams; and facilities for softball, skiing, hiking, cycling, picnics, and other activities. More than 60 ethnic groups live in Cleveland; seasonal festivals continue traditions brought to the region from throughout the world.

UNIVERSITY CIRCLE
Case Western Reserve University is located in University Circle, a 550-acre concentration of more than 40 cultural, medical, educational, religious, and social service institutions located at the eastern edge of the city. In addition to Case Western Reserve University, which is the largest institution in University Circle, the community includes Severance Hall, home of the world-famous Cleveland Orchestra; the Cleveland Museum of Art, housing one of the nation’s finest collections; the Cleveland Institute of Music; the Cleveland Institute of Art; University Hospitals; the Western Reserve Historical Society; the Cleveland Botanical Garden; the Cleveland Museum of Natural History; and many others. All are within walking distance of the university.

University Circle attracts visitors worldwide and from throughout the region to its concerts, theater performances, athletic events, art shows, public lectures, exhibits, and restaurants. Housing, shopping, and recreational facilities are all located in the area.

UCITE
University Center for Innovation in Teaching and Education
101 Allen Memorial Medical Library Building
Phone 216-368-1224; Fax 216-368-0197
http://www.case.edu/provost/UCITE
E-mail ucite@case.edu

The purpose of UCITE is to support faculty in their research and teaching and to encourage change and innovation in teaching. It does this through a combination of informal seminars and workshops (about fifty per year) led by UCITE personnel and campus faculty; special programs with invited outside speakers of renown and expertise; and individualized services (such as class visitation, mentoring, presentation skills, accent reduction, and consultation) to faculty who request them. UCITE also serves as a research, planning, and implementation resource for the many education-related initiatives undertaken on campus.

UCITE also conducts programs for new faculty. These serve an important function for faculty: development and socialization to the university culture, as well as to growth of teaching skills.

UCITE administers grants programs that are designed to encourage faculty members to develop and experiment with their teaching and education activities. The Glennan Fellows Program provides five stipends of $6,500 annually from the income of an endowment provided by the Glennan family. Selected fellows must be tenure-track but untenured faculty members who exhibit outstanding talent as both teachers and scholars. Awards are made on the basis of proposals, which they submit following nominations by their peers. It is a significant honor to serve as a Glennan Fellow, and these junior faculty become recognized as leaders and role models for other junior faculty.

UCITE also offers programs such as the Learning Fellows seminar, a semester-long course on teaching open to all faculty members.

Support in the form of gifts and donations by alumni and friends is continually being sought. These funds are used to provide additional teaching grants to university faculty members. For a more complete listing of services and events, go to the UCITE website.

UCITE is administered by a director and an associate director. The center has a full-time administrative assistant.

INFORMATION TECHNOLOGY SERVICES
http://www.case.edu/its

Information Technology Services (ITS) offers a wide variety of state-of-the-art technology applications, tools, and services to enrich the university’s learning, teaching, and research environment. Services managed include:
- The university’s high speed switched gigabit Ethernet network
- Wireless deployment to the campus community
- Personal productivity and general-purpose software packages, generally at no cost, through the online Software Center
- Support and training services to assist users in maximizing use of technology resources
- Academic and instructional systems such as Blackboard and MediaVision Courseware
- Campus-wide application software, such as e-mail and group calendaring
- Campus-wide collaborative software, including Adobe Connect
- Telephone services, including Voice over IP and unified messaging
- Audio/video/videoconferencing/streaming services
- Internal administrative systems

ITS Services
Instructional Technology & Academic Computing (ITAC)
http://www.case.edu/its/itac

ITAC supports current technologies that enhance teaching and learning at Case Western Reserve University. Through technology support and professional development, ITAC supports the university community in its endeavor to experience, explore, collaborate and extend learning beyond its traditional boundaries. Services include:
- MediaVision Courseware, videoconferencing, iTunes, YouTube
- Technology-enhanced classrooms
- Video production, streaming video and web casting
- Event Support
- Emerging instructional technologies
- 3D and virtual experiences
- Innovative multimedia
- BlackboardStudent technology consultants

Software Services
http://softwarecenter.case.edu

Case Western Reserve faculty, staff and students are eligible to download software packages over the university network. Packages and tools include:

- Personal productivity and general purpose software packages, including:
  - Microsoft Office Suite
  - Calendar
  - Virus protection
  - Desktop publishing
  - Operating System upgrades
  - Mathematical and statistical packages and tools and programming languages

**eStore**
http://www.case.edu/its/estore

Case Western Reserve University strategic partnerships with many premier technology manufacturers allow the university to offer university faculty, staff, and students cutting-edge technology products and services at highly advantageous educational discounts. Products available at the eStore include computers, backup services, high speed internet, cellular phones, and other accessories.

**Information Security Office**
http://www.case.edu/its/security

Managing risk to assure confidentiality, integrity and availability of information, information systems and critical infrastructure. This office is responsible for:

- Creation and enforcement of university-wide policies
  - University IT Policies
  - University Security Policies
  - Coordination with compliance and various policies through established Governance processes
- Development and operation of network defenses and plans
  - Network monitoring and defense
  - Incident response
  - Disaster recovery planning
- Creation and implementation of relevant and appropriate security controls
  - 3-Tier information architecture
  - Vulnerability Management
  - Identity Management
  - Risk Management
- Training and education of all faculty, staff and students in security risks
  - Security awareness program
  - Management training

**Research Computing**
http://www.case.edu/its/researchcomputing

The mission of ITS Research Computing is to facilitate cost-effective access to IT resources for the research community at Case Western Reserve University. These resources include high performance computing services, database hosting and programming services, server hosting and administration services, and pre-award IT consultation. ITS Research Computing is prepared to engage with faculty in technologies as they emerge at the university, including, for example, visualization and grid technologies, and incorporate them into the suite of centrally supported services.

**Help Desk**
http://help.case.edu

The Help Desk, powered by PerceptIS, provides computing support to the university community. Walk-in centers are conveniently located around campus. Check website for hours. Services include:

- Troubleshooting and technical assistance
- Telephone support available twenty-four hours a day, seven days a week
- Dispatching, if necessary, of technical assistants to residence halls to resolve user problems
- Annual service contracts provide unlimited dispatch to campus locations

**Telephone Services**
http://phone.case.edu

Telephone Services offers Voice Over IP phone service to Case Western Reserve University administrative offices and residence halls. It also manages the university’s Unified Messaging voicemail system, which delivers voicemail messages to a university email account.

**UNIVERSITY LIBRARIES**
http://www.case.edu/dir/libraries.html

All Case Western Reserve University’s libraries support the university’s undergraduate, graduate and professional programs. Combined, their collections contain over 2.5 million volumes. The libraries maintain individual websites to facilitate communication of their unique services to the university community. Collections of electronic databases and electronic journals are shared and available for all university faculty, staff, and students through the campus network or authorized remote access.

**Kelvin Smith Library (KSL)** is open to all members of the university community, with collections and services supporting the faculty, staff, undergraduate, and graduate students of the College of Arts and Sciences, the Case School of Engineering, the Weatherhead School of Management, and the general administration of the university. The main collection of KSL is over 1.7 million volumes. The Astronomy and Music Libraries are branches of KSL and are housed within their respective departments. KSL has access to more than 54,000 serials and periodicals and has a large retrospective collection housed in the Retrospective Research Collections Center located in Cedar Avenue Service building. KSL’s collection also includes audiovisual materials, government documents, special collections, and digital collections. KSL provides staff and services in support of teaching and research, including expert reference assistance in-person and online, ILLiad interlibrary loan services and electronic article delivery, Course Reserves and Electronic Reserves, the Center for Statistics and Geospatial Data, the Freedman Digital Library, Language Learning and Multimedia Services Center and the International News Commons. During the academic

**UNIVERSITY ARCHIVES**
http://www.case.edu/its/archives

University Archives manages university records and publications to ensure the preservation of a reliable institutional memory. The office, which manages a collection of over 12,000 linear feet (approximately 25 million pages) and over 40 gigabytes that document the university’s life from 1826 to 2009, offers the following services:

- Research and reference services to help discover the who, what, where, when, how and why of Case Western Reserve University history and development
- Duplication services (digital, xerographic, and fax copies) of most documents
- Records services to assist in managing active records and guidance in transferring records to the University Archives
- Digitization of select, high-demand materials for ease of access and use

**CASE WESTERN RESERVE UNIVERSITY**
semesters, KSL is open 24 hours, 7 days a week.

The Mandel School of Applied Social Sciences (Mandel School) has the distinction of being one of the few schools of social work that maintains a professional library for the use of its students, staff, faculty, and alumni as well as for the general university community. The Lillian F. and Milford J. Harris Library contains over 40,000 volumes and subscriptions to 250 periodicals and about 900 video and audio items to support Mandel School academic programs. The library also has a variety of electronic media and other materials, which are available for classroom use by faculty. The library’s website provides information resources for social work students, faculty, practitioners, and other human service workers in Greater Cleveland.

The Cleveland Health Sciences Library operates in two locations: the Allen Memorial Medical Library and the Health Center Library. The Cleveland Health Sciences Library collections support programs in the biological sciences, medicine, nursing and dentistry and are open to all university students, faculty and staff. The CHSL total collections number over 400,000 volumes. The collection consists of books, theses, nearly 2,000 subscriptions to journals, government documents, audiovisual items, and electronic resources. The collection in the Dittrick Medical History Center contains archives, rare books and artifacts for research in the history of medical technology.

The Judge Ben C. Green Law Library is located in the School of Law and has more than 300,000 volumes including complete collections of statutory and case law, law reviews, the National Reporter System, state reports, administrative reports and current law services. There is also an extensive British collection and special collections in taxation, labor law and foreign investments. The law library’s website provides core links to legal information resources, government agencies and legislative history resources.

The Library Catalog is the university’s comprehensive online, public access catalog and also has holdings of the Cleveland Institute of Music, Cleveland Institute of Art and the Siegal College of Judaic Studies. The Library Catalog has search and display functions for the records of all volumes in the campus and affiliated libraries and is accessible through any web browser. The Library Catalog also provides quick links to the libraries’ websites, research databases, electronic journals, OhioLINK consortium materials, and major local libraries. Computer workstations are located in each university library to facilitate use of all digital library information resources. Network access allows researchers to search the resources of the university’s libraries and the OhioLINK catalog from any port on the campus network, from the Kelvin Smith Library wireless network or through university-authenticated remote access.

Case Western Reserve University is a founding member of the OhioLINK consortium, which provides a shared, unified catalog for eighty-nine colleges and universities, as well as the State Library of Ohio. The OhioLINK Central Catalog, at 47.6 million items, provides access to many electronic journals and theses, media resources, and online databases. Authorized faculty, students, and staff enjoy automated online borrowing and renewals of book and media materials, as well as onsite borrowing privileges at OhioLINK member libraries.

Case Western Reserve University students may apply for a Cleveland Public Library CLEVNET card, which expands access to many local city and county libraries in the area. Other libraries in University Circle include the Cleveland Institute of Art, the Cleveland Institute of Music, the Cleveland Museum of Art, the Western Reserve Historical Society, the Cleveland Museum of Natural History, and the Cleveland Botanical Garden Library.

The university is a member of the Association of Research Libraries (ARL), which comprises 123 North American research libraries.

Kelvin Smith Library
http://library.case.edu

Cleveland Health Sciences Library
http://www.cwru.edu/chsl/homepage.htm

Ben C. Green Law Library
http://www.law.case.edu/tech_library/index.asp

Harris Library – Mandel School
http://msass.cwru.edu/library/

OhioLINK
http://www.ohiolink.edu

ARL
http://www.arl.org

DENTAL CLINIC
Phone: 368-3200
Fax: 368-3204
http://dental.case.edu/patients/

The School of Dental Medicine of Case Western Reserve University maintains a clinic that provides dental services to students and faculty, as well as the general public. The Dental Clinic is dedicated to training dental students in the skills necessary to be competent dental practitioners and to being lifelong learners to provide the best possible patient care under the direct supervision of the practicing dental faculty. Students and their family dependants covered by the university medical plan receive some dental services covered 100 percent and others at a discounted rate. Students should refer to their medical plan for more specific information.

The School of Dental Medicine also provides dental benefit plans for faculty and staff of the university. Care is provided in general practice and in all the specialties and is available through the dental clinics on campus.

THE UNIVERSITY

AUXILIARY SERVICES

University Bookstore
Thwing Center
Phone 216-368-2650
http://www.case.bncollege.com
Fax 216-368-5205

The University Bookstore, located in Thwing Center, serves as the source for all required and recommended course materials that include new and used textbooks and CaseNotes (custom-produced course packets designed by faculty for their classes). In addition to course books, the University Bookstore features complete reference sections and a large general book department, quality school and office products, a broad selection of clothing and gift items, and a variety of convenience foods and beverages. The University Bookstore also offers special book orders and custom orders of clothing and gifts for groups and organizations. In addition to all the textbooks for medical, dental, and nursing programs, the department features a complete medical reference section, medical equipment, and supplies.

The University Bookstore is open 8:30 a.m. to 5:30 p.m. Monday to Thursday, and 8:30 a.m. to 5 p.m. on Friday. Saturday hours are 11 a.m. to 3 p.m. Hours are subject to change at the start of each semester, for summer, breaks, and special events. Please check the website for current hours of operation. The bookstore accepts cash, checks, major credit cards, debit cards, CaseCash, and department requisitions.

PRINTING SERVICES
THE UNIVERSITY

Thwing Center, lower level, Room A-21
Business Office-Phone 216-368-2550
Thwing Copy Center -Phone 216-368-2553
Bindery - Phone 216-368-0084
Fax 216-368-1250
Peter B. Lewis Building Room 23
Phone 216-368-2062
Monday - Friday 8:30 a.m. to 5 p.m.
http://www.case.edu/finadin/auxserv/printsrv/print.html

University Printing Services is a full-service
print facility, designed to serve the printing
needs of faculty, staff, and students. With
two convenient copy centers, full service
bindery department, and a centrally located
business office, staff provides such services
as photocopying, printing or finished docu-
ment needs. Specific amenities include: black
and white photocopying, color copying, stan-
dard university items, business cards, letter-
head, envelopes, offset printing, scanning,
CD burning, foil stamping, thesis/hardcover
binding, wide format printing, campus mail
envelopes, promotional items, full finishing
capabilities, specialty papers, passport photos,
and much more.

Free pickup and delivery is provided from all
campus locations and staff can help clients
print directly from their desktop to printing
services’ black and white and color copiers.

Please check the website for a full range of
products and services. Order items online at
http://www.case.edu/finadin/auxserv/printsrv/print.html/.

TRANSPORTATION

http://shuttle.case.edu

A free shuttle bus system runs throughout the
week to serve the 550-acre University Circle
area. In the evenings, a loop bus runs ap-
proximately every 20 minutes over a specific
campus route. Please see bus schedules, which
are available on the buses, in Access Services,
Thwing Center, and several other buildings,
for the specific operating hours for each shuttle.
In addition, Regional Transit Authority
bus routes run through the heart of Uni-
versity Circle, linking the campus with the greater
community. Rapid Transit trains run directly
from the campus to Cleveland Hopkins Inter-
national Airport.

CAMPUS PARKING

http://parking.case.edu

Parking on campus is not allowed except by
permit, and then only in the areas for which
the permit is valid. Students attending classes
for more than 12 credit hours (undergraduate)
or more than 9 credit hours (graduate) must
purchase a full-time permit. Graduate stu-
dents registered for 651 or 701 courses must
purchase full-time permits. Students living in
residence halls and fraternities must obtain
parking permits if they maintain cars while in
residence. Resident student parking is granted
with a confirmed housing assignment. Cur-
cent proof of part-time parking is required when
a request for a part-time parking per-
mit is made. Summer session permits are also
available.

Information for renewal of permits for the
next academic year is available during the
spring semester. Students must resolve all out-
standing parking violations prior to renewal.
All students registered at the university must
abide by the parking rules of the Joint Park-
ing Systems, which includes Case Western
Reserve University, University Hospitals, and
University Circle Inc. Complete copies of the
rules are available at the Standard Parking Of-
fice and at Access Services.

Violators are subject to fines and, if fines are
not paid, to towing. A person charged with a
violation has the opportunity of re-appealing
in person with counsel, if desired, before the
Joint Parking Systems Appeals Committee.
Failure to pay a fine will ultimately result in
the withholding of transcripts.

Information about parking may be requested
from Access Services, Crawford Hall, 10900
Euclid Avenue, Cleveland, Ohio 44106-7084
(216-368-2273) or see the university parking
website at http://parking.case.edu/.

UNDERGRADUATE ADMISSION

http://admission.case.edu

Admission to Case Western Reserve Univer-
sity is competitive. Primary consideration is
given to measures of academic performance
such as grades, level of courses completed, and
SAT or ACT scores. Class rank and extracur-
ricular accomplishments are also important
factors. Letters of recommendation and a
personal written statement to accompany the
application for admission are also carefully
considered. Students are not required to take
the SAT Subject Tests. An informational ad-
mission interview is recommended but not
required. All applications for admission are
submitted online.

FIRST YEAR APPLICANTS

Application Dates and
Notification of Admission

First-year applicants are students who have
not enrolled in course work at a college or
university after graduation from high school.
Students seeking to enroll in the fall may use
any of three application plans. Those who
wish to receive early notification of their ad-
mission status should indicate their prefer-
ence for Early Action and meet the November
1 application deadline. They will be noti-
fied of the Admission Committee’s decision
by December 15. Early Action admission is
non-binding; students admitted under this
plan are free to apply to other colleges and,
if admitted, have until May 1 to accept an
offer of admission. Students who wish to be
considered for the Pre-Professional Scholars
Program (PPSP) must submit their applica-
tions by December 1. By March 1 they will
be notified about admission to the university,
and by the same date a select number appli-
cants will be invited to interview for the PPSP.
Finalists are selected by April 15. The regular
application deadline is January 15. Applicants
indicating an interest in Regular Decision by
this deadline will be notified of their ad-
mission by April 1. PPSP and Regular Decision
admitted students are expected to accept the
offer of admission by May 1.

Case Western Reserve University does not ad-
mit first-year students for the spring or sum-
mer sessions. If unusual circumstances apply,prospective students should contact the Office
of Undergraduate Admission.

Enrollment is contingent upon successful
completion of secondary school work and
graduation. Students must arrange to have
final semester grades sent to the Office of Un-
dergraduate Studies.

Secondary School Preparation

All entering first-year students are expected to
have completed rigorous, full-credit academic
work in secondary school, including four years
of English, three years of mathematics, three
years of social studies, three years of science—
two of which must be laboratory science, and
two years of foreign language. A fourth year
of mathematics is expected of students plan-
ning to concentrate in mathematics, science,
or engineering. Students planning to pursue
premedical studies or concentrations in math-
ematics, science, or engineering should have
three years of laboratory science, including
biology, chemistry, and physics. For students interested in the liberal arts, we recommend an additional unit of social studies and foreign language.

TESTS
Applicants must submit scores directly from either the ACT or the SAT. Students electing to take the ACT must complete the Writing Test component. It is recommended that these tests be taken no later than December of the senior year of high school. International students, those who are not U.S. citizens or permanent residents, are required to take the TOEFL unless their SAT Critical Reading and Writing scores are each above 550. The recommended minimum TOEFL score is 550(PBT), 213 (CBT) or 80 (iBT).

INTERVIEW
An informational interview is recommended as part of the admission process, but it is not required. Interviews, group information sessions, and student guided campus tours are offered most weekdays. The Admission Office is open on select Saturdays for group information sessions and campus tours. The office is closed on holidays. Students may arrange appointments at our website or by calling:
Case Western Reserve University
Office of Undergraduate Admission
Wolstein Hall
11318 Bellflower Rd.
Cleveland, Ohio 44106-7055
Phone 216-368-4450
E-mail admission@case.edu
http://admission.case.edu

APPLICATION PROCESS
Before an admission decision can be made, the applicant must submit the following:
1. An application including the required personal written statement and Case Western Reserve University supplement. The application is available through the Common Application at http://commonapp.org.
2. The secondary school report, including class rank, courses and grades from school years 9 through 11, and senior year courses in progress. It is the applicant’s responsibility to request that the high school guidance office prepare the secondary school report and mail it with an official high school transcript to the Office of Undergraduate Admission.
3. Scores from the ACT or SAT testing agencies.
4. Written recommendations from a high school counselor (required) and a teacher (optional).

APPLICATION PROCESS
All admission decisions will be mailed by April 1. Enrollment is contingent on successful completion of secondary school work and graduation. Students must arrange to have a final, official high school transcript sent to the Office of Undergraduate Studies.

ACCEPTANCE OF ADMISSION
Case Western Reserve University subscribes to the College Board Candidate’s Reply Date Agreement. Under this agreement, admitted candidates have until May 1 to accept or decline the offer of admission.

Note: Applicants who have been offered admission by a college or university that requires a response before May 1 (except when applying under a binding Early Decision plan) should contact that college or university to ask for an immediate extension of its deadline until all the colleges applied to have responded. They should also contact the Office of Undergraduate Admission to inform the Admission Committee of the problem.

Case Western Reserve University subscribes to the National Association of College Admission Counselors’ Statement of Principles of Good Practice.

ENROLLMENT DEPOSIT
Students who accept the offer of admission must complete the enrollment confirmation website and submit a non-refundable enrollment deposit of $500 to reserve a place in the entering class. If a student does not complete both steps by May 1, the Office of Undergraduate Admission will permit enrollment only on a space available basis.

Advanced Placement and Proficiency Examinations
Case Western Reserve University grants degree credit and placement in advanced courses on the basis of the College Board Advanced Placement Examinations and the International Baccalaureate (IB) Diploma or the International Baccalaureate higher level examinations. The determination of credit and placement is made by the appropriate academic departments. An Advanced Placement score of 4 or higher or an IB higher level examination score of 5, 6, or 7 may receive favorable consideration. It is the student’s responsibility to have Advanced Placement scores sent to the Office of Undergraduate Studies. Students may also receive college credit on the basis of proficiency examinations administered by individual departments.

TRANSFER APPLICANTS
Transfer applicants are students who have enrolled in a college or university after graduation from high school is considered a transfer student; transfers are considered for admission for the fall semester, spring semester, or summer session. In order to provide adequate time for evaluation, applications should be completed as early as possible by the appropriate deadline. The deadline for fall semester is May 15, for spring semester it is October 15, and the deadline for summer session is April 15. The degree requirements for all students are established by the undergraduate colleges. For specific requirements for transfer students, please see the appropriate section under “Undergraduate Studies.” It is generally expected that the final two academic years will be taken in residence at the university.

Each transfer applicant is asked to submit:
1. An application including the required personal written statement and Case Western Reserve University supplement. The application is available through the Common Application at http://commonapp.org
2. An official high school transcript.
3. Official transcripts from each college or university attended.
4. The College Official’s Report from the supplement to the Common Application, completed by an academic dean or advisor.
5. A letter of recommendation from a college or university professor.
6. The university’s mid-semester report form.
7. If available, SAT or ACT scores. The scores may be included with the high school transcript or sent directly to the university from the testing service.

Transfer applicants will be notified of the admission decision shortly after the file is complete. In order to enroll, students must complete the enrollment confirmation website and submit a non-refundable $500 deposit by the deadline cited in the letter of admission. Offers of admission are contingent upon satisfactory completion of work in progress at another college or university. In order to evaluate transfer credit, the Office of Undergraduate Admis-
sion must receive a complete official transcript of all work taken and course descriptions.

**BINARY (3-2) PROGRAM**

In cooperation with a number of liberal arts colleges, Case Western Reserve University offers the Binary (3-2) Program in engineering, in which students complete three years of study in the liberal arts college and two years in engineering at the Case School of Engineering and receive degrees from both colleges. For further details, consult the program description found under “Undergraduate Studies.”

**SPECIAL ADMISSION PROGRAMS**

Students seeking a B.A. degree in music from Case Western Reserve University must audition with faculty in the music department. Auditions can be arranged before or after enrollment at Case Western Reserve University. Students admitted for a music major can enroll in theory, performance, and composition classes at Cleveland Institute of Music.

Students seeking to enroll in the dual degree program in music, which provides B.A. or B.S. degree from Case Western Reserve University and a B.M. degree from Cleveland Institute of Music, should apply for admission through the Cleveland Institute of Music.

Students seeking to major in art education must submit a portfolio for review by Case Western Reserve University art studio faculty. Portfolio review can be arranged before or after enrollment. Students admitted for an art education major can enroll in theory, performance, and composition classes at Cleveland Institute of Art.

For information regarding admission as a transient student or an adult non-degree student, and admission to the PreCollege Scholars Program, can find information at http://www.case.edu/provost/ugstudies/visitingstu.htm/.

**REGISTRATION**

http://www.case.edu/provost/registrar/registrar.html
(Summer, Fall and Spring)

Students register at the time indicated on the University Registrar’s website or as indicated by individual graduate/professional school registrars. Undergraduate student registration for fall begins in April and continues through the beginning of classes in August; undergraduate student registration for spring begins in November and continues through the beginning of classes in January. Only those students who have no outstanding financial obligations to the university are eligible to register. The University Controller bills those who register early for the next semester, with payment due by the specified deadline before the start of the next semester. At registration just prior to the beginning of classes, students must have paid all previous charges and be able to pay or have financial aid equal to one-half of that semester’s tuition and fees. The “Schedule of Classes” is available electronically and can be accessed from the University Registrar’s website at: http://www.case.edu/provost/registrar/registrar.html/ or through the Student Information System (SIS) at http://www.case.edu/sis/.

The University Registrar’s website includes the academic calendar, the dates for late registration and drop/add, and the Student Information System includes a complete real time listing of courses offered. Students use SIS to register for classes and a listing of registration start dates for each school is available from the University Registrar’s website. No zero-credit only registrations (e.g., zero-credit physical education courses) are allowed, unless approved as part of ongoing degree programs.

**COURSES OF INSTRUCTION**

All courses at the university, except courses in the Medical School, Law School, School of Dental Medicine and School of Nursing, are numbered according to the following plan:

- 100-199 Elementary courses
- 200-299 Intermediate courses
- 300-399 Advanced undergraduate courses
- 400-499 Lower level graduate courses (some are open to undergraduates; consult with the appropriate department)
- 500 and above Advanced graduate courses

Roman numerals (I, II, etc.) after course titles indicate segments of a multicourse sequence. Arabic numerals in parentheses after course titles indicate the semester credit hours for each course.

**VETERANS’ COORDINATOR**

The Veterans’ Coordinator, housed in the Office of the University Registrar, 110 Yost Hall, administers the regulations governing the educational benefits and opportunities open to veterans under various federal laws. The office maintains close contact with the Veterans Administration and is the only office authorized to verify veterans’ attendance. For information call 216-368-4310.

**GRADING SYSTEM**

The following grading system is used at Case Western Reserve University:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Meaning</th>
<th>Quality Points</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Excellent</td>
<td>4.000</td>
<td></td>
</tr>
<tr>
<td>A-</td>
<td>3.666</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>B+</td>
<td>3.333</td>
<td>1</td>
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<tr>
<td>B</td>
<td>3.000</td>
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<td>B-</td>
<td>2.666</td>
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<td>C+</td>
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<td>C</td>
<td>2.000</td>
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<td>C-</td>
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<td>D+</td>
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<td>D</td>
<td>1.000</td>
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</tr>
<tr>
<td>D-</td>
<td>0.666</td>
<td>2</td>
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<tr>
<td>F</td>
<td>0.000</td>
<td></td>
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</tr>
</tbody>
</table>

**Notes:**

1. Schools of Applied Social Science, Dental Medicine, Law only
2. Schools of Dental Medicine, Law only
3. Not applicable for Schools of Applied Social Science, Nursing

- AD Successful Audit
- AP Advanced Placement (test/transfer credit)
- AS Advanced Subsidiary (test/transfer credit)
- COM Commendable (School of Medicine only)
- CR Non-graded course, Award credit for course
- H Honors (Schools of Law, Medicine only)
- I Incomplete
- IB International Baccalaureate (test/transfer credit)
- M Met Expectations (School of Medicine only)
- NC No Credit for a credit/no credit course (School of Law only)
- NG Unsuccessful Audit (Graduate and Professional Schools only)
- NOG Non-graded course, does not earn credit
- NP Not passing
- P Pass
- PR Proficiency
R  In progress, for courses that extend beyond one semester
RPT  Repeated Course (through Summer 2006)
S  Satisfactory (master’s/doctoral thesis, EMBA seminar courses, Schools of Law, Medicine only)
SA  Special Audit
TR  Transfer (test/transfer credit)
U  Unsatisfactory (master’s/doctoral thesis, EMBA seminar courses, Schools of Law, Medicine only)
W  Withdrawal from a class
WD  Withdrawal from all classes for a term
WF  Withdrawn under Academic Regs. 5 & 6 (Law only)

First Year Undergraduates: (effective fall 2005)
For the first two semesters of enrollment and after consultation with a dean in the Office of Undergraduate Studies, matriculated students who are beginning their college studies may withdraw from a course at any time during the semester, but no later than the last day of classes. Any course for which a grade of W is assigned will not be posted on the official transcript. This policy is not available for transfer students and does not apply to the summer session.

EXPLANATION OF GRADES
The responsibility for assigning grades rests exclusively with the instructor of a course or section, who must announce the general method of grading to his/her class at the beginning of the course. Grades in all courses are reported to the University Registrar at the end of each semester for all students and at midterm for undergraduates (midterm grades are not considered part of the student’s permanent academic record). Changes to student grades must be reported on grade change cards and have all required signatures.

I (INCOMPLETE)
The grade of I is assigned at the discretion of an instructor provided that:
1. There are extenuating circumstances, explained to the instructor before the assignment of the grade, which clearly justify an extension of time beyond the requirements established for other students in the class. It is the student’s responsibility to notify the instructor of the circumstances preventing completion.
2. The student has been passing the course and only a small segment of the course remains to be completed, such as a term paper, for which the extenuating circumstances justify a special exception.
An Incomplete grade may not be assigned if a student is absent from a final examination, unless the dean has authorized the absence. Unauthorized absence from a final examination will result in a failing grade. When the student completes the work, the Incomplete is changed to an A, B, C, D, F, or NP. (Note: not all schools award all of these grades, see first paragraph of “Grading System” above.)

For Undergraduate Students: All work for the Incomplete grade must be made up and the change of grade recorded in the Office of the University Registrar, by the date specified by the instructor, but no later than the 11th week of the session following the one in which the Incomplete grade was received. In certain cases (such as students on probation or graduating students), the dean may establish an earlier date for completion of courses with Incomplete grades. When a student fails to submit the work required for removing the Incomplete by the date established, the instructor shall transmit to the Registrar a final grade that assumes a failing performance for the missing work. In the absence of the assignment of a grade by the instructor the Registrar will convert the I to F when the deadline for making up Incomplete grades from a previous semester has passed. Failure to meet this deadline for removing the Incomplete will result in a failing grade. An instructor may elect to give the grade of F or NP if the Incomplete is not removed within the specified time limit. For Students in the Graduate and Professional Schools: In order to receive credit for a course marked Incomplete, the student must complete the work by the date specified by the instructor and in no event later than the end of the next regular semester (fall or spring). If the student fails to remove the Incomplete within the specified time, he or she forfeits the privilege of completing the course for credit, and the grade becomes a permanent Incomplete unless the instructor elects to give a grade of F.

S (SATISFACTORY)
The grade of S given graduate students in the School of Graduate Studies indicates satisfactory progress in evaluating exclusively thesis and dissertation research. The grade S is not counted in determining quality averages. The alternative to a grade of S is U (Unsatisfactory). The grade of I (Incomplete) may not be used in evaluating thesis and dissertation research. In other graduate/professional schools, the grade of S may indicate passing performance in designated courses and advanced seminars.

R (CONDITIONAL)
The grade of R is used for work, such as undergraduate thesis and project laboratories, that extends more than one semester and, upon completion of the thesis or project, will be changed to the letter grade awarded for the completed work. The R grade assigned in ENGL 148 indicates that a student must re-enroll in ENGL 148. In the following semester; the R grade in ENGL 148 remains on the student’s record and is not subject to replacement by the final grade earned in ENGL 148.

AD (AUDIT) AND NG (UNSUCCESSFUL AUDIT)
The grade of AD (audit) will be given when a student has officially registered to audit a course and has satisfied the requirements specified by the instructor for this grade. The grade of NG (unsuccessful audit, graduate, and professional schools only) will be given when a student has officially registered to audit a course and has not satisfied the requirements specified by the instructor.

UNDERGRADUATE STUDENTS
A student may audit a course with the dean’s or advisor’s approval and the consent of the instructor of the course. An auditor receives no credit for the course.

Registration in a course cannot be changed from audit to credit or the reverse after the end of the drop/add period. At the beginning of the course, the student and instructor should reach agreement regarding the requirements to be met for a grade of AD. The grade of AD is entered on the student’s transcript if approved by the instructor of the course. If the instructor does not approve the grade AD, the enrollment is not posted on the transcript. A student may take for credit a course he or she audited in an earlier semester.

GRADUATE/PROFESSIONAL STUDENTS
Dental students: Courses toward degree programs in the School of Dental Medicine may not be audited.

The following statements apply to the Schools
of Graduate Studies and Management: The instructor may designate that the student has not completed all requirements for auditing the course and that NG (Unsuccessful Audit) be recorded on the student’s transcript. A course once audited may not be repeated for credit, nor may any course for which credit has been given be repeated for credit toward degree requirements. Students will be permitted to change their registration in a course from credit to audit (AD), or the reverse, with written consent of their advisor and the instructor only if the change is officially made on or before the date specified in the academic calendar for the given term.

Other graduate and professional schools: Please refer to individual school sections of this publication, or to individual school student handbooks.

W (PARTIAL WITHDRAWAL)
The grade of W will be given if a student officially withdraws from a course on or before the date specified in the academic calendar for the given term. After this date, the grade as determined by the instructor will be posted.

WD (COMPLETE WITHDRAWAL)
The grade WD is assigned by the University Registrar for complete withdrawal from all course work for the semester. All withdrawal requests are to be submitted to the University Registrar prior to the last day of class.

GRADE-POINT AVERAGES
Grade-point averages are calculated by multiplying the number equivalent of the letter grade by the number of credit hours for the course. The semester grade-point average is computed by dividing the total grade points earned at the university by the sum of the credit hours for all courses included in the grade-point calculation.

The cumulative grade-point average is computed by dividing the total grade points earned at the university by the sum of the credit hours for all courses included in the grade-point calculation.

PASS-NO PASS
See specific colleges and schools for information about courses that may be taken on a pass-no pass basis and similar options.

STUDENT RECORDS
The Family Educational Rights and Privacy Act of 1974 (FERPA) contains several provisions that are important to students. First, the university may not release personally identifiable student records to a third party, with certain specific exceptions, unless the third party has requested the information in writing and the student has consented, again in writing, to its release. The university may release directory information about a student, however, unless the student submits a written request that any or all such information not be released. Second, a student may request, in writing, an opportunity to inspect and review the student’s official files and records maintained by the university and may, if appropriate, challenge the accuracy of those records. The university is permitted a reasonable time, not to exceed 45 days, to respond to such a request. Third, a student may file with the Family Policy and Regulations Office of the U.S. Department of Education a complaint concerning what he or she believes to be the university’s failure to comply with FERPA. Finally, a student may obtain from the Registrar a copy of this policy, which the university has adopted to meet the requirements of FERPA. The information below is presented in compliance with the provisions of FERPA, which require the university to notify students annually of their rights and the university’s policies and procedures. Specific procedures may vary slightly among the schools and colleges of the university, and each student is encouraged to inquire at his or her own dean’s office if any question arises.

ACCESS TO FILES
A student may request, in writing, an opportunity to review the contents of the student’s educational file. Certain materials are excluded from review as specified in FERPA. Among these are:

• Records kept in the sole possession of faculty, staff, and other personnel, used only as a personal memory aid, and not accessible to any other person except a temporary substitute for the maker of the record.
• Records created and maintained by law enforcement units solely for law enforcement purposes that are not maintained by persons other than law enforcement officials.
• Records created and maintained by a physician, psychiatrist, psychologist, or other professional or paraprofessional acting in that capacity in connection with the provision of treatment to a student. Such records can, of course, be reviewed by a physician or other appropriate professional of the student’s choice.
• Employment records of a student made and maintained in the normal course of business. Such employment records may be obtained in the Student Employment Office or Human Resources under the policies applicable to those offices.
• Financial records of a student’s parents, or any information contained therein.
• Confidential letters and statements of recommendation placed in the file before January 1, 1975.
• Records for which the student previously waived his or her right of access.
• Records that contain only information about a person after that person is no longer a student, such as alumni records.

The office to which the request is made will arrange an appointment within a reasonable period of time (not to exceed 45 days) for the student to review the file in the presence of a member of the office staff.

FERPA affords students certain rights with respect to their educational records. Students may ask the university to amend a record that the student believes is inaccurate or misleading. The student should write to the university official responsible for the record, clearly identifying the part of the record the student wants changed, and specify why it is inaccurate or misleading. If the university decides not to amend the record as requested by the student, the university will notify the student of the decision and advise the student of his or her right to a hearing regarding the request for amendment. Additional information regarding the hearing procedures will be provided to the student when notified of the right to a hearing.

The student may request copies of those records to which he or she has access under the terms of FERPA. The student will be charged a nominal fee per page for these copies.
RELEASE OF PERSONALLY IDENTIFIABLE RECORDS

FERPA affords the student the right to consent to disclosures of personally identifiable information contained in the student’s educational records, except to the extent that FERPA authorizes disclosure without consent. One exception, which permits disclosure without consent, is disclosure to school officials with legitimate educational interests. A school official is defined as a person employed by the university in an administrative, supervisory, academic, or support staff position (including law enforcement unit and health staff); a person or company with whom the university has contracted (such as an attorney, auditor, or collection agent); a person serving on the Board of Trustees; or assisting another school official in performing his or her tasks. A school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility.

Upon request, the university discloses education records without consent to officials of another school in which a student seeks or intends to enroll. The university also discloses education records to organizations conducting studies for educational agencies or institutions under certain circumstances.

DIRECTORY INFORMATION

For the convenience of faculty and fellow students, FERPA provides for a category known as directory information, which may be released without requesting the eligible student’s specific prior consent. Rather, the act requires that students be notified annually of the types of information included in this category and be given an appropriate period in which to express, in writing, any preference that such information about themselves not be released. For this purpose, directory information is defined to include

- Name (including both maiden name and married name, where applicable)
- Address, telephone listing, and electronic mail address
- Date and place of birth
- Major field of study
- Anticipated graduation date
- Enrollment Status (undergraduate or graduate, full-time or part-time)
- Dates of attendance
- Degrees and awards received
- Participation in officially recognized sports and activities

- Weight and height (members of athletic teams)

Any student who would prefer that the university not release such information about himself or herself should so notify the Office of the University Registrar, in writing, prior to the first week of classes in the fall semester. Students entering the university at midyear may submit such notice during the first week of classes of the spring semester.

TRANSCRIPTS

A transcript of grades will be released only upon written request of the student, either in person or by mail. A fee is charged for each transcript copy. Transcripts will not be issued to, or on behalf of, students who have not discharged all delinquent obligations to the university.

POLICY ON SEXUAL HARASSMENT

It is the policy of Case Western Reserve University to provide a positive, discrimination-free educational and working environment. Sexual harassment is unacceptable conduct that will not be tolerated. All members of the university community share responsibility for avoiding, discouraging, and reporting any form of sexual harassment.

Members of the university community found in violation of this policy may be disciplined, up to and including being discharged for cause or being expelled from the university. Retaliation against persons raising concerns about sexual harassment is prohibited and will constitute separate grounds for disciplinary action, up to and including discharge or expulsion from the university.

This policy and the accompanying procedures shall serve as the only internal university forum of resolution and appeal of sexual harassment complaints.

The policy is available online at http://www.case.edu/stuaff/shpp/harasspolicy.html, in the offices of Equal Opportunity and Diversity, Student Affairs, the Office of the Provost, and at other offices throughout campus. Consultation and advice are available in the offices of Equal Opportunity and Diversity and Student Affairs. See the section, “Student Affairs,” for policies and procedures regarding sexual assault.

STUDENT RIGHT TO KNOW

The Student Right to Know and Campus Security Act requires that universities throughout the country produce statistics and information on the following subjects: 1) retention and graduation rates (http://www.case.edu/provost/registrar/gradrate.html/); 2) financial assistance available to students and requirements and restrictions imposed on Title IV aid; 3) crime statistics on campus (http://www.case.edu/finaid/security/protserv/protserv.html/); 4) athletic program participation rates and financial support; and 5) other institutional information including: the cost of attendance, accreditation and academic program data, facilities and services available to disabled students, and withdrawal and refund policies.

Data on retention and graduation rates is available in the Office of the Provost in Albert Hall (216-368-4389) and is posted on the Registrar’s website (http://www.case.edu/provost/registrar/registrar.html/). Information on financial assistance, including descriptions of application procedures and forms, may be obtained from the Office of University Financial Aid (http://finaid.case.edu/), Yost Hall (216-368-4530). Information concerning athletic program participation and financial support may be obtained from The Physical Education and Athletics Department, Veale Center (216-368-2867). Other institutional information, such as that listed in number 5, above, may be obtained from the Office of the Provost and in the various undergraduate, graduate, and professional schools’ registrars’ offices. Case Western Reserve University’s annual security report (http://www.case.edu/finaid/security/protserv/protserv.html/) includes statistics for the previous three years concerning reported crimes that occurred on campus, in certain off-campus buildings owned or controlled by the university, and on public property within, or immediately adjacent to and accessible from, the campus. The report also includes institutional policies concerning alcohol and drug use, crime prevention, the reporting of crimes, sexual assault, and other matters. To obtain a copy of this report contact the Protective Services Office at 216-368-2908.

EXCEPTIONS TO POLICIES

Requests for exceptions to any academic or administrative policy must be submitted within three months of the end of the semester for which the exception is sought.
UNIVERSITY ADMINISTRATION

March 1, 2009

Glenn Nicholls
Vice President for Student Affairs

Jeanine Arden Ornt
Vice President, General Counsel and Secretary of
the Corporation

John Siders
Sr. Vice President for Finance and Chief
Financial Officer

Lynn T. Singer
Deputy Provost and Vice President for Academic
Programs

Sally Staley
Chief Investment Officer

John Wheeler
Sr. Vice President for Administration

ACADEMIC DEANS

Pamela B. Davis
Dean of the School of Medicine and Vice
President for Medical Affairs

Grover C. Gilmore
Dean of the Mandel School of Applied Social
Sciences

Jerold S. Goldberg
Dean of the School of Dental Medicine

Robert H. Rawson, Jr.
Interim Dean of the School of Law

Mohan Reddy
Dean of the Weatherhead School of Management

Charles Rozek
Vice Provost and Dean of Graduate Studies

Norman C. Tien
Dean of the Case School of Engineering

Cyrus Taylor
Dean of the College of Arts and Sciences

Jeffrey Wolcowitz
Dean of Undergraduate Studies

May L. Wykle
Dean of the Frances Payne Bolton School of
Nursing

BOARD OF TRUSTEES

March 1, 2009

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Timothy J. Callahan, Vice Chair
Mary Ann Jorgenson, Vice Chair
Joseph A. Sabatini, Vice Chair

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Linda Burns Bolton, Ph.D.
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Timothy J. Callahan
John P. Campi
Antony E. Champ, Ph.D.
Kenneth B. Chance, D.D.S.
Archie G. Co
David A. Daberko
James C. Diggs
Thalia Dorwick, Ph.D
Charles D. Fowler
Susie Gharib
Joie A. Gregor
Sally Gries
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Samir N. Jadallah
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Joseph P. Keithley
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Caroline Kovac, Ph.D.
Frank N. Linsalata
George L. Majoros, Jr.
Joseph M. Mandato
Joshua W. Martin III
Thomas F. McKee
Ferid Murad, M.D., Ph.D.
Paul M. Ostergard
Brian J. Ratner
Joseph B. Richey
Joseph A. Sabatini
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S. Andrew Banks
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James McCrea Biggar
Claude M. Blair
C. Bingham Blossom
Charles P. Bolton
Harry J. Bolwell
Christine F. Branche
David L. Brennan
Conella Coulter Brown
FINANCIAL INFORMATION

FINANCIAL INFORMATION
All financial obligations to the university must be discharged before a student can graduate and obtain a degree. A student will not be considered to have registered in the university until all tuition and fees have been paid in full or deferred in accordance with the deferred payment plan outlined at the end of this section. Checks and money orders should be made payable to Case Western Reserve University and should show the name and SIS User ID (a seven digit institutionally-assigned number) of the student for whom payment is made.

TUITION CHARGES
Students registered in the undergraduate colleges and the School of Nursing will be charged tuition according to the following schedule for 2009–2010:

- 1 to 11 credit hours (credit or audit)
  $1,496 per semester hour for students entering fall 2006 and later
- $1,436 per semester hour for students entering prior to fall 2006
- 12 or more credit hours (credit or audit)
  $179,750 per semester for students entering fall 2006 and later
  $17,475 per semester for students entering prior to fall 2006.

Students registered in the School of Graduate Studies and Mandel School will be charged according to the following schedule for 2009–2010:

- 1-11 credit hours (credit or audit)
  $1,375 per semester hour
- 12- And above credit hours (credit or audit) in Graduate Studies
  $16,500 per semester

Students enrolled in undergraduate courses for the summer session will be charged at a rate, which is one-half of the previous semester’s per credit hour charge.

Registration in the fall or spring semester for more than 9 credit hours of dissertation research or more than a total 16 graduate credit hours requires special permission of the dean of graduate studies. Such permission is also necessary for summer session registration in excess of 6 graduate credit hours.

DENTAL MEDICINE
Students who entered the School of Dental Medicine in fall 2006 will be charged $49,486 for the 2009-2010 academic year. Students who entered the dental program after fall 2006 will pay $49,780 for the 2009-2010 academic year. Dental medicine students pay additional tuition for each summer clinic. For summer 2009, this amount is $2,265.

MEDICINE
The tuition rate for students is $45,930.

MANAGEMENT
Students in the various programs administered by the Weatherhead School of Management have a tuition rate established for the duration of the program at time of entry.

Full-time students entering the Accelerated MBA program in fall 2009 will be charged $18,500/semester. Full-time MBA students entering fall 2009 are charged $18,500/semester for 12-20 hours. Students entering prior to fall 2009 are charged $17,661/semester for 12-20 hours. Credit hours in excess of 20 during a semester will be assessed an additional $1,542 per credit hour for new students and $1,439 per credit hour for continuing students. The part-time MBA rate will be $1,542 per credit hour. Part-time MBA students enrolling for more than 12 credit hours will pay $18,500 plus $1,542 for each credit hour over 12. First-year students in the Executive Master of Business Administration program are charged $41,400 for the academic year 2009–2010. Second-year students will pay $40,320 for the academic year and $9,660 for summer 2009. Students in the Executive Doctor of Management program will be charged $37,300 if they entered prior to fall 2008 for the 2009–2010 academic year. Students entering fall 2009 will be charged $45,000 for the 2009–2010 academic year. Students in the MSM-BA, MAcc, MSM-SC, MSM-OR, or MSM-Finance will pay $18,500 for 12 or more hours. The part-time rate is $1,542 for the 2009–2010 academic year.

LAW
In the School of Law, students pursuing a J.D. degree, taking 10 credit hours or more will be charged $38,575 for the 2009-2010 academic year if entering the program in fall 2009. Students who entered prior to fall 2009 will be charged $38,050. The part-time rate is $1,607 per semester.

MANDEL SCHOOL
In the Mandel School of Applied Social Sciences, a student in the master’s program will be charged $16,500 per semester for the 2009–2010 academic year for enrollment between 12 and 16 credits in a semester. The part-time rate of $1,100 applies to students taking 11-credits in a semester. Full-time students enrolled for credit hours in excess of 16 will be assessed an additional $1,100 per credit hour. Doctoral candidates will be charged $1,375 per credit hour to a maximum of $16,500 per semester for registrations of 12 or more credit hours. Students enrolled in the Mandel Center for Nonprofit Organizations will be charged $1,375 per credit hour to a maximum of $16,500 per semester for 12 or more credit hours.

SPECIAL FEES—NOT REFUNDABLE

APPLICATION FEES
Required with all applications for admission. This fee is payable at the time of filing the application. It is not refundable and no portion will be applied to tuition.

Applied Social Sciences: $0
Dental Medicine: $45
Graduate Studies: $50 (not required for non-degree students)
Law: $40 (paper application only); free online
Management: $50
Medicine: $85
Nursing: $75 (D.N.P. & M.S.N.); $50 (Ph.D)

The university’s medical plan fee is automatically billed at the beginning of the fall semester and spring semester (spring semester coverage extends through the summer) to all students registered for one or more credit hours. The
### FINANCIAL INFORMATION

Medical plan provides coverage for medical care not available at the University Health Service. Students registered for one or more credit hours are eligible to use the University Health Service regardless of their participation with the medical plan. Students who have alternate medical insurance may waive the university's medical plan fee each semester by completing an online waiver form. The deadline date for completing the waiver process is stated on the website. Remember, this fee is billed twice a year; therefore, a waiver must be completed twice a year.

#### LATE REGISTRATION FEE
Required of students who register after classes have begun: $25

#### TRANSCRIPT FEE
There is a $5 fee assessed for each transcript request.

#### STUDENT ACTIVITIES FEE
Undergraduate: $144 per semester for students entering prior to fall 2006; $140 per semester for students entering fall 2006 and after.
- Dental Medicine: $110 per semester
- Graduate: .85% of the per credit hour tuition rate per semester ($12/semester for 2009–2010)
- Law: $52 per semester
- Nursing: $15 per semester (D.N.P., & M.S.N.); $7.50 per semester (Ph.D.) $65 Background Check
- Medicine: $15 per semester

#### CO-OP FEE
- First time participants: $150
- Subsequent placements: $75

#### CLINICAL PRACTICE FEE
All nursing undergraduates are charged a clinical practice fee in the fall semester of each year. For the 2009–2010 academic year, the clinical practice fee is $225.

#### LABORATORY FEE
- Dental Medicine: $295 per semester

#### LEASING FEE
- Dental Medicine: $128.50 per semester

#### COMPUTER LEASING FEE
- Dental Medicine: $90 per semester

#### GRADUATION FEE
- Doctor of Philosophy: $87
- This fee for the doctorate includes the cost of microfilming the doctoral dissertation by University Microfilms, Ann Arbor, Michigan, which is a requirement for the degree.

#### IN ABSENTIA FEE
Paid by undergraduate degree candidates who are registered in an approved program at another institution: $500.

#### TUITION DEPOSIT
- Mandel School of Applied Social Sciences: $100 (non-refundable)
- Dental Medicine: $1,000 (non-refundable)
- Nursing (Graduate Entry DNP and MSN Nurse Anesthesia): $200 (non-refundable)
- Law: $200 spring deposit and $400 summer deposit (both non-refundable)
- Management: $500 (non-refundable)
- Undergraduate: $500 enrollment deposit (non-refundable)

#### SPECIAL NURSING FEES
- FPB/NSNA insurance, B.S.N. students: $30 per year
- Malpractice insurance, B.S.N. $29 per year

#### OTHER EXPENSES (ESTIMATED)
- Books, Supplies, and Equipment
  - Nursing—Level I: $1,755 Level II: $1,305; Levels III and IV: $1,245
  - Medicine—$4,000 year (students must also supply their own microscopes; contact School of Medicine for requirements)
  - Dentistry—first year: $11,711; second year: $6,503; third year: $3,935; fourth year: $6,025
- Law: $1,325 per year
- Management: $3025 for first-year students; $1,325 for second year students
- Housing and Meals (On Campus)
  - See “Office of Housing and Residence Life” in the Student Affairs section of this Bulletin.

#### PERSONAL PROPERTY INSURANCE
Students are responsible for their personal property while on campus. The university assumes no responsibility for loss of or damage to a student’s personal property, and the university insurance program does not cover such losses. Many “homeowner policies” purchased by a student’s family provide coverage for such perils as fire, water, and theft. If this coverage does not exist, the student may wish to consider the purchase of a separate policy.

#### POLICY FOR TUITION PAYMENT
Students enrolled in fall, spring, and summer terms for courses of full term length may arrange to pay bills for tuition and fees in two installments. At least one-half of the total bill must be paid at registration; the remainder must be paid by October 9 for the fall semester, March 9 for the spring semester, and July 9 for the summer session. Any remainder after the dates specified will be considered delinquent and will be assessed a late payment charge of 1.5 percent per month. Students registering as transient from another institution must pay the tuition and fees in full at the time of registration. Case Western Reserve University provides a Tuition Made E-Z Payment Plan. This ACH process will automatically debit a designated checking account on a monthly basis and apply the credits electronically to the student’s account. This process will eliminate the need for writing checks and the cost of postage. Information on this plan is available through the Bursar’s Office at 216-368-2226 or the Bursar’s Office website at www.case.edu/bursar/controller/st_ar.htm/.

Case Western Reserve uses the e-mail system to send out monthly billings. The e-mail is sent around the 25th of every month. Students and authorized third parties can view the student’s account in the Student Information System (SIS) for an up to date accounting of the outstanding balance. Students and authorized third parties can also view and/or pay the bill through the Student Information System (SIS) with an e-check or Discover Card. Please note that there is a service charge of 1.77% on a Discover card payment.

#### REFUNDS
It is the policy of Case Western Reserve University that a refund from a scholarship, a grant, a loan or other assistance will be issued only after all charges payable to the university for an entire semester have been satisfied. If the gift assistance and loans for a semester exceed the student’s charges for that semester, a refund will be issued during that semester. Since a refund cannot be processed until after the end of the late registration/drop/add
A student who completely withdraws from a fall or spring semester must pay a percentage of the tuition charge. The percentage charged is based on the number of weeks classes have been in session at the time of withdrawal.

<table>
<thead>
<tr>
<th>WEEK</th>
<th>AMOUNT OF CHARGE</th>
</tr>
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<tbody>
<tr>
<td>1-2</td>
<td>0%</td>
</tr>
<tr>
<td>3</td>
<td>25%</td>
</tr>
<tr>
<td>4-</td>
<td>50%</td>
</tr>
<tr>
<td>5</td>
<td>75%</td>
</tr>
<tr>
<td>6</td>
<td>100%</td>
</tr>
</tbody>
</table>

There is no tuition refund after the 5th week of classes.

In the summer session a student’s withdrawal from a class may change the amount of tuition charged. The amount of tuition charged after withdrawing or dropping a class is based on the percentage of class elapsed prior to the processing of the withdrawal.

<table>
<thead>
<tr>
<th>PERCENTAGE OF CLASS</th>
<th>AMOUNT OF CHARGE</th>
</tr>
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<tbody>
<tr>
<td>0-8%</td>
<td>0%</td>
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<tr>
<td>9-20%</td>
<td>25%</td>
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<tr>
<td>21-27%</td>
<td>50%</td>
</tr>
<tr>
<td>28-39%</td>
<td>75%</td>
</tr>
<tr>
<td>40%</td>
<td>100%</td>
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</tbody>
</table>

There is no tuition refund after the class has been in session for 40% of the scheduled term.

The university will refund any tuition paid for a semester by any student in good standing who is inducted into the armed forces before the end of that semester and who does not receive credit for the work completed during that semester.

**RETURN OF FEDERAL AND INSTITUTIONAL STUDENT**

**FINANCIAL INFORMATION**

This policy applies to students who withdraw or are dismissed and refunds for these students are determined according to the following policy:


2. A student’s withdrawal date is the date the student began the institution’s withdrawal process by submitting a completed withdrawal form to the dean’s office of the school of enrollment. The form must be signed by representatives of all specified departments, including a representative of the dean’s office of the school of enrollment. Students who leave the university without official notification will be considered to have withdrawn as of the midpoint of the semester or the last date of attendance at an academically related activity as documented by the university.

3. Refunds on tuition and room and board, if contracted with the university, will be prorated on a weekly basis based on the university calendar up through the fifth week of the semester. There are no refunds after that time.

4. Federal aid and institutional aid is earned in a prorated manner on a per diem basis based upon the university calendar up to the 60 percent point in the semester. Federal and all other aid is viewed as 100 percent earned after that date.

5. In accordance with federal regulations, when financial aid is involved, refunds are allocated in the following order:

6. Any funds received in excess of the amount earned must be returned to the funding source. If the return of unearned federal assistance causes any portion of the student’s tuition and other charges to be unpaid, the student will be billed by the university.

7. Refunds and adjusted bills will be sent to the student’s Case Western Reserve e-mail account following withdrawal.

**PARTIAL WITHDRAWAL**

A student who withdraws from a course or courses after the normal drop/add period without completely withdrawing from the university is not entitled to a tuition refund for the course or courses dropped. At the discretion of the dean of a school, a partial tuition refund may be authorized in cases in which unforeseen and unavoidable circumstances necessitate that a student withdraws from a course or courses, and the student does not wish to withdraw completely. Federal, state, or institutional aid may be adjusted to reflect the adjusted tuition cost in accordance with federal, state, and institutional rules, regulations, and policies. These may require a minimum level of enrollment to receive any assistance from a specific program.

**FINANCIAL ASSISTANCE**

An important consideration for nearly every student is how much higher education will cost and how much the student will be expected to provide toward that cost. Students should not assume that they will be unable to attend Case Western Reserve University for financial reasons. Each year more than half of the entering class receives financial assistance. Sources of support are many and varied. Students and parents are encouraged to investigate the financial aid opportunities at Case Western Reserve University. For undergraduate students, in addition to a comprehensive program of financial assistance based on a student’s demonstrated need, the university offers academic awards based solely on academic merit. Individual students may be eligible for the Financial Aid Program or the Academic Awards Program, or both. Scholarship and university controlled grant support are restricted to tuition only, unless otherwise noted. An individual student may not receive gift assistance from university programs or scholarship funds in excess of full tuition.

Case Western Reserve University has established academic prizes to recognize the out-
standing academic achievement of its students in the pursuit of their educational programs and objectives. These prizes are announced at honors assemblies at the conclusion of each academic year. In recognition of its commitment to scholarship and research excellence, Case Western Reserve University permits the first $500 of any academic prize received at the honors assemblies to be awarded to a student without affecting other university scholarship or grant assistance. In instances in which federal or state regulations would mandate a reduction in need-based assistance, financial aid and scholarship policy will result in a reduction of up to $500 in self-help assistance (loan and job), if possible, before any grant or scholarship assistance will be adjusted.

For graduate and professional students, in addition to extensive loan assistance and in some cases opportunities for employment, a number of schools and departments offer assistantships and/or grant and scholarship aid. Financial aid information may be found online at http://finaid.case.edu/. Information regarding application procedures, eligibility criteria, financial aid definitions, university scholarships and grants, and student employment is currently available. The university’s financial aid website has direct links to other financial aid websites that provide current financial aid publications. Prospective and current students can search for external scholarships by connecting to the fastWEB free scholarship search home page. Students may direct specific questions to the Office of University Financial Aid using the “Ask the Financial Aid Counselor” link. The counselors will respond via the Internet.

A secure link on the financial aid website, briefCase, provides students and applicants 24-hour access to the status of the application and actual financial aid award. Students will use briefCase to obtain current information on the financial aid process and assistance awarded.

FINANCIAL AID POLICY

A student at Case Western Reserve University may receive assistance for academic excellence, financial need, or both. Academic excellence is recognized by the Academic Awards Program and other scholarship programs of the undergraduate colleges and by various assistantships, fellowships, scholarships and other awards of individual departments in the School of Graduate Studies and several of the professional schools. A student who wishes to apply for financial assistance based on merit should contact the admissions office of the appropriate college or school.

The term “financial aid” refers to assistance awarded to meet demonstrated financial need. The university’s policy regarding the determination of financial need and the awarding of financial aid is presented below. This policy is administered by the Office of University Financial Aid (except for the School of Medicine).

NEED-BASED AID POLICY

Case Western Reserve University assumes that a student’s family will make available from its income and assets a reasonable contribution toward the cost of attending the university. The university will assist a family to make up the difference between the family’s contribution and the cost of attendance. In its effort to employ an equitable method of evaluating requests for financial assistance, the university requires that all new undergraduate students complete the Free Application for Federal Student Aid (FAFSA) which provides the university with an objective means of determining a reasonable educational contribution. All continuing undergraduate students are requested to submit the FAFSA to the processing center and send other documents directly to the Office of University Financial Aid for use in determining eligibility and the amount of financial aid to be awarded. Graduate and professional students are required to complete the FAFSA and submit the other documents directly to the Office of University Financial Aid.

The analysis of the application documents considers the family’s annual income and accumulated assets, with allowances for family size, the number of dependent family members attending postsecondary educational institutions, retirement needs, and other factors. A determination is also made of the amount a student may be expected reasonably to contribute toward college expenses from savings and employment. Financial need is computed by subtracting the student and parental contributions from the cost of attendance, also called student’s budget. This budget includes the actual cost of tuition and fees, an allowance for housing and meals, books and supplies, miscellaneous personal and incidental expenses, and transportation. An undergraduate student’s financial aid award consists generally of three basic types of financial assistance non-repayable gift or grant assistance, repayable loans, and student employment during the school year. A graduate or professional student’s financial aid award is primarily in the form of loan assistance, although other types of aid may be awarded. Most gift assistance is in the form of assistantships, fellowships, or scholarships. Case Western Reserve University adheres to the principle that a student’s need-based financial assistance may not exceed demonstrated financial need.

Because financial aid is initially awarded without regard to any other aid a student may receive from other sources (university or non-university), a student’s financial aid may be adjusted if additional assistance is received. It is the obligation of each financial aid recipient to report the amount, terms, and sources of other assistance not included in the university’s financial aid award. This includes any work, loan, or gift assistance not incorporated in the financial aid package. Any significant change in the family’s financial circumstances (an increase or decrease of $300 or more in income or assets) should be reported to the Office of University Financial Aid. The amount of an individual’s financial aid will vary from year to year as the individual’s financial need varies. The determination of eligibility for financial aid is usually based on the prior calendar year’s income. Normally, financial aid is awarded with the expectation that it will be renewed each year upon reaplication on the basis of funds available, continued demonstrated financial need, and satisfactory academic performance and conduct. Each applicant will be considered for all programs of financial assistance for which he or she is eligible.

In most cases, students who are classified as independent are not required to provide information on their parents’ finances. For purposes of receiving financial aid, a student is considered independent who is:

1. Twenty-four years of age or older by December 31 of the year for which aid is requested; or
2. An orphan or ward of the court or in foster care at age 13 or older; or
3. A veteran of the U.S. Armed Forces or on active duty in the U.S. Armed Forces for purposes other than training; or
4. Married; or
5. A graduate or professional student; or
6. Not married but with children or legal dependents other than a child or spouse who receive more than one-half their support from the student and who live with the stu-
If the student did not file a tax return, a Student Affidavit of Income must be completed and submitted to the Office of University Financial Aid. This form is available from the Office of University Financial Aid. In addition, applicants must complete a Case Western Reserve University Financial Aid Form. All application forms are available for downloading and printing from the Financial Aid website at http://faid.case.edu under “Forms and Publications.”

Applicants should respond promptly to the request for verification documents because federal regulations prevent the disbursement of federal funds until this process has been completed.

Transfer students are evaluated for all sources of financial aid. Transfer students must submit the Free Application For Federal Student Aid. In addition, transfer students must complete a Case Western Reserve University Financial Aid Form. Undergraduate students admitted to either the Integrated Graduate Studies or the Bachelor of Science/Master of Science program must include a memorandum of departmental financial support with their annual application. To maintain continued eligibility for undergraduate aid, the student must register for a 12-credit-hour, full-time undergraduate course load and meet all other requirements of undergraduate aid awards. Undergraduate financial aid eligibility including federal, state, and institutional gift assistance normally terminates after ten semesters of enrollment, regardless of degree completion.

For more information about application procedures, review the on-line publication, “undergraduate financial aid and scholarships” at http://faid.case.edu under “forms and publications.”

Graduate and Professional Students

Following is a summary of procedures for applying for need-based assistance by school.

Students in the School of Medicine should contact the Financial Aid Office in the School of Medicine.

In most instances it is the policy of the Office of University Financial Aid to meet the first $20,500 of financial need with a Stafford Loan. All financial aid application forms are available from the admission offices of the various schools or the Office of University Financial Aid. Some schools may have specific application forms for institutional funds. Check with the admissions office of the graduate/ professional school for information on the application procedures and forms. (Students of the School of Medicine should obtain all application forms from the School of Medicine’s Financial Aid Office.)

Each student in or applying to a dual-degree program must request and provide the Office of University Financial Aid with a memorandum detailing financial support that the student will receive from each school involved in the dual-degree program.

Mandel School of Applied Social Sciences

First-year students or first-time financial aid applicants must submit:

1. A Free Application for Federal Student Aid (FAFSA) Federal Code E00084
2. To the Office of University Financial Aid:
   a. A Case Western Reserve form.
   b. If selected for verification, assigned copy of the student’s (and, where appropriate, the student's spouse's) prior year federal income tax return and W-2 forms; if a tax return was not filed, a completed Student/Spouse Affidavit of Income.
   c. A memorandum from the Mandel School of Applied Social Sciences specifying the amount and types of aid, if any, the student will be receiving from the School.

Continuing students must submit:

1. A Free Application for Federal Student Aid (FAFSA) Federal Code E00084
2. To the Office of University Financial Aid:
   a. A Case Western Reserve form.
   b. If selected for verification, a signed copy of the student’s (and, where appropriate, the student’s spouse’s) prior year federal income tax return and W-2 forms; if a tax return was not filed, a completed Student/Spouse Affidavit of Income.
   c. A memorandum from the Mandel School of Applied Social Sciences specifying the amount and types of aid, if any, the student will be receiving from the School.

School of Dental Medicine

All financial aid applicants must submit:

1. New and continuing students: A Free Application for Federal Student Aid (FAFSA)
2. To the Office of University Financial Aid:
   a. A Case Western Reserve form.
   b. A signed copy of the parents’ prior-year federal income tax return and W-2 forms if applying for funds through the Department of Health and Human Services.
   c. If selected for verification, signed copy of the student’s (and, where applicable, the student’s spouse’s) prior year federal income tax return and W-2 forms; if a tax return was not filed, a completed Student/Spouse Affidavit of Income.
   d. A financial aid transcript from any previous U.S. dental school attended (transfer students and applicants to the graduate master’s programs only).

School of Graduate Studies
New and continuing students must submit:
a. A Free Application for Federal Student Aid (FAFSA) Federal Codes E00078.
e. All financial aid applicants must submit the following documents:
   a. A Case Western Reserve form.
   b. If selected for verification, signed copy of the student’s (and, where applicable, the student’s spouse’s) prior year federal income tax return and W-2 forms; if a tax return was not filed, a completed Student/Spouse Affidavit of Income.
   c. A memorandum from the Weatherhead School of Management specifying the amount and types of aid, if any, the student will receive from the school.
   d. A memorandum from the Mandel Center for Nonprofit Organizations indicating the amount and kind of assistance, if any, the student will receive from the School of Law.

Weatherhead School of Management
All financial aid applicants must submit the following documents:
2. To the University Office of Financial Aid:
   a. A Case Western Reserve form.
   b. If selected for verification, signed copy of the student’s (and, where applicable, the student’s spouse’s) prior year federal income tax return and W-2 forms; if a tax return was not filed, a completed Student/Spouse Affidavit of Income.
   c. A memorandum from the Mandel Center for Nonprofit Organizations indicating the amount and kind of assistance, if any, the student will receive from the school.

School of Law
All applicants for financial aid must submit:
2. To the Office of University Financial Aid:
   a. A memorandum from the School of Law to the Office of University Financial Aid will be submitted on behalf of each student, indicating the amount and kind of assistance, if any, the student will receive from the School of Law.
   b. A Case Western Reserve form.
   c. A financial aid transcript from any graduate master’s program.

School of Medicine
All financial aid applicants must submit a Free Application for Federal Student Aid (FAFSA) Federal Code E00079 and complete the electronic Need Access application provided by the Access Group.

Frances Payne Bolton School of Nursing Graduate Programs
The following procedures must be observed for all Doctor of Nursing (D.N.P.), M.S.N., and Ph.D. students seeking financial aid based on need:
1. All new and continuing students must submit a Free Application for Federal Student Aid (FAFSA) Federal Code E00083.
2. Some new students may be required to submit a Financial Aid Transcript from the college or university previously attended. The transcripts are to be sent to the Office of University Financial Aid at Case Western Reserve University.
3. All new and continuing students must submit to the Office of University Financial Aid:
   a. A Case Western Reserve form.
   b. If selected for verification or applying for funding through the Federal Nursing Loan administered by the U.S. Department of Health and Human Services, a signed or certified copy of the student’s and spouse’s (if applicable) prior year federal income tax return and W-2 forms. If a tax return was not filed, a completed Student/Spouse Affidavit of Income;
   c. A memorandum from the Mandel Center for Nonprofit Organizations indicating the amount and kind of assistance awarded for each term.

Mandel Center for Nonprofit Organizations Students applying for scholarships must apply directly to the Mandel Center. One application is sufficient to apply for any scholarship available. The following procedure applies to those students who wish to borrow through the educational loan programs, in addition to any scholarship(s) received. Students must be enrolled at least halftime to qualify for federal educational loans.

All financial aid applicants must submit:
2. To the Office of University Financial Aid:
   a. A Case Western Reserve form.
   b. If selected for verification, a signed or certified copy of the student’s and spouse’s (where applicable) prior year federal income tax return and W-2 forms; if a tax return was not filed, a completed Student/Spouse Affidavit of Income.
   c. A memorandum from the Mandel Center for Nonprofit Organizations indicating the amount and kind of assistance, if any, the student will receive from the school.

TYPES OF AID
Gift and Scholarship Aid
Aid Available to Undergraduate, Graduate, and Professional Students
Ukrainian Student Assistance Fund Scholarship
Available to students in the Case School of Engineering, the College of Arts and Sciences, the School of Graduate Studies, and each of the professional schools, this scholarship stipulates that the applicant must be a full-time student in good standing, must demonstrate financial need, and normally must have at least one parent or grandparent who was born in the Ukraine. The student must be a U.S. citizen or permanent resident and must be otherwise eligible for need-based financial assistance.

Undergraduate Aid related to Academic Achievement or Potential, Awarded by Case Western Reserve University
(Follow the application procedures indicated above, unless otherwise indicated.)

Academic Awards Program
The following academic awards, honoring distinguished faculty, alumni, and benefactors of the university, are offered to qualified applicants for admission as freshmen. Transfer students are ineligible. These awards are renewable for each of the four years of undergraduate study, provided high academic achievement is maintained.

Three full-tuition Albert W. Smith Scholarships for freshmen accepted in engineering, science, or mathematics.

Two full-tuition Treuhaft Scholarships for freshmen accepted in engineering, science, or mathematics.

Four full-tuition Andrew Squire Scholarships for freshmen accepted in the arts, humanities, natural sciences, social and behavioral sciences, management and accountability.

Two full-tuition Adelbert Alumni Scholarships for freshmen accepted in the arts, humanities, natural sciences, social and behavioral sciences, management and accountability.

One $20,000 Curtis Lee Smith Scholarship every four years for a first-year student accepted in the arts, humanities, natural sciences, social and behavioral sciences, management or accountability.

One $20,000 Elizabeth Walker Scholarship every four years for a first-year student accepted in the arts, humanities, natural sciences, social and behavioral sciences, management, or accountability.

Two full-tuition Congressional Black Caucus Scholarships

One full-tuition Milton A. Wolf Scholarship
A Trustee’s Scholarship for selected freshmen entering the College of Arts and Sciences, the Case School of Engineering, the Frances Payne Bolton School of Nursing, or the Weatherhead undergraduate program. (Value for freshmen entering in 2009 is $22,500.) The university may establish annual limits on the number of Trustee’s Scholarships to be offered.

A President’s Scholarship for selected first-year student entering the College of Arts and Sciences, the Case School of Engineering, the Frances Payne Bolton School of Nursing or the Weatherhead undergraduate program. (Value for freshmen entering in 2009 is $27,500.) The university may establish annual limits on the number of President’s Scholarships to be offered.

A Provost’s Scholarship for selected first-year students entering the College of Arts and Sciences, the Case School of Engineering, the Frances Payne Bolton School of Nursing or the Weatherhead undergraduate program (Value for freshmen entering in 2009 is $17,500.) The university may establish annual limits on the number of Provost’s Scholarships to be offered.

Provost’s Special Scholarships for selected first-year students entering the College of Arts and Sciences, the Case School of Engineering, the Frances Payne Bolton School of Nursing, or the Weatherhead undergraduate program who demonstrate superior academic performance, and who have encountered economic or educational obstacles that affected their college preparation. Applicants from inner-city and remote rural schools, including Indian reservations, and members of underrepresented minority groups, are encouraged to apply. Students with special talents and significant extracurricular and community activities are encouraged to apply as well. (Value for freshmen entering in 2009 is $20,000.) The university reserves the right to limit the number of Provost Special Scholarships offered.

Dean’s Scholarships are offered to selected first-year students in the College of Arts and Sciences, Case School of Engineering, the Frances Payne Bolton School of Nursing, or the Weatherhead undergraduate program. (Value for freshmen entering in 2009 is $15,000.) The university reserves the right to limit the number of Dean’s Scholarships offered.

Faculty Scholarships are offered to selected first-year students in the College of Arts and Sciences, Case School of Engineering, or the Weatherhead undergraduate program. (Value for freshmen entering in 2009 ranges from $5,000 to $10,000.) The university reserves the right to limit the number of Faculty Scholarships offered.

Renewal of Scholarships
Scholarships are renewable for each year of undergraduate study provided that the student meets the renewal criteria established for the student’s class. A student may receive scholarship assistance for no more than eight semesters of continuous undergraduate course work or until the student completes the number of continuous semesters of full-time undergraduate course work to receive a degree, whichever is less.

Student records are reviewed at the end of each academic year for renewal of scholarship assistance regardless of the number of semesters for which the student was enrolled during the academic year. The student must meet both a qualitative and quantitative standard for scholarship renewal.

The minimum standards for continuation are:

a) Cumulative hours earned after matriculation at Case Western Reserve (not including AP/IB/transfer or Pre-College Scholar credit earned prior to matriculation at the University)

At end of first year: 21 semester hours
At end of the second year: 54 semester hours*
At end of the third year: 84 semester hours*

*For students participating in an approved off-campus program (Cooperative Education, Practicum, Junior Year Abroad, or Washington Semester) an adjustment is made in the number of hours expected.

b) A cumulative scholarship GPA of 2.5 at the end of the first year, and a cumulative scholarship grade point average of 3.0 thereafter.**

**Scholarship GPA: No courses are eliminated from a student’s record for the purpose of calculating the “Scholarship GPA.” The “Scholarship GPA” is the student’s cumulative GPA; unless the student has used the Repeat Option or has earned any F grades in the

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Freshman year that do not appear on the official transcript. If a scholarship recipient has used the Repeat Option for any course or has earned any F grades that do not appear on the official transcript, the original grades will be included in the computation of the cumulative grade average for the purpose of determining eligibility for scholarship continuation.

If a scholarship recipient's achievement falls below the standard, the scholarship is terminated. A student planning to take a leave for one semester must obtain approval prior to the leave of absence in order for a scholarship to be deferred and re-activated upon re-enrollment.

Students are expected to maintain a full time course load (12 or more credit hours in a regular semester to receive the scholarship. Students in the final semester of study who do not require a full time course load to complete degree requirements may petition the Office of Undergraduate Studies for use of a pro-rated amount of the scholarship for enrollment on at least a half time basis.

Students should consult the Handbook for Undergraduate Students for complete details regarding the renewal of the scholarships.

Music and Theater Arts Scholarship
Case Western Reserve offers scholarships to prospective first-year students who plan to major in Music or Theater Arts. Individual scholarships range from $2,000 to $22,500 per year. Scholarships are renewable for each of the four years of undergraduate study, or until the attainment of the baccalaureate degree, whichever comes first. To be considered for the scholarship, students will audition with the specified department.

Minority Scholars Program
A special program of academic preparation, career counseling, internships, and mentoring is offered for selected minority students. Program participants may qualify for special financial assistance designated for low income or disadvantaged students. To apply, a student must identify himself or herself as an underrepresented minority to the Office of Undergraduate Admission. Minorities who are underrepresented in higher education include Native Americans, African Americans, Mexican Americans, Puerto Ricans, Native Alaskans, and Native Pacific Islanders.

National Merit Scholarships
Case Western Reserve University sponsors at least 25 four-year scholarships for National Merit Scholarship Corporation finalists who have listed Case Western Reserve University as their first-choice institution. Scholarships range from $500 to $2,000 per year.

Case School of Engineering Alumni Association Scholarships
The Case School of Engineering Alumni Association provides scholarship assistance to selected juniors and seniors who have demonstrated outstanding academic achievement and participation in extracurricular activities.

Alden Undergraduate Fellowship in Systems Engineering
Several scholarships of varying amounts are offered for the junior and senior years to students in Case School of Engineering who have declared a major in systems engineering. Contact the Department for further details.

James Dysart Magee Scholarships
Two or more scholarships are awarded annually to seniors in the Integrated Graduate Studies programs in economics and the social and behavioral sciences.

Trustee’s, President’s, and Provost’s Scholarships for Upper-Class Students
Recipients will be chosen from students not previously receiving these or similar scholarships. All first, second, and third year students will be eligible for consideration provided that the student has achieved a minimum 3.75 cumulative GPA at the university and has earned at least 30, 60, or 90 credit hours respectively at Case Western Reserve after the freshman, sophomore, or junior year of study. AP credit and transfer credit will not be considered. Recipients will be selected from eligible applicants who have attained a record of achievement, participation, and leadership at Case Western Reserve University that distinguishes them from their peers. Recipients will be selected by the Committee on Academic Standing.

The following scholarships will be available:
• One Trustee’s Scholarship
• Two President’s Scholarships
• Four Provost’s Scholarships

Students may obtain an application after February 15 in the Office of Undergraduate Studies or the Office of University Financial Aid. Applicants must submit the completed application and a letter of recommendation from a faculty member by April 15 to the Office of Undergraduate Studies.

The scholarships are renewable through the fourth year of undergraduate study or completion of the undergraduate degree, whichever comes first. A student must achieve a cumulative 3.0 GPA, full time undergraduate status, and earn at least thirty additional credit hours during each subsequent year to retain the scholarship.

Community College Transfer Scholarships Program
Two scholarships are offered to selected graduates of community colleges for admission as transfer students. These scholarships of $10,000 each are renewable at the same level for up to two additional years of full time undergraduate study, provided that the recipient earns at least thirty credit hours each year at Case Western Reserve University with at least a 3.0 cumulative GPA.

Undergraduate Aid Based on Financial Need and Contingent upon Satisfactory Academic Progress, Awarded by Case Western Reserve University
(Follow the application procedures outlined above, unless otherwise indicated.)

GRANTS-IN-AID FROM THE SCHOOLS
Grants-in-aid comprise non-repayable gift assistance which varies according to the amount of unmet financial need but which may not exceed tuition.

Federal Supplemental Educational Opportunity Grants (FSEOG)
Students with financial need may receive a Federal Supplemental Educational Opportunity Grant. The FSEOG is awarded to students with great financial need who would be unable to attend the University without this grant. Grants may range from $200 to $4,000 per year.

UNDERGRADUATE AID AWARDED OUTSIDE CASE WESTERN RESERVE UNIVERSITY
Federal Pell Grant
The Federal Pell Grant program is a federal grant program through which a student can receive a maximum of $5,350 (for 2009-
2010). The student must apply for the Federal Pell Grant by completing the Free Application for Federal Student Aid (FAFSA). Within two weeks of filing, the student will receive an electronic or paper Student Aid Report, and the Office of University Financial Aid will receive the results electronically. The amount of Federal Pell Grant the student is eligible to receive will be determined according to federal payment tables that are updated annually. The U.S. Department of Education requires that eligibility for a Federal Pell Grant be determined before any other federal aid can be awarded.

**Non-Public, Need-Based Block Grant**

The proposed State of Ohio biennial budget bill for academic years 2009-2010 and 2010-2011 includes a proposal to provide a block grant to each Ohio institution of higher education to be awarded on the basis of the highest financial need to undergraduate students who are Ohio residents. This proposal is subject to change and final approval from both the Ohio General Assembly and the Governor of the State of Ohio no later than June 30, 2009.

**War Orphans Scholarship Program**

The state of Ohio provides scholarship assistance to children of veterans who were killed in action during times of war, who received a service-connected disability of at least 60 percent, or who are totally disabled. The veteran must have entered the service as a resident of Ohio. The scholarship provides a sum of money equal to the average of tuition and fees of state-assisted institutions to students who attend eligible private institutions in the state of Ohio. Students should contact the Student Assistance Office of the Ohio Board of Regents for further details.

**Other State Scholarship and Grant Programs**

The states of Delaware, Maryland, Michigan, Pennsylvania, Rhode Island, and Vermont have state scholarship or grant programs for residents. The recipients of these state scholarship or grant programs may use this assistance at any eligible college or university. Students should contact their high school guidance directors or the appropriate state agency for further information.

**ROTC**

U.S. Army and Air Force Scholarships are available on a competitive basis. The scholarships pay a portion or all of the recipient’s tuition, laboratory, textbook, and incidental fees. Recipients also receive a tax-free stipend ranging from $250 to $400 on a monthly basis during the academic year. Students compete for three or four year scholarships. Case Western Reserve University provides matching grants to assist with tuition for up to ten new students each year.

**OTHER GRANTS AND SCHOLARSHIPS**

Many students receive grants or scholarships from companies, community organizations, ethnic or religious groups, or fraternal organizations. Students are encouraged to seek such outside assistance. It is a condition of receiving financial assistance from the University that the student notifies the Office of University Financial Aid of all assistance received from outside the university, whether paid directly to the university or to the student.

**Mandel School of Applied Social Sciences**

MANDEL SASS SCHOLARSHIPS

Scholarships are awarded to full-time, intensive, and international students in varying amounts, as determined by financial need and academic merit. These scholarships are renewable, provided the recipient meets eligibility requirements and availability of funds.

**School of Dental Medicine**

ALUMNI SCHOLARSHIPS

The School of Dental Medicine, with the support of the Alumni Association, awards a number of four-year partial tuition scholarships to entering students of outstanding achievement and potential.

**American Dental Association (ADA) Endowment and Assistance Fund**

The ADA provides competitive scholarships to second year Dental Medicine students. Selection criteria include U.S. citizenship; demonstrated need of at least $2,500; cumulative GPA of 3.0 on a 4.0 scale. Each dental school is allowed to provide two students with an application. Eligibility to apply is determined by the scholarship committee of the School of Dental Medicine. The application deadline is June 15.

**American Dental Association (ADA) Endowment Fund Minority Dental**

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**Student Scholarship Program**

The ADA offers scholarships for second year minority Dental Medicine students. Selection criteria include demonstration of financial need and cumulative GPA of 2.5 on a 4.0 scale. Each dental school is allowed to provide two students with an application. Eligibility to apply is determined by the scholarship committee of the School of Dental Medicine.

**Armed Services Scholarship Program**

The Army, Navy, and Air Force permit selected students to be commissioned as officers in their programs. Terms and conditions of each branch scholarship program are available from the Health Professions recruiter for the specific branch of service.

**National Health Service Corps**

National Health Service Corps offers scholarship benefits to recipients including tuition, fees, and a stipend. Participants are obligated for a full year of service for each year of benefits with a minimum obligation of two years. Further information is available through the School of Dental Medicine.

It is suggested that applicants check with local fraternal and community organizations and with their local dental societies.

**School of Graduate Studies**

**FELLOWSHIPS, TRAINEESHIPS, ASSISTANTSHIPS AND AWARDS**

The university has approximately 1,000 competitive awards for the support of full-time study in the School of Graduate Studies. These include a variety of fellowships, traineeships, and assistantships, and are assigned through most of the departments offering graduate degree programs. Most awards are granted for study beginning in the fall semester. New students are eligible for award consideration at the time they apply for admission. The general deadline for completed applications for admission with financial aid consideration is March 1 for the following semester.

**OTHER RESOURCES**

The Office of Research Administration has access to a terminal-based data system (SPIN) that can provide information on a variety of additional public and private sources for financial assistance.

**School of Law**
School of Medicine

Scholarships

It is the policy of the School of Medicine to use its limited scholarship funds to assist those students whose financial needs are so great that, if they were all met by loans, the burden of indebtedness would be extreme. No scholarships are granted merely because of academic excellence to students whose personal and family resources are adequate to meet the costs of a medical education. Minority group students selected for admission to the medical school are eligible to apply for aid from:

**National Medical Fellowships, Inc.**
110 West 32nd St.
New York, NY 10001-3205

It is desirable for eligible students (African-Americans, Mexican-Americans, mainland Puerto Ricans, and Native Americans) to initiate such applications promptly after they are accepted.

**Fellowships**

Many students seek opportunities to devote vacation months to intensive study of some subject in which they have become interested. Summer research fellowships are made available to students to enable them to engage in such investigations under the supervision of a faculty sponsor. The present policy is to provide, insofar as possible, a stipend of $1,200, with the requirement that the student devote a minimum of two months of full-time effort to the project. Support for the vacation research fellowship program comes from many sources.

**Federal Scholarship Programs**

Branches of the military service and the National Health Service Corps offer scholarship benefits to recipients including tuition, fees, and a stipend. Participants are obligated for a full year of service for each year of benefits with a minimum obligation of two years. Further information about these programs may be obtained from the local recruiting office of the armed forces or through the financial aid office at the School of Medicine.

**Frances Payne Bolton School of Nursing**

**Doctorate of Nursing Practice (D.N.P.)**

Grants-in-Aid are awarded to full-time students of the D.N.P. program who demonstrate financial need and maintain satisfactory academic progress. Some of these are from endowments but the majority is contributions from alumni of the school.

**M.S.N. and Ph.D. Students**

The following grants and scholarships are available through the School of Nursing:

Professional Nurse Traineeships are federal traineeships designed for M.S.N. students preparing for teaching, administration, or specialization in a particular field of nursing practice. Students must be enrolled at least half-time (5 credit hours) both fall and spring semesters to qualify. Students entering in the spring will qualify if they commit to at least a half-time enrollment thereafter. Professional Nurse Traineeships may be used for master's study for up to 18 months. The current level of funding pays for approximately 1 to 1 1/2 credit hours per semester.

National Research Service Awards for Individual Predoctoral Nurse Fellowships are awarded under the authority of the Public Health Service Act to nurses for predoctoral training in specified areas of nursing. These awards are made to individuals selected in national competition. Applicants must be enrolled for study leading to the Ph.D. in nursing and be sponsored by faculty of the School of Nursing.

Research and/or teaching graduate fellowships/assistantships may be available to part-time or full-time students who are registered nurses based upon academic merit and prior relevant academic and/or work experience. A fellowship/assistantship carries a revision of tuition for 1.5 to 6 hours each semester plus a small monthly stipend in exchange for 20 hours of work per week for the 15-week semester. To apply for the fellowship/assistant, check the appropriate space on the School of Nursing application form.

**Nurse Faculty Loan**

The U.S. Department of Health and Human Services provides funding through the Nurse Faculty Loan Program to assist students in pursuing doctoral degrees in the field of nursing, with the goal of becoming an educator at the college or graduate level. Eligible students must be enrolled on at least a half-time basis, be U.S. citizens or nationals, and not be in default on a federal loan. Loan funds may be used to cover tuition, fees, books, lab expenses, and reasonable education expenses.

**Loan Assistance**

Loans Awarded by Case Western Reserve Office of University Financial Aid

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**FINANCIAL INFORMATION**

**Law School Scholarships**

Each year a number of scholarships are awarded to entering students on the basis of merit. The scholarship is renewable provided the recipient maintains the requisite GPA. Funds for these scholarships are provided from the generous support of alumni and friends of the law school. Scholarships are awarded in varying amounts up to full-tuition, depending upon academic performance and availability of funds.

**Weatherhead School of Management**

In addition to participating in federal financial aid programs, the Weatherhead School of Management sponsors its own programs of financial assistance for qualified MBA and M.Acct. students. The Weatherhead School programs include scholarships, grants, and loans. All requests for financial aid should be submitted no later than April 1. Because the availability of financial aid is limited, students are encouraged to apply as early as possible for such aid. Decisions concerning admission and financial aid are made independently of one another. Applying for financial aid will neither help nor hinder an applicant’s chances for admission.

To apply for any of the Weatherhead Scholarships, check the appropriate space on the application for admission. Scholarship decisions are made on a rolling basis until funds are exhausted.

**Scholarships**

The Weatherhead School awards a limited number of scholarships each year to entering full-time MBA and M.Acct. students. Primary consideration is given to students who have demonstrated a high level of academic achievement in undergraduate studies in conjunction with outstanding scores on the GMAT. Relevant work experience is also evaluated. To be considered for admission, scholarship funds are available to students who have demonstrated a high level of academic achievement in undergraduate studies in conjunction with outstanding scores on the GMAT. Relevant work experience is also evaluated. To be considered for admission, scholarship decisions are made on a rolling basis until funds are exhausted.

**M.S.N. and Ph.D. Students**

The following grants and scholarships are available through the School of Nursing:

Professional Nurse Traineeships are federal traineeships designed for M.S.N. students preparing for teaching, administration, or specialization in a particular field of nursing practice. Students must be enrolled at least half-time (5 credit hours) both fall and spring semesters to qualify. Students entering in the spring will qualify if they commit to at least a half-time enrollment thereafter. Professional Nurse Traineeships may be used for master’s study for up to 18 months. The current level of funding pays for approximately 1 to 1 1/2 credit hours per semester.

National Research Service Awards for Individual Predoctoral Nurse Fellowships are awarded under the authority of the Public Health Service Act to nurses for predoctoral training in specified areas of nursing. These awards are made to individuals selected in national competition. Applicants must be enrolled for study leading to the Ph.D. in nursing and be sponsored by faculty of the School of Nursing.

Research and/or teaching graduate fellowships/assistantships may be available to part-time or full-time students who are registered nurses based upon academic merit and prior relevant academic and/or work experience. A fellowship/assistantship carries a revision of tuition for 1.5 to 6 hours each semester plus a small monthly stipend in exchange for 20 hours of work per week for the 15-week semester. To apply for the fellowship/assistant, check the appropriate space on the School of Nursing application form.

**Nurse Faculty Loan**

The U.S. Department of Health and Human Services provides funding through the Nurse Faculty Loan Program to assist students in pursuing doctoral degrees in the field of nursing, with the goal of becoming an educator at the college or graduate level. Eligible students must be enrolled on at least a half-time basis, be U.S. citizens or nationals, and not be in default on a federal loan. Loan funds may be used to cover tuition, fees, books, lab expenses, and reasonable education expenses.

**Loan Assistance**

Loans Awarded by Case Western Reserve Office of University Financial Aid
These loans are awarded on the basis of financial need. A loan will probably be a part of a package awarded in response to an application for financial assistance.

**Federal Perkins Loan**

Perkins Loans enable students to borrow up to $40,000 through graduate school (up to $20,000 as an undergraduate). Repayment begins six months after graduation or after the student ceases enrollment on at least a half-time basis. To be eligible a student must be a citizen of the United States or have a permanent resident visa, be at least a half-time student making satisfactory progress toward a degree, and establish financial need for the loan. The Federal Perkins Loan may be awarded to undergraduate students and graduate and professional students in all programs except the School of Medicine.

**HEALTH PROFESSION**

**Student Loans (HPSL)**

Awarded to students in the School of Dental Medicine and School of Medicine who demonstrate financial need, HPSL is a federal loan that enables eligible students to borrow at 5 percent simple interest, with repayment made over a ten-year period. Parental information must be provided by all students wishing consideration for these funds.

**Federal Nursing Loan Program**

Only D.N.P. and M.S.N. students in the School of Nursing are being awarded the limited federal loans provided under the Nursing Student Loan Program. They may receive up to $4,000 per year, depending upon financial need and availability of funds. Interest is 5 percent, and repayment begins when the student completes the program or ceases to be enrolled at least half time.

**University Loans**

A university loan is a low-interest long-term loan provided to a student to assist with educational expenses. Repayment is made over a ten-year period after graduation or over a ten-year period after the student ceases enrollment on at least a half-time basis. Interest is 8 percent.

a) Undergraduate

Forty-eight loan funds have been established for undergraduate students. Loans are awarded by the Office of University Financial Aid on the basis of need.

b) Graduate and Professional

The Mandel School of Applied Social Sciences has a small amount of loan money available to meet financial need after federal loan availability has been exhausted. These loans are awarded by the Office of University Financial Aid.

A number of loan funds have been established for students in the School of Dental Medicine. Loans from these funds are awarded only to meet cases of exceptional need that cannot be met by other funding, and some of these funds are restricted to certain classes and categories of students.

The School of Law provides low-interest, long-term loans to students with unmet need who have exhausted all other available assistance.

The Weatherhead School of Management has loan funds for MBA students who demonstrate financial need.

Loans are available to students in the School of Medicine from funds given to the School of Medicine for that purpose. The Medical Alumni Association Rotating Loan Fund, augmented each year by contributions from graduates of the school, is a major source of aid for currently enrolled students.

The Frances Payne Bolton School of Nursing has several loans funds available to assist students with exceptional financial need as determined by the Office of University Financial Aid.

The interest is subsidized (paid) by the U.S. Federal Government. All undergraduate students must apply for the Federal Pell Grant. Application forms for the Federal Stafford Loan Program may be obtained from a bank or other lending institution, or from the Office of University Financial Aid. The appropriate forms must then be submitted to the Office of University Financial Aid. All applicants for Stafford Loans must submit the following:

1. A Free Application for Federal Student Aid (FAFSA).
2. To the Office of University Financial Aid:
   b. If a student is selected for verification, a signed copy of the parents’ prior year federal income tax return, including all schedules and W-2 forms (in the case of dependent students).
   c. A signed copy of the student’s prior year federal income tax return, including all schedules and W-2 forms (and where appropriate, the student’s spouse’s), or, if a tax return was not filed, a completed Student/Spouse Statement of Income.
   d. In the case of students enrolled or admitted to the Mandel School of Applied Social Sciences, School of Graduate Studies, School of Law, Weatherhead School of Management, Mandel Center for Nonprofit Organizations, or the D.N.P., M.S.N. or Ph.D. program of the Frances Payne Bolton School of Nursing, the Office of University Financial Aid also requires a memorandum from the school specifying
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the admission status, number of credit hours enrolled for each term, current academic standing, and the amount of other financial assistance, if any, being awarded. The student should allow at least 8 to 10 weeks between submission of the forms to the Office of University Financial Aid and receipt of the loan proceeds.

e. All first-time Stafford Loan borrowers must complete a loan entrance interview to acquaint themselves with the rights and responsibilities of federal loan borrowers. This information session may be handled online and must be completed before the promissory note may be signed or funds disbursed.

Unsubsidized Loans

Unsubsidized Federal Stafford Loans require the same enrollment criteria. The interest rate is 6.8% for all students. Borrowers are responsible for paying the interest during the in-school and deferment periods. Borrowers may choose to make periodic interest payments to the lender/servicer, or opt to have the accrued interest capitalized (added on to) the principal loan amount. Borrowers who do not qualify for the maximum amount under a subsidized loan may borrow an unsubsidized loan up to the maximum allowable loan amount. All undergraduate students are eligible to borrow up to $2,000 in unsubsidized Stafford Loan in addition to the $3,500, $4,500, or $5,500 annual maximum in subsidized Stafford. The maximum aggregate Stafford loan amounts for dependent students are $5,500 per year for freshmen, $6,500 per year for sophomores, $7,500 per year for juniors and seniors, and $20,500 per year for graduate students. Independent undergraduate students are eligible for an additional unsubsidized loan in the amounts of $4,000 per year for freshmen and sophomores, $5,000 per year for juniors and seniors, and $12,000 per year for graduate students. Students enrolled in the Schools of Medicine and Dental Medicine are eligible to borrow an additional $20,000 annually. The application process is identical to that for the subsidized loans. Undergraduate students must apply for and have eligibility determined for the Federal Pell Grant and all students must have eligibility for the subsidized loan determined before borrowing an unsubsidized loan. Promissory notes are completed online at the SallieMac website.

Federal Parent Loans for

Undergraduate Students (FPLUS)

Many lending institutions participate in the FPLUS program, through which a parent may borrow on behalf of a dependent undergraduate student up to the difference between the cost of education and any other financial assistance awarded. Students must be enrolled at least half time (6 credit hours per semester), be admitted to or enrolled in a degree-seeking program, and be making satisfactory academic progress. Interest and repayment begin 60 days after disbursement of the loan. The interest rate is fixed at 8.5 percent. There is no aggregate borrowing limit. Eligibility is not based on need, but a Case Western Reserve Application for Financial Aid must be submitted to the Office of University Financial Aid. The loan applications may be obtained from lending institutions such as banks, credit unions, and savings and loan associations or a parent may apply online and select from several lenders. The student should allow at least 8 to 10 weeks between submission of the forms to the Office of University Financial Aid and receipt of the loan.

Graduate PLUS Loan

Beginning July 1, 2006, graduate and professional students are eligible to borrow under the PLUS Loan Program up to the cost of attendance, minus other estimated financial assistance. The terms and conditions applicable to the Parent PLUS apply to the Graduate/Professional PLUS Loans. The applicant may not have an adverse credit history, must file the Free Application for Federal Student Aid (FAFSA), and apply for the maximum eligibility under the Federal Subsidized and Unsubsidized Stafford Loan Program. The interest rate is a fixed 8.5 percent.

Federal Consolidation Loans

Borrowers with outstanding indebtedness through the William D. Ford Federal Direct Loan Program, Federal Stafford Loan, Unsubsidized Stafford Loan, Federal Supplemental Loan for Students, National Direct Student Loan, Federal Perkins Loan, or Health Professions Student Loan programs may consolidate their loans, provided the loans are not in default or if in default, the borrower must have made satisfactory repayment arrangements with the lender. Consolidation may occur during the repayment period or the grace period preceding repayment.

Limited deferments of principal are available. The variable interest rate is capped at 8.25 percent. Repayment terms may include graduated or income-sensitive repayment schedules. The repayment period is tied to the amount consolidated and may extend up to thirty years.

Interested borrowers should contact their lenders for additional information and referrals to participating agencies. Borrowers under the William D. Ford Federal Direct Loan program may contact the Servicing Center’s Consolidation Department or the Office of University Financial Aid.

Outside Loan Programs

Several lenders offer low interest educational loans to students and/or parents. These loans are in addition to or alternatives to the Federal Stafford and PLUS Programs. Interest rates are variable, based on the LIBOR (London Inter-Bank Offered Rate). Interest payments must be paid during the in-school period. Students in the schools of Medicine and Law may use other loan programs and should consult their school of enrollment for additional information and application materials.

Frances Payne Bolton School of Nursing

OHIO NURSE EDUCATION ASSISTANCE LOAN PROGRAM (NEALP)

This program was created to assist the state of Ohio in meeting nursing shortages by providing assistance to students enrolled in approved nurse education programs and to encourage these students to remain in Ohio as they enter the nursing profession. These loans are available to students pursing the B.S.N. and D.N.P. degrees.

Eligibility requirements include:
1. Ohio residency
2. U.S. citizenship or permanent residency
3. Acceptance or enrollment in an approved R.N. nurse education program.
4. Demonstration of intent to practice nursing within the state of Ohio after graduation.
5. Owe no refund nor be in default on any state or federal educational loan or grant.
6. Satisfactory academic record that places student in good academic standing.

NEALP loans are limited to $3,000 per year with an aggregate limit of $12,000. Financial need must be demonstrated through the filing of the Free Application for Federal Student Aid (FAFSA). Upon graduation, a student may be eligible for debt cancellation at the rate of twenty percent (20 percent) per year.

CASE WESTERN RESERVE UNIVERSITY
PART-TIME EMPLOYMENT

for a maximum of four years (80 percent) if the borrower is employed in the clinical practice of nursing within the state of Ohio.

Borrowers who complete the entire service obligation will be required to repay twenty percent (20 percent) of the loan plus interest. Borrowers who do not complete the service obligation must repay the entire outstanding loan balance plus interest. Applications are available from the Office of University Financial Aid. The application deadline is June 1.

STUDENT EMPLOYMENT

Case Western Reserve University offers a variety of part-time employment opportunities to its students and recognizes that student employment is a valuable form of financial assistance as well as a practical learning experience. Students must enroll on at least half time during a regular semester to be classified as student employees and be employable through the Office of Student Employment for hourly jobs. Students enrolled on a less than half time basis should contact Kelly Services in the Office of Human Resources to be placed on temporary payroll. The university has made a commitment to utilize student employees whenever possible. To fulfill this commitment, the Office of Student Employment, a division of the Office of University Financial Aid, has been established to centralize information about employment opportunities, provide standardized practices and procedures for employment, prevent discrimination, and increase the number and variety of available jobs on campus and in the community.

Federal College Work Study Program

The Federal College Work Study Program is a federally sponsored employment program designed to aid at least half-time degree-seeking students with financial need. A Federal Work Study award is awarded as part of the financial aid package and provides the opportunity for job placement and a maximum level of earnings. The Office of University Financial Aid determines a student’s eligibility and the amount of the work award. The employer pays a portion of the student’s salary and the federal government subsidizes the remainder. Employment opportunities are available on campus and with not-for-profit agencies in the surrounding community.

Campus Jobs

This program is funded by the university through departments on campus and offers part-time employment to at least half-time degree-seeking students. Students not demonstrating financial need but interested in securing on-campus employment may apply to the Office of Student Employment. Students not on financial aid who obtain jobs on campus on their own initiative are permitted to work provided there is no student with a financial need qualified and willing to take the job offered. All students working on campus must clear their employment with the Student Employment Office. International students must obtain a Social Security number from the U.S. Social Security Administration and permission to work from the University Office of International Student Services.

SATISFACTORY ACADEMIC PROGRESS FOR FINANCIAL AID

Case Western Reserve University has established guidelines for determining whether students are making satisfactory academic progress for financial aid purposes. Federal regulations require that in order to receive Title IV assistance, all students must maintain a standard of satisfactory academic progress, as determined by the university. Title IV assistance comprises the following: Federal Pell Grants, Federal Supplemental Educational Opportunity Grants, Federal Perkins Loans, Federal College Work Study awards, Federal Stafford Loans (subsidized and unsubsidized), loans under the FPLUS program, and any state grants funded by the State Student Incentive Grant program. A Case Western Reserve University undergraduate student must satisfy the minimum number of semester hours and earn the minimum cumulative GPA listed in the table below. A half-time student must have successfully completed one half of the minimum number of semester hours with at least the minimum cumulative GPA in the table below:

<table>
<thead>
<tr>
<th>YEAR AT UNIVERSITY</th>
<th>SEMESTER HOURS COMPLETED</th>
<th>CUMULATIVE GRADE-POINT AVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>21</td>
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<td>115</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>139</td>
</tr>
</tbody>
</table>

(If a student has an uneven number of semesters, then the mid-point between the necessary semester hours completed for the year before and the year after will be the appropriate expectation. For example, if a student has completed five semesters and a determination is required of hours completed, then 55 would be considered satisfactory, i.e., the midpoint between 43 and 67.)

Procedure: If, after two semesters at Case Western Reserve, the student fails to meet the criteria for satisfactory academic progress, the student is placed on financial aid warning. While on financial aid warning, a student may continue to receive Title IV aid for one semester. At the end of that semester, if the student is still not meeting the criteria, he or she is placed on financial aid probation. While on financial aid probation, a student may not receive any Title IV aid but may be eligible for other assistance, including university grants-in-aid. If, after a semester on financial aid probation, the student still does not meet the criteria for satisfactory academic progress, the student is removed from all institutional financial aid. A student will be restored to good standing if found to be making satisfactory academic progress at the end of a semester on warning, probation, or separation. However, aid may be restored only once following financial aid separation. Students in financial aid good standing will have their satisfactory academic progress reviewed at the end of the spring semester. Students below good standing will have their status reviewed each semester. Appeals may be made on grounds of mitigating circumstances; such appeals should be addressed to the associate director of financial aid.

For further details of financial aid policy and procedure regarding Satisfactory Academic Progress, consult the Office of University of Financial Aid.

Graduate and Professional Students

Since each graduate/professional school of the university differs in length of program and in method of evaluation, there is a different method of measuring Satisfactory Academic Progress for Title IV aid for each school, although the same general principles and procedures apply as indicated above. For specific information about how satisfactory academic progress is determined for an individual school or program, please consult the Office of University Financial Aid.
The University Office of Student Affairs provides leadership in the development of services and programs that supplement experiential learning of university students and enrich student life. The staff of the Office of Student Affairs attempts to promote an environment which provides positive, developmental experiences for all students. Additionally, the office serves as an ombudsman, focusing attention on the rights and responsibilities of students within the university community. The Office of Student Affairs is a central source of information about university policies and procedures that affect student life and co-curricular programs and services. Students should feel free to contact the Office of Student Affairs for resolution of specific problems and for referral to other university offices and campus agencies. Services of the Vice President’s office, itself, include orientation, minority affairs, free admission to the Cleveland Orchestra and Cleveland Play House through weekly ticket drawings, facilitation of the Fee Access program and distribution of the Little Blue Book, crisis intervention, the judicial/disciplinary process, and student research.

### STUDENT AFFAIRS ADMINISTRATION

**Glenn Nicholls, M.A.R.**
(Asbury Theological Seminary)
*Vice President for Student Affairs*

**Donald J. Kamalsky, M.S.**
(State University of New York, Albany)
*Associate Vice President for Student Affairs*

**Sue Nickel-Schindewolf, M.A.**
(University of Akron)
*Associate Vice President for Student Affairs*

**G. Dean Patterson, Jr., M.S.**
(Case Western Reserve University)
*Associate Vice President for Student Affairs*

**Colleen Barker-Williamson, M.A.**
(Bowling Green State University)
*Director of Thwing Center for Programs and Leadership*

**Mayo Bulloch, M.A.**
(Case Western Reserve University)
*Director of Educational Enhancement Programs and Director of the Center for Civic Engagement and Learning*

**Eleanor Davidson, M.D.**
(University of Michigan Medical School)
*Director of University Health Services*

**David Diles, Ed.D.**
(University of Michigan)
*Director of Athletics and Chair, Department of Physical Education and Athletics*

**Janice Gerda, Ph.D.**
(Bowling Green State University)
*Director of Residence Life*

**Joel Kraft, M.S.**
(Case Western Reserve University)
*Director of Student Affairs ITS*

**Ana Loci, Ph.D.**
(Case Western Reserve University)
*Director of University Farm*

**Elise Lindsay, M.A.**
(Case Western Reserve University)
*Director of International Student Services*

**Thomas Matthews, Ph.D.**
(Syracuse University)
*Director of Career Center*

**Caseal Jordan Medley, B.A.**
(Cleveland State University)
*Director of Administration and Operations for Thwing Center*

**Judith Olson-Fallon, M.S.**
(Purdue University)
*Director of Educational Services for Students*

**Dennis Rupert, M.A.**
(Edinboro University of Pennsylvania)
*Assistant Vice President for Finance and Administration*

**Wesley Schaub, M.A.**
(Eastern Michigan)
*Director of Greek Life*

**Alma Sealine, M.S.**
(Indiana University-Bloomington)
*Director of Residence Life*

**Jes Sellers, Ph.D.**
(University of Florida)
*Director of University Counseling Services and Center for Behavioral Health*

**Deborale Richardson-Bouie, Ph.D.**
(University of Delaware)
*Director of Multicultural Affairs*

**Kendra Weatherhead, J.D.**
(Case Western Reserve University)
*Director of Judicial Affairs and Community Standards*

### CAREER CENTER

206 Sears Library Building
*Phone 216-368-4446; Fax 216-368-4759*
http://studentaffairs.case.edu/careers

The Career Center offers individualized assistance, programs, and technological resources to educate students in the development of lifelong career management skills, the attainment of work experience, and the integration of academic and career plans. The Career Center offers programs and resources to address career development issues such as:

- Identifying career interests and related options
- Learning more about specific career fields
- Choosing a major and setting career goals
- Applying for admission to graduate and professional schools
- Obtaining relevant work experience through internships, practica, and summer employment
- Targeting and researching prospective employers
- Preparing effective cover letters, resumes, and other written communications
- Identifying current job openings
- Preparing for interviews

### SPECIFIC SERVICES AND RESOURCES INCLUDE:

- Individual career counseling and job search guidance
- Career exploration programming and special services for 1st-year and undecided students
- Accenture Career Resource Library
- Occupational information, career references, and computer workstations
- Comprehensive web site of career/employment resources
- Dun & Bradstreet’s Million Dollar Directory
- Career Network—mentoring, shadowing and networking program for students to connect with alumni
THE CENTER FOR CIVIC ENGAGEMENT AND LEARNING
Thwing Center
Phone 216-368-6960
E-mail commservice@case.edu
http://studentaffairs.case.edu/civicservice

The Center for Civic Engagement and Learning connects students and community through service. The center coordinates both curricular and cocurricular activities that promote learning through service to communities locally, nationally, and internationally. Service learning venues include academic course work, work-study positions, residence hall and Greek Life programs, the University Circle Literacy Corps., and weekly service opportunities.

The Center for Civic Engagement also offers regular, weekly, and bi-monthly opportunities for community service through the Case SERVES projects; assists faculty and students in designing and implementing community-based courses and SAGES capstone projects; coordinates on-going volunteer and work study tutoring; and schedules Days of Service for one-time community service projects.

EDUCATIONAL SERVICES FOR STUDENTS (ESS)
Sears Building, Room 470
Phone 216-368-5230; Fax 216-368-8826
http://studentaffairs.case.edu/education

Educational Services for Students (ESS) empowers students to achieve their potential as active, confident learners and as full participants in a community of scholars and researchers. ESS offers academic programs, services, and individual consultations. Students seeking help with study skills and/or time management strategies are encouraged to make an appointment to see an ESS staff member and to check out programs and resources at the ESS website.

The Plain Dealer Electronic Learning Center (PDELC) offers printing and computing to everyone at Case Western Reserve University and the surrounding community. During the fall and spring semesters, approximately 1400 undergraduates each month use the center to work on papers and projects, meet with study groups, and write their resumes and cover letters. The PDELC is home to one of the Print2Here printers, which provides up to 500 pages of free printing for undergraduate students. A variety of assistive technology is available for those who require screen readers, screen magnification, document magnification, voice input, or document readers.

The PDELC is a less-formal computer environment which invites collaborative learning and peer support. It is also the sight of various workshops, including the Presentation Skills workshops conducted by ESS staff. The PDELC staff is available to assist with any problems. A card swipe system is utilized to gather demographic information to help improve our services, and meet our students’ computing needs.

Supplemental Instruction
The Supplemental Instruction (SI) program provides regularly scheduled student facilitated group study sessions for traditionally challenging courses. SI sessions are free and participation is completely voluntary. Attending sessions allows students to ask questions, review notes, practice problems, prepare for exams, and reinforce material that already know in a relaxed environment. Sessions are led by SI leaders—students who have successfully completed the course, are recommended by the professor, and have been trained by ESS.

During SI sessions, the SI leader will facilitate an activity related to recent material covered in the lecture. The goal is to involve students with the material and to introduce good study skills and habits. Some activities may include a practice quiz, vocabulary building, creating review sheets, or collectively working on problems on the board. Depending on the number of SI leaders for a course, there may be anywhere from two to six 90-minute sessions per week. Visit http://studentaffairs.case.edu/education/resources/supplemental/ for details and to view the complete SI schedule.

Peer Tutoring
Peer tutors are undergraduate students who have been nominated by their professors and trained by ESS to work with students on an individual and/or group basis in many undergraduate courses. Peer tutors can help students clarify course content and assignments, connect class notes and readings, and help practice problem solving. Additionally, peer tutors can help students reinforce what they already know, model new ways of learning, monitor their progress over several sessions, and prepare students for addressing specific questions with the professor. Graduate Teaching Assistant Training
UNIV 400 A and B, which consists of an orientation and four required seminars for new graduate TAs, is designed to develop skills in communication and teaching. This course is required of students with graduate appointments that include instructional responsibilities. Students have a total of two consecutive semesters to complete either UNIV 400A or UNIV 400B. Students who do not complete the course within the first semester will receive an Incomplete (I). They do not need to re-register for the next semester. Once students complete the course, they will receive Pass (P). If students do not complete the course within two consecutive semesters, they will receive No Passing grade (NP).

PROF DEVELOPMNT FOR INTERNATIONAL TAS UNIV 400C
UNIV 400A. Professional Development for Graduate Teaching Assistants (0)
An orientation and the four required seminars for new TAs designed to develop skills in communication and teaching. Required of students with graduate appointments that include instructional responsibilities. Students have a total of two consecutive semesters to complete either UNIV 400A or UNIV 400B. Students who do not complete the course within the first semester will receive an Incomplete (I). They do not need to re-register for the next semester. Once students complete the course, they will receive Pass (P). If students do not complete the course within two consecutive semesters, they will receive No Passing grade (NP).

UNIV 400B. Professional Development for Int'l Graduate Teaching Assistants (0)
In addition to satisfying the requirements of UNIV 400A, ITAs are required to attend a special half-day ITA orientation, which is scheduled each August and to participate in an evaluation of spoken English. Students have a total of two consecutive semesters to complete either UNIV 400A or UNIV 400B. Students who do not complete the course within the first semester will receive an Incomplete (I). They do not need to re-register for the next semester. Once students complete the course, they will receive Pass (P). If students do not complete the course within two consecutive semesters, they will receive No Passing grade (NP).

UNIV 400C. ITA Communication Skill Development (0)
Small group, interactive course that concentrates on American culture, pronunciation, idiomatic usage, and English grammar. Required of all new ITAs.
who do not meet the minimum requirements on the SPEAK evaluation.

UNIV 401. Teaching with Technology for Graduates at Case (0)
As the integration of instructional technology into the university classroom becomes increasingly important, graduate students have an increasing need to explore the potential of technology-supported learning activities and how they might be useful and productive in enhancing a student’s learning experiences and outcomes. This course provides knowledge of and hands-on experience with educational technologies with an emphasis on uses as instructional tools not only in the classroom but how these new tools can make a significant difference in learning in any setting. This course will offer graduate students hands on experience using available technologies, strategies on initiating and guiding particular technology-supported learning activities, discussion about the different roles technology might play in a classroom, and consideration of the best uses of technology in all teaching and learning activities. Participants will learn to use technologies to enhance current lessons, use appropriate technologies to support, manage, enhance, and assess student learning, and to improve overall communication with students.

UNIV 410. Teaching/Clinical Practicum (1 - 9)
This course is designed for graduate students who are either teaching or involved in clinical or other internship practicums and require full-time student status. Permit required.

Commuter Services
Commuter services for undergraduate commuting students are provided through the office of Educational Services for Students (ESS). A Commuter Assistant (CA) team spearheads commuter services by hosting commuter events, advocating for commuter concerns, and maintaining the Rock Bottom Lounge, located in Thwing Center West and organizes the Annual Commuter Appreciation Day. The Rock Bottom Lounge is open Monday through Friday, 8 a.m. to midnight, Saturday from 10 a.m. to midnight, and Sunday from noon to midnight. Commuters may obtain card access to the lounge’s exterior door by visiting Educational Services for Students (ESS) located in Sears 470 during business hours. The exterior entrance is located on the bookstore side of Thwing Center. All commuters are welcome to use the lounge, which contains lockers, a pool table, a television and VCR, and a kitchenette with refrigerator and microwave oven.

Disability Resources
Students with disabilities seeking accommodations should disclose their disability and provide supporting documentation to Disability Resources in Educational Services for Students (ESS).

Documentation will be reviewed in order to determine the student’s eligibility for accommodation and the type of accommodation needed. Matriculating and enrolled students may submit an online disclosure form available at the Disability Resources website http://studentaffairs.case.edu/education/disability/. Upon receipt of verifying documentation to Disability Resources the review process will begin. Students are encouraged to make an appointment to meet with a staff member from Disability Resources at any time before, during, or after the admission process to discuss individual concerns.

Students may submit a disclosure form and documentation for review at any time during their tenure at Case Western Reserve University. However, accommodations and services cannot be provided retroactively. Students with disabilities must be proactive in their requests for services, equipment, and other accommodations. Students who suspect they have an undiagnosed disability should make an appointment to meet with a staff member.

It might be possible to arrange for an evaluation through either University Health Services or University Counseling Services.

Students with disabilities that require assistance with parking, transportation, housing, academic, or any other area involving their participation in university activities should seek accommodations through Disability Resources. Staff will facilitate access through appropriate departments on campus. Disability Resources staff are available to do an information program for any student group. All students are welcome to meet with a member of the Disability Resources staff to discuss any disability-related issues.

Prometric Testing Center
The Prometric Testing Center provides computer-based testing for various certification tests and entrance exams such as the Graduate Record Exam (GRE) and the Medical College Admission Test (MCAT). Candidates who are seeking information about a test and the registration process are encouraged to visit the Prometric website (prometric.com). The test center also offers the Miller Analogies Test, (MAT) and conducts certified proctoring for Independent Study exams. The test center is located in the Sears Library, Room 440. Candidates seeking information and the registration process for the internet-based Test of English as a Foreign Language (TOEFL) should visit http://www.toefl.org. This website will provide the test dates available at Case Western Reserve University in Sears 464.

HOUSING, RESIDENCE LIFE & GREEK LIFE

Undergraduate Housing
Case Western Reserve University believes strongly in the value of the living and learning environment that is provided on campus. In addition to the opportunities to meet new people and to develop a sense of campus community, students appreciate the convenience of being close to classrooms, libraries, laboratories, and other campus facilities. Because of this, Case Western Reserve has a two-year residency requirement. Students who live within forty miles of the university may commute from home.

To enrich the college experience, the Housing, Residence Life & Greek Life Program is designed to meet the needs of residential students throughout their time on campus. The program is designed to meet the specific needs of first year, second year and upperclass students by exploring the academic and social expectations students experience as they progress through their university education.

Each residence hall is staffed with trained undergraduate students (residence assistants), graduate students (assistant coordinators, and graduate resident mentors), and professional staff (coordinators of residence education).

In addition to administering the daily operation of the buildings, the staff works to meet the academic, interpersonal, social and community needs of their populations. Staff members also work with students in developing quality programs, projects, and social activities in the residence halls. Through a variety of programs, students explore personal and social issues, make new friends, and discover opportunities for personal and intellectual growth. The staff members know the university community resources and are committed to helping each student benefit to the fullest extent from his or her college experience.

The First Year Experience
The first year at the university is the begin-
ning of an exciting time of learning about the many opportunities and resources available on campus, in University Circle, and beyond. To facilitate and maximize this learning, all first year students who reside in University Housing live together in one of four Residential Colleges: Cedar Residential College, Juniper Residential College, Magnolia Residential College, and Mistletoe Residential College. Programs are designed specifically to assist students in their transition to the university, involving various departments across campus. Each Residential College consists of three residence halls, each Residential College housing approximately 100 students. Residential Colleges are staffed by full-time, live-in Coordinators of First Year Residence Education (FYC). With offices located in the Residential Colleges, the FYCs strive to build a community where students can live, learn, and reach their maximum potential.

The Second Year and Upperclass Experiences
The second year is a time of continued social and academic adjustment, and a time when students are expected to commit to a particular academic major. Therefore, the focus of the Second Year Experience is the emphasis on the exploration of academic, career and personal decisions, engaging in leadership opportunities, traditions, and mentoring relationships and creating a personal vision for the upperclass years. Upperclass students are faced with many questions and decisions regarding their future. The Upperclass Experience is designed to ease the transition to life after graduation. In collaboration with numerous other Student Affairs and academic offices, the Residence Life Staff works to provide information and services designed to assist upperclass students in their decision making process.

Fraternities and Sororities
Greek Life is the largest campus activity at the university, involving 30 percent of the undergraduate population in the twenty-four fraternity and sorority chapters. All of the chapters belong to one of the two umbrella organizations which govern the Greek community and link the chapters to the campus. The Panhellenic Council coordinates the activities of the seven sororities, while the Interfraternity Congress governs the seventeen fraternities. The Greek community also supports the Order of Omega, a society that recognizes outstanding Greek leaders, and Gamma Sigma Alpha, a scholastic honor society for Greeks with a grade point average above 3.60. The Greek Life staff, including the director of greek life, assistant director of greek life and coordinator of greek life, are full-time staff members who offer administrative, supervisory, counseling, and related services to all facets of Greek life. The Black Greek Council (BGC) is the governing organization of the eight historically Black Greek fraternities and sororities represented at Case Western Reserve University. The five national sororities are Alpha Chi Omega, Alpha Phi, Delta Gamma, Phi Mu, and Phi Sigma Rho. There is one local interest group sorority—Sigma Psi.

The seventeen national fraternities are Alpha Epsilon Pi, Beta Theta Pi, Delta Kappa Epsilon, Delta Tau Delta, Delta Upsilon, Lambda Chi Alpha, Phi Delta Theta, Phi Kappa Psi, Phi Kappa Tau, Phi Kappa Theta, Sigma Alpha Epsilon, Sigma Chi, Sigma Nu, Sigma Phi Epsilon, Theta Chi, Zeta Beta Tau, and Zeta Psi. Nineteen chapters reside in houses on either the north or south campus. The other five chapters reside in residence halls or do not have an organized house.

North Residential Village
The North Residential Village (NRV) is situated just a few blocks from Cleveland’s renowned museums, cultural centers, and the humanities and social sciences classroom buildings. The NRV is the home to twelve residence halls with beautifully landscaped outdoor areas, recreational fields and a dining commons. It is also home to three sororities and seven fraternities. It offers students a variety of living arrangements convenient to classes and community resources. Cedar Residential College (Taft, Smith, Tyler), Juniper Residential College (Norton, Raymond, and Sherman), Mistletoe Residential College (Pierce, Hitchcock, and Storrs) feature double rooms and some single rooms with community bathrooms and floor lounges. Also in the North Residential Village are areas designed to meet the needs of second year and upperclass students. Clarke Tower provides suite-style living with single and double room options for second year students. The Village at 115, is an apartment-style option for upperclass students and offers one- to nine-bedroom apartments around new athletic fields.

In the center of the North Residential Village community, students can find Leutner Commons, which houses Leutner Dining Commons and L3, where meals are served for all North Residential Village residents.

Wade Commons houses a Resource Center, which consists of satellite offices for the Office of Undergraduate Studies, the Center for Women, the SAGES writing center, and the Peer Helper Network. There is also a fireplace lounge, a walk-in tutoring center, and the NRV Area Office. The NRV Area Office is the central location for picking up packages, filing maintenance requests and distributing room keys for the North Residential Village residents.

South Residential Village
A mix of second year and upperclass students live in the seven, suite-style residence halls, and nine fraternity and three sorority houses located on Murray Hill Road and Carlton Road that make up the South Residential Village. Glaser House, Kusch House, and Michelson House are three high-rise undergraduate halls located on Carlton Road. Alumni House, Howe House, Staley House, and Tippit House are located on Murray Hill Road. Each suite has six private bedrooms that share a furnished living room area and bathroom. Also within the South Residential Village is Fribbley Commons, which houses Fribbley Dining Commons, a twenty-four hour study lounge, two classrooms, satellite offices for the Office of Undergraduate Studies and the SAGES writing center, and the SRV Area Office. The SRV Area Office is the central location for picking up packages, filing maintenance requests, and distributing room keys for South Residential Village residents.

Students with Disabilities
Students who have a disability that requires special accommodations should contact the Coordinator of Disability Services at 216-368-5230. For more information, see the “Disability Resources” section in this General Bulletin or go to: http://studentaffairs.case.edu/education/disability/.

Room Rates
For the most up-to-date rate information, please visit our website at http://studentaffairs.case.edu/living/resources/documents/. The following accommodations are currently available for Case Western Reserve students:

Doubles (North Residential Village), Singles (North and South Residential Villages), One-to nine-person apartments (North Residential Village).

Meal Plan
For the most up-to-date meal plan rate information, visit our website at http://www.case.edu/diningservices/.

The following meal plans are available to all students. First- and second-year students must choose from the Standard or Gold Meal plans. A Halal/Kosher meal plan is also available.

Graduate Housing

There is currently no graduate housing available. However, to assist graduate students in identifying off-campus housing, the Office of Housing, Residence Life & Greek Life suggests visiting ALOHA, the off-campus housing listing service available online at http://studentaffairs.case.edu/living/housing/off-campus/. ALOHA lists apartments and houses for rent that are a short distance from campus. ALOHA is updated daily.

INTERNATIONAL STUDENT SERVICES

210 Sears Building
Phone: 216-368-2517; Fax: 216-368-4889
E-mail: ISSNews@case.edu
http://studentaffairs.case.edu/international/

The Office of International Student Services (ISS) supports and enhances the international student experience at Case Western Reserve University. The office provides assistance with immigration procedures, social/cultural adjustment, housing questions, health care concerns, financial matters, and legal issues. The office acts as a liaison with off-campus agencies, such as the U.S. Department of Homeland Security, the U.S. Department of State, embassies, educational resource centers, the International Institute of Education, and Homeland Security, the U.S. Department of Homeland Security. The ISS Office supports the university’s goal to internationalize. The office partners with other offices, departments, and divisions at the university to nurture the growth of an international community and to help develop a campus environment that is responsive to their needs. More than eighty different countries are represented on campus. Every fall, a special orientation is held for newly arrived international students. The ISS Office sponsors an International Club, a student lounge and study room, cross-cultural workshops, an annual international dinner, and several other social gatherings. An electronic news list keeps students up to date on immigration policies, special events on campus and in the community, and other matters of particular interest to international students. Many nationality-based student organizations provide additional opportunities for international students to meet others with similar interests and experiences.

Case Western Reserve University has been authorized under federal law to enroll non-immigrant alien students in both F-1 and J-1 visas.

Students from Other Countries

Case Western Reserve University will consider for admission highly qualified students who are not citizens of the United States. An international student who is admitted to study at the university may face problems of living in a different cultural environment and negotiating an unfamiliar academic system. It is anticipated that the student can solve such problems if he or she has an excellent academic record, understands rapidly spoken English, and can speak, read, and write English with facility. In addition to completing the regular application materials, a student from another country must take several other steps.

Financial Resources

International Students must submit a letter from their sponsor and a bank statement verifying the sponsor’s willingness and ability to fund a Case Western Reserve University education. For the 2008-2009 academic year, sponsors of undergraduate students must demonstrate an ability to contribute $49,744. (The cost of graduate and professional school programs vary from $36,256 to $76,078. Please contact the Office of International Student Services to get the appropriate amount for your intended program of study.) Case Western Reserve provides no financial assistance or need-based scholarships to international undergraduate students. Graduate and professional school students may qualify for a limited number of tuition grants and assistantships provided by certain academic departments. These grants are made available to unusually well-qualified students. A decision on these awards is made only after a student has been admitted to a program of study at the university.

Before the student leaves his or her home country, it is very important to inquire about the regulations regarding the transfer of funds. In addition to expenditures for travel, the student should have at least $1,200 in U.S. dollars on arrival in Cleveland to meet initial expenses. Foreign bank drafts made out to Case Western Reserve University may take as long as one month to redeem (cash) at this university. It is advisable to draft a check on a bank located in the United States. Traveler’s checks are recommended in place of currency.

Employment

International students on F-1 or J-1 Visas may work on campus provided that they 1) maintain status, and 2) do not work more than a total of 20 hours per week while school is in session. They may be employed on campus full-time during school holidays and vacation periods.

English Requirement

Applicants from other countries must be able to speak, read, write, and comprehend English. A score of at least 550 on the paper-based Test of English as a Foreign Language (TOEFL), a score of 213 on the computer-based TOEFL, or a score of 80 on the TOEFL Internet-based test (iBT) is the general requirement for admission to most programs at Case Western Reserve University. (Please go to the TOEFL website at http://www.toefl.org for more information about the TOEFL test.) Completion of the ELS Language Center Level 112 with at least a 3.0 average is also acceptable. To learn more about the ELS Language Centers, please go to http://www.els.com. Applicants who are required to submit TOEFL scores may be tested again for English placement before they are permitted to register.

Applicants are exempt from the TOEFL requirements if they 1) speak English as their native language; 2) have completed a bachelor’s degree or higher at a foreign university where the instruction was in English; 3) qualify for admission on the basis of U.S. high school graduation (rank in the class and SAT scores); 4) have completed six semester hours of sophomore-level English literature in a U.S. college or university; or 5) have earned a bachelor’s degree or higher in a U.S. college or university with instruction in the English language.

For additional information about the English requirement, please contact the admissions office for your specific academic program.
OFFICE OF STUDENT AFFAIRS

Medical Insurance
All students must carry medical insurance. No exceptions are allowed. Refer to the University Health Service section of this Bulletin for details.

Passports and Visas
When accepted by the university, the student will be sent a letter of admission and the appropriate form with which he or she may obtain a student visa for entry into the United States. The form for the U.S. visa will be issued by the Office of International Student Services only after receipt of a statement indicating sufficient financial support (for example, a letter of scholarship, a bank statement of deposited funds, or an affidavit of support) for one full year of tuition and living expenses. Students who are admitted as transfers from other U.S. colleges and universities will be contacted by the Office of International Student Services regarding the procedures to be followed. To meet U.S. government regulations, an undergraduate student on an F-1 or J-1 visa must take at least 12 credit hours of coursework each semester, and a graduate student must register for at least 9 credit hours.

Applications
Prospective undergraduates should send application materials by January 15 for fall semester or by October 15 for spring semester to:
Case Western Reserve University
Office of Undergraduate Admission
11318 Bellflower Road
Cleveland, Ohio 44106-7055
U.S.A.

Certified translations of academic credentials into English should be submitted with the official copies of all credentials.

Students applying to graduate and professional school programs should contact their specific academic departments or professional school office of admission for information regarding application procedures and deadlines.

MULTICULTURAL AFFAIRS
The Office of Multicultural Affairs (OMA) 450 Sears Building
Phone 216-368-2904
http://studentaffairs.case.edu/multicultural/
The Office of Multicultural Affairs encourages, supports, and facilitates the success of all Case Western Reserve University students by providing opportunities for diverse interaction and cultural education that occurs outside of the classroom environment.

The OMA supports the university’s mission to recruit, retain, and graduate underrepresented students. The OMA guides students to available resources throughout the university and strives to ensure that multicultural student’s needs are recognized and addressed. The OMA collaborates with departments campus-wide to support efforts such as individual tutoring, master tutor study groups, college success workshops, academic advising, counseling, developing a sense of community, social and cultural enrichment programs, and career development opportunities. The office involves students, faculty, administrators, and staff to create a campus environment that promotes intellectual development, independent thinking, self-confidence, and appreciation of ethnic and cultural diversity. The OMA welcomes all students to become involved in their office’s efforts to educate, appreciate, collaborate, and build bridges for an inclusive welcoming society.

STUDENT ACTIVITIES AND LEADERSHIP
Thwing Center
Phone 216-368-2679
http://studentaffairs.case.edu/activities

The Office of Student Activities and Leadership has made a commitment to providing a variety of leadership opportunities to students. Student activities and leadership opportunities are available in a multitude of ways. Students may become involved within the Undergraduate Student Government or in planning all campus programs with the University Program Board. There are approximately 165 student clubs and Class Officers, offering many opportunities for leadership and participation in a variety of social, cultural, and recreational events. The Student Activities and Leadership Office is home to several university traditions, including Relay for Life, Halloween at the Farm, Homecoming, Springfest, and the Hudson Relay.

The Undergraduate Student Government (USG) holds elections each spring for student representatives of academic colleges, commuter and each fall for first year residential colleges. The student government acts as a liaison between the students and the faculty, administration, and other appropriate groups and fulfills legislative and executive functions. The Executive Committee plans the agenda for assembly meetings every other week and sets long-range goals. The Finance Committee recommends recognition and budget allocations for undergraduate student organizations. The Finance Committee also advises the student government on the management of special project funds. Student Life Committee works to improve the quality of cocurricular life on campus and maintains a grievance process whereby students may express their opinions. The Vice President for Academic Affairs, an elected undergraduate representative serves as a voting member of the university-wide Faculty Senate. Each class elects class officers, who coordinate large- and small-scale programs.

The University Program Board (UPB) presents all-campus social, educational, cultural, and recreational activities. Committees made up of undergraduate volunteers develop activities in accordance with their interests. UPB is structured under five different committees and the executive board. The Traditions Committee coordinates many events for Welcome Days, Homecoming, Family Weekend, Halloween at the Farm and Hudson Relays. The Concert Committee is the largest of the UPB committees, developing free shows every Wednesday night at the Spot. They also book large-scale bands and offer larger concert experiences for the Case Western Reserve student. The Arts and Entertainment Committee develops coffeehouse events, purchases tickets for Cleveland events and theatre productions. Special Events Committee coordinates Fall and Spring Break trips, skiing excursions and purchases tickets for Cleveland sporting events. Cultural Development coordinates lectures and other events which enhance the culture of the Case Western Reserve student. Thwing Tuesday’s is the newest committee, creating fun and creative activities every Tuesday in Thwing Center.

The Interfraternity Congress/Panhellenic Council
The council oversees the activities of the Greek social organizations on campus. In the spring, they plan Greek Week activities and an all-campus party.

Advisory Board
The Advisory Board works with the director of Thwing Center in making policy and developing facilities. Students, staff, faculty, and alumni serve on the Advisory Board. Each undergraduate class elects officers to plan class activities, and direct each of the more than 100 student organizations.

SQUIRE VALLEEVUE FARM

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The University Farm, consisting of the Squire Valleeveue and Valley Ridge properties, is located on Fairmount Boulevard about ten miles east of campus in the Village of Hunting Valley.

389-acre property that includes within its boundaries forests, ravines, waterfalls, meadows, ponds, a self-contained natural watershed, seven residences, many other structures, and several miles of roads and trails. Several historic facilities are designed for education, research, and recreation. The buildings accommodate research and instructional laboratories, classrooms, and a state-of-the-art greenhouse. The Sheep Barn, Pink Pig (a rustic lodge with overnight accommodations), and Manor House facilities are used for conferences, retreats, and recreation. There is also a five-mile running (or cross-country skiing) trail, a nature trail, several picnic areas, and playing fields for volleyball and softball. University activities at Squire Valleeveue Farm include undergraduate and graduate academic courses, on-site research, intercollegiate athletic events, picnics, continuing education courses, and retreats. The University Farm is open and available to all students, faculty, and alumni. Utilization of the buildings and large picnic shelters must be in accordance with University Farm policies and be secured by completing the on-line reservation form.

THWING CENTER

Thwing Center
Phone 216-368-2660
http://studentaffairs.case.edu/thwing/

Thwing Center, the student union of Case Western Reserve University, is located in the heart of campus. The architectural award-winning building represents many years of proud service to Case Western Reserve University students, faculty, alumni and guests. The facility houses food services and pub, the campus bookstore, an elegant ballroom, meeting rooms, notary service, postal substation, cyber cafe, ATMs, student and administrative offices, and lounges for study and relaxation.

Thwing Center is named for Charles Franklin Thwing, President of Western Reserve University from 1890 until 1921 and a great advocate for students. The facility is a mixture of several buildings in differing architectural styles: the historic, home-like Thwing West – former Hitchcock Hall (built in 1897); Thwing East – former Thwing Hall (built in 1908); and a modern atrium joining them in 1980.

Thwing Center combines the traditions of a major independent university with a relaxing informality that puts everyone at ease and helps make any event rewarding and memorable. Meeting rooms in Thwing Center can be reserved online at http://studentaffairs.case.edu/thwing/.

Media Board

Media Board is a student group comprised of representatives from each of Case Western Reserve’s student media organizations. It promotes responsible forums of student expression in the various media. The Board supervises and reviews the operations of all undergraduate student publications and broadcast media. Thwing Center Administrative Office coordinates the Media Board.

Member organizations include The Athenian (Humor Magazine, Case Reserve Review (literary Magazine, Discussions (Undergraduate Research Journal), Engineering & Science Review, Film Society, Ignite TV, The Observer, Retrospect (Yearbook), and WRUW 91.1 FM radio station.

These groups are all student run and they always welcome new members. Any interested students should check the Media Board website for more information at http://studentaffairs.case.edu/groups/mediaboard/.

In addition, any media oriented student group interested in becoming a member of the Media Board is welcome to apply for membership and should contact the Media Board Chair at mediacboard-chairman@case.edu.

The Media Board provides a valuable outlet for creative students to work on the student newspaper, at the campus radio station, on literary reviews, and with the film society.

Film

The CWRU Film Society Phone 216-368-CINE (2463) http://films.case.edu

An unusually large number of films are shown at Case Western Reserve University. The Film Society shows outstanding motion pictures four times weekly at Strosacker Auditorium. These range from popular films to foreign art films. The Film Society publishes a calendar of offerings each semester. It is one of the few university film societies to show films in 70 mm and Dolby stereo. Other student organizations also show films centering on their interests or for special events.

Publications

Students may practice journalism and management on any of seven different publications. The undergraduate student newspaper on campus, The Observer, is published weekly during the academic year. Other campus publications include a yearbook, Retrospect; a literary magazine, Case Reserve Review; a technical magazine, the Engineering and Science Review; and a humor magazine, the Athenian.

Radio Station – WRUW

W RUW-FM 91.1
112200 Bellflower Road
Cleveland, OH 44106
Studio phone: 216-368-2208
Office phone: 216-368-2207
http://www.wruw.org

The university’s student-operated radio station, WRUW-FM 91.1, which operates at 15,000 watts, is open to all students interested in radio broadcasting and engineering.

TRIO PROGRAMS

(Upward Bound and Talent Search)
131 Yost Hall
216-368-3750
216-368-6640
http://studentaffairs.case.edu/trio/upward-bound/

Upward Bound is the oldest of the precollege programs at Case Western Reserve University. Established in 1966, the program is designed to prepare low income and potential first-generation college high school students for successful postsecondary studies. High school students, grades nine through twelve, attending Cleveland Public Schools are eligible for participation in the program. Upward Bound operates year-round and includes a six-week summer residential component and a well-developed academic year component.

UNIVERSITY COUNSELING SERVICES AND COLLEGIATE BEHAVIORAL HEALTH

Center for Collegiate Behavioral Health
University Health Service
Call 216-368-2510
E-mail: mindbody@case.edu
University Counseling Services
University Counseling Services (UCS) and the Divisions of Collegiate Behavioral Health (CBH) and Prevention and Recovery Services (PRS) provide individual, group and couples counseling, psychiatric consultation, psychological and learning disabilities testing, and referrals for community services for all undergraduate, graduate, and professional school students and their spouses or partners. In general, these services are offered on a short-term basis (usually twelve or fewer sessions) to help students make adjustments in their personal, social, and educational areas of life. The staff of the UCS and its divisions understand the need to maintain confidentiality; therefore, we will not disclose information to any other party -- for example, faculty, parents, or future employers -- without written permission from the student. Release of information without written consent would occur only in cases of imminent harm to one’s self or to another adult or child, or when compelled by law or court ruling to do so.

There are two locations on the Case Western Reserve campus: The Counseling Service in the Sears Library Building, second floor and the Center for Collegiate Behavioral Health at the University Health Service building. Both services are staffed with professional social workers, counselors, psychologists, psychiatrists, and substance abuse intervention and prevention specialists who are experienced in helping college students.

The MindBody Connection newsletter and website at http://studentaffairs.case.edu/counseling/mindbody/ illustrate our commitment to the promotion of healthy life choices for our students and the entire university community. Free workshops, groups and seminars are also offered each semester on topics including test anxiety management, interpersonal learning groups, meditation and stress reduction, overcoming shyness, students in recovery, global nomads, eating and nutrition groups and sleep hygiene. Also, the Sex, Drugs, and Rock n’ Roll Conference is an annual student conference for the appreciation of popular culture and for the prevention of alcohol and substance abuse among college students.

For more information regarding our services and current groups, please call or visit our website.

University Health Service (UHS) is served by health care professionals whose special interest is in college health. These include board-certified nurse practitioners and physician-specialists (internal medicine, pediatrics, family practice), psychologists, psychiatrists, registered nurses, social workers and a licensed dietician. All students registered for one or more credit hours may use any of the services offered within UHS during fall and spring semester AT NO CHARGE. Students who choose to waive the Student Medical Plan (insurance) are still eligible to use our services without charge. If laboratory tests or x-rays are ordered, then the student will receive a bill from the provider of these services (usually University Hospitals of Cleveland), and they, in turn, submit these bills to their own insurance for consideration of reimbursement.

Primary Care
Care for most acute illness (infections, injuries, etc.) is delivered by the staff of the Primary Care Clinic. Students are seen by appointment (there are urgent, same day appointments available every day – the earlier a student calls, the more likely they can be seen the same day.) Whenever possible, we try to have the student receive care from the same provider at each visit, in order to improve continuity of care. There are several specialty clinics available within UHS during the regular school year. These include Women’s Clinic (for annual gynecologic exams; evaluation of such things as irregular menstrual periods, breast lumps, etc), diagnosis and treatment of genital infections; prescription of birth control), Skin Clinic (for treatment of acne, warts, mole removal, etc), and Allergy Clinic. If more sub specialized care is required, students are referred to appropriate physicians in the Cleveland metropolitan area.

Labs/X-ray/Emergency Room
For any of these services that are provided outside UHS (usually by University Hospitals of Cleveland), students will receive a bill. They need to submit a copy of the itemized bill to the University Medical Plan or their own insurance for consideration of payment.

Medications
In some cases, over-the-counter medications or frequently prescribed drugs are provided without charge to students, but only when part of the prescribed treatment plan (UHS does not have a pharmacy). In other cases, students may receive a written prescription for medications that they may fill at a nearby pharmacy of their choice. If they have the Student Medical Plan, they are automatically enrolled in a co-pay drug plan administered by Envision Rx.

Hospitalization
In those unusual situations when students require inpatient care, they will be referred to one of the many excellent facilities available nearby. Where this occurs will depend on the student’s medical needs as well as their medical insurance requirements. On occasion following hospitalization, a student may be asked to meet with a member of the University Counseling Service or UHS staff to determine their ability to return to full campus life.

Notification of Illness/Privacy
In general, UHS does not notify any third parties regarding a student’s illness. It is the student’s decision whom to notify and when this might be appropriate. UHS believes strongly in the student’s right to privacy. UHS staff will notify a student’s immediate family in case of illness or injury after consent has been obtained from the student. Specific medical information about a student’s illness is confidential and privileged. In cases of life threatening emergencies, notification will be made without prior consent. In other cases, the UHS staff will work with the student to have the student do the notification of family members, whenever possible.

A nurse, physician, and counselor are available by beeper, 24 hours a day, 7 days a week during the regular fall and spring semesters. They can be reached by calling the main UHS phone at 216-368-2450. This will reach the Answering Service who can page them. The on-call staff assists students in making decisions about what situations are truly medical emergencies and where best they can access the services that they need. In case of obvious severe illness or injury, students should proceed directly to the nearest Emergency Room and then notify the Health Service later. Students
will be billed directly for the services they receive. It is their responsibility to initiate insurance claims for these expenses. Assistance in filing claims for those enrolled in the Student Medical Plan is available within UHS.

Medical Records/HIPAA
Information from a student’s medical record is only available to staff within UHS and not to anyone outside of UHS, without the express written consent of the student. University Counseling Services records are maintained separately and are only released in accordance with their own policies and procedures. The student’s written authorization is required, except in the case of life-threatening emergencies.

Excuses
If a student must miss a class, a laboratory, or an exam because of illness, it is the student’s responsibility to notify the relevant faculty member directly. UHS does not issue excuses. In circumstances of prolonged illness or hospitalization, UHS (with the student’s permission) may notify the appropriate academic dean.

What We Need from Each New Student
Each new student should receive in the mail information regarding the Immunization form and brief Medical History (whom to notify in case of emergency). They should complete these and return them to the Health Service. (It might be helpful to keep a copy of the Immunization History before mailing it in, for future records, travel abroad, etc.)

The Immunization History may be completed by a family physician, or students may send a copy of their school immunization record. A tuberculin skin test (Mantoux) is required of all students in the healthcare professions (medicine, dentistry, nursing, applied social sciences, podiatry). These will be provided without charge after arrival on campus.

Students who have not been immunized because of illness or religious beliefs should document that for our records. In some instances, they might be excluded from classes and residence halls in the event of an outbreak of a vaccine-preventable disease. Refer http://studentaffairs.case.edu/health.

Student Medical Plan
The Student Medical Plan provides coverage, within the stated guidelines, for medical services rendered outside the University Health Service (typically lab tests, X-rays, prescriptions, hospitalization, etc.). A fee for this plan is automatically billed each fall and spring semester to all students enrolled for one or more credit hours. Students with alternative coverage for such expenses may waive the Student Medical Plan by indicating this as they register for courses online or accessing the waiver option in the Student Information System. A waiver must be completed each semester by the deadline stated (check the Medical Plan website for the appropriate dates).

When a student is enrolled for the Medical Plan in the spring semester, coverage automatically applies through the summer until August 1.

Students taking a leave of absence because of a personal medical condition may be eligible to extend that coverage one additional semester, if already covered by the Medical plan (inquire at UHS for further information 216-368-3050).

For additional information about the Student Medical Plan, go to the Medical Plan website at http://studentaffairs.case.edu/medicalplan/ or call 216-368-3050.

All students should receive a brochure about the current Student Medical Plan yearly. Additional copies may be obtained by calling 216-368-3050.

Dependent Coverage
Information regarding optional medical coverage for dependent spouse, domestic partner, or children is available at UHS.

OTHER RESOURCES FOR STUDENTS

The Arts
Students interested in the arts have numerous opportunities for involvement. Eldred Theater offers dance and drama activities. Students interested in the visual arts may work with the Mather Gallery Committee. Students with musical interests may participate in several performing organizations, including the Case Western Reserve University Marching Band, two jazz bands, the Wind Ensemble, the University Circle Chorale, the Glee Club, and the University Circle Chamber Orchestra. The Department of Music has information on auditions.

Honerary Societies
Case Western Reserve has four major undergraduate honoraries. Several more are based on specific fields of interest. Tau Beta Pi and Eta Kappa Nu are engineering honoraries. Mortar Board, a national honorary society for full-time senior students, recognizes scholarship leadership, and service. Phi Beta Kappa, a national honorary society, recognizes outstanding scholarship in the liberal arts and sciences. Outstanding students may qualify for election to membership in the second semester of the senior year. A few specially gifted students may be elected to membership as juniors.

Religious Activities
The three staffed campus ministries recognized by the university are the Newman Catholic Campus Ministry, the Hillel Foundation, and the United Protestant Campus Ministries. These centers sponsor worship services and religious education activities, as well as general programs oriented to the interest of all students. In addition, the campus has several other religious organizations open to all students. A Muslim prayer room is located in Sears Building.

STANDARDS OF CONDUCT
A student enrolling in the university assumes an obligation to behave in a manner compatible with the university’s function as an educational institution. It is clear that in a community of learning, willful disruption of the educational process destruction of property, dishonesty, and interference with the rights of other members of the university cannot be tolerated. The university retains the right to maintain order within the university and to exclude those who are disruptive to the educational process. Student organizations are held accountable for their actions through their leadership. Representative officers of organizations are held responsible for group action to the extent they are judged to have control of such action. The following principles are the basis for the Standards of Conduct at Case Western Reserve University:

- Respect
- Integrity
- Tolerance
- Safety
- Cooperation
- Pride
- Civility
- Responsibility
• Honesty

Conduct that is subject to university disciplinary action includes:

1. Interference with freedom of speech or movement, or intentional disruption or obstruction of teaching, research, administration, or other functions on university property.

2. Actual or threatened physical harm or mental abuse of any person on university premises or at functions sponsored or supervised by the university.

3. Refusal to comply with the directions of university officials, instructional or administrative, acting in performance of their duties.

4. Theft or vandalism of university property or that of a member of the university community or campus visitor.

5. All forms of dishonesty, including cheating, plagiarism, knowingly furnishing false information to the university, forgery and alteration or misuse of university documents, records, or instruments of identification.

6. Unauthorized carrying or possession on university premises of firearms or of any weapon with which injury, death, or destruction may be inflicted.

7. Violations of civil law on university premises or in connection with university functions.

8. Violation of published university rules and regulations.

ACADEMIC INTEGRITY POLICY

Definition of Violations

All forms of academic dishonesty including cheating, plagiarism, misrepresentation, and obstruction are violations of academic integrity standards. Cheating includes copying from another’s work, falsifying problem solutions or laboratory reports, or using unauthorized sources, notes or computer programs. Plagiarism includes the presentation, without proper attribution, of another’s words or ideas from printed or electronic sources. It is also plagiarism to submit, without the instructor’s consent, an assignment in one class previously submitted in another. Misrepresentation includes forgery of official academic documents, the presentation of altered or falsified documents or testimony to a university office or official, taking an exam for another student, or lying about personal circumstances to postpone tests or assignments. Obstruction occurs when a student engages in unreasonable conduct that interferes with another’s ability to conduct scholarly activity. Destroying a student's computer file, stealing a student’s notebook, and stealing a book on reserve in the library are examples of obstruction.

Discussing, Reporting and Adjudicating Violations

If a faculty member suspects that an undergraduate student has violated academic integrity standards, the faculty member shall advise the student and the departmental chair and consult with the dean of undergraduate studies about the appropriate course of action. Before speaking with the student, the faculty member also may choose to consult with the chair or dean about academic integrity standards. If the faculty member, in consultation with the dean, determines that the evidence is not adequate to charge the student with a violation, the matter will be dropped. Otherwise, the following procedures will be followed:

First Violations

If the faculty member and the student agree that a violation has occurred, and the violation is determined to be a first violation (the university has no record of previous violations by the student of the university’s Standards of Conduct, the faculty member shall choose either to sanction the student or to refer the case to the academic integrity board. If the faculty member chooses to sanction the student, the minimum sanction is failure in the work in question and the maximum sanction is failure in the course. The faculty member will be provided with a standard reporting form to be signed by both the student and faculty member.

However, the case will be referred to the assistant vice president for student affairs for Integrity Board action if either:

1. the student claims not to have violated academic integrity standards or the student disagrees with the sanction imposed by the professor;

2. the faculty member feels that the seriousness of the first offense warrants presentation to the academic integrity board;

3. the faculty member, after consultation with the dean, prefers to have the academic integrity board investigate or adjudicate the alleged violation, or prefers that the board sanction the student.

The signed report form from a faculty member or the finding of responsibility by the academic integrity board will become part of the student’s university judicial file. Students found responsible for a first violation will be required, in addition to any other sanctions imposed, to attend an ethics education program or to complete an ethics exercise as assigned by the dean of undergraduate studies or the assistant vice president for student affairs.

Subsequent Violations

If the university judicial file indicates that the student suspected of a violation has been responsible for one or more previous violations of the university’s Standards of Conduct, the case will be referred to the assistant vice president for student affairs for Integrity Board action.

Misrepresentation and Obstruction

Reports of suspected academic misrepresentation or obstruction occurring in settings other than the classroom will be referred to the assistant vice president for student affairs for Integrity Board action.

Academic Integrity Board

If a suspected or known violation of academic integrity standards warrants consideration by the Academic Integrity Board, the assistant vice president for student affairs (or his or her designee) will convene the board. The board will be comprised of three students (voting members) appointed by the Undergraduate Student Government, two faculty (voting members) appointed by the Executive Committee of the Faculty Senate and two administrators (non-voting members). One administrator will be a dean from the office of undergraduate studies. The other administrator, the associate vice president for student affairs or his or her designee, will chair the board. All members of the board may question witnesses. Academic integrity board procedure, the vote required for the determination of responsibility, and the evidence standard will be the same as those for the university judicial board.

Should the board find the student not responsible for a suspected violation, the faculty member and the student will be so informed. The faculty member will be asked to evaluate the student’s performance in the assignment in question and to issue a grade based on his or her normal grading practices.

If the board finds a student responsible for a violation of academic integrity standards, the
board will notify the student and the faculty member. The board can sanction violations by issuing failure in the work in question, failure in the course, university disciplinary warning, university disciplinary probation, university disciplinary suspension, or expulsion.

In cases in which the academic integrity board finds a student responsible for a second or subsequent violation, the minimum sanction will be failure in the course; the maximum penalty will be expulsion.

If the academic integrity board finds a student responsible for misrepresentation or obstruction, the minimum sanction will be university disciplinary probation; the maximum penalty will be expulsion.

### Violations Reported After Voluntary Withdrawal or Academic Separation

Suspected violations of academic integrity standards reported after a student voluntarily withdraws or is academically separated will be investigated and adjudicated. A student who withdraws or is academically separated during the investigation and adjudication of a suspected violation may be asked to appear at a hearing or, if the student fails to appear, have his or her case heard in absentia. If the student is found responsible for a violation, sanctions can be imposed.

### Violations Reported After Graduation

In the event that a suspected violation of academic integrity standards is reported after graduation, the assistant vice president for student affairs will make a determination as to the feasibility of investigation and adjudication. Graduation will not preclude investigation or adjudication of a suspected violation when those processes are feasible. If a student is found responsible for a violation and the sanction imposed makes the student ineligible to earn his or her degree, the degree may be revoked.

### Maintenance of Records

Violations of academic integrity standards are considered violations of the university’s Standards of Conduct and will be recorded in the student’s judicial record. University judicial files are maintained by the assistant vice president for student affairs in the Office of Student Affairs.

### GUIDELINES ON ALCOHOL

The university will conform to all state and local laws controlling the sale and use of alcoholic beverages. It is illegal to sell, provide, or serve beer, wine, or liquor to anyone who is under the legal age (21). Servers of alcohol and sponsors of social events must be aware of and comply with all state statutes and with university policies and procedures. The following regulations apply to all events at which students are present:

GUIDELINES: the university expects responsible behavior of students who choose to drink alcoholic beverages and requires an environment free of coercion for those who choose to abstain. Therefore, students must adhere to guidelines provided by the university for responsible and legal consumption of alcoholic beverages, individual students must accept responsibility for their own behavior and should demonstrate a concern for the safety and well-being of others in the university community. All the following apply:

1. The sponsors of events where alcohol is served must file an Alcohol Use Permit in the Office of Student Affairs at least three business days prior to the event. A copy of this form will be needed for student groups to reserve any university facility for events where alcohol is served.
2. Open containers of alcoholic beverages are generally prohibited in public places according to state law unless a university permit is obtained. Public areas are defined to include patios, balconies and any other area outside a facility. Other specifically restricted in some university areas including Squire Valleeve Farm, Harkness and Amasa Stone Chapels, and at university athletic events.
3. At all events where alcohol is served, an effective procedure must be established and adhered to for certifying those legally of age to drink. To obtain alcoholic beverages a valid driver’s license or other valid legal document showing proof of age must be presented. A Case Western Reserve I.D. card may be required for admission.
4. When alcohol is sold, temporary For F-2 permits will be required in accordance with state laws. The sale of alcohol is defined to include such methods for defraying the cost of the beverage or event as sale by the glass or container, advance ticket sales, and cover charges at the door.
5. At all events where alcohol is served, non-alcoholic beverages must be provided by the sponsor of the event. The amount of alcoholic beverage provided should reflect the proportion of those attending the event who are legally eligible to drink; the amount of non-alcoholic beverages provided should be sufficient to serve the number of people attending the event who are too young to drink or choose not to drink alcohol.
6. No one should be coerced, even subtly, to drink or overindulge, and the rights of those who choose to abstain must be respected.
7. When alcohol is served, food must be provided by the sponsor of the event in adequate amounts to last through the event.
8. The type and amount of security required for an event will be determined according to the following factors: the nature of the event, the number of people attending the event, whether an alcoholic beverage is served, and whether cash will be on hand.
9. Social events which encourage drinking or drunkenness as themes and the advertisement of such events are considered inappropriate and will not be permitted. Neither the cost nor brand of alcoholic beverage may be advertised in Ohio.
10. When beer is provided, it must be served to individuals in single servings in containers of 16 ounces or less. When wine or liquor is provided, it must also be served in appropriately sized glasses.
11. The serving of alcohol must cease at least one-half hour before the scheduled end of an event.
12. When entertainment is included in the event, the type of entertainment and the duration must be listed on the Alcohol Use Permit.
13. The gift of alcohol as a reward for any student activity or contest is prohibited.
14. Individuals or groups violating state law or university student alcohol policy will be subject to disciplinary action. Additional information on the Student Alcohol Policy and the university’s commitment and expectation are included in the Student Services Guide.

### GRIEVANCE PROCEDURE

Case Western Reserve University has established a mechanism whereby students of the university may express a grievance against the actions of other students or members of the faculty. Details of the grievance procedure are included in the Student Services Guide, an annual publication of the University Office of Student Affairs. Students who wish to have a specific problem reviewed should contact Student Affairs.

### University Appeals Board
The University Appeals Board has jurisdiction over student appeals of disciplinary actions. Appeals to the board must be presented in writing to the Vice President of Student Affairs. The board normally reviews the case on the record alone.

DRUG POLICY
Case Western Reserve University has the responsibility to provide its students, employees, and the public with the safest environment possible. The university also has an interest in promoting the highest standard of health and welfare among its students, staff, and faculty. It is therefore the policy of Case Western Reserve University to discourage the use of controlled substances. The unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited in and on property owned or operated by Case Western Reserve University. Further information regarding the university’s drug policy is available at http://studentaffairs.case.edu/handbook/policy/university/drugs.html.

UNIVERSITY POLICY ON E-MAIL COMMUNICATIONS WITH STUDENTS
Official communications from the university may be sent electronically using the student’s university-assigned e-mail address. The university expects that students will read such official university communications in a timely fashion. Students who choose to forward e-mail from their university account to another e-mail address remain responsible for receiving and reading official university communications.

SEXUAL ASSAULT POLICY
Case Western Reserve University is a community dependent upon trust and respect for its constituent members—students, faculty, and staff. Sexual assault is a violation of that trust and respect; it will not be tolerated. The university strongly encourages persons who have been sexually assaulted to report the assault, to seek assistance and to pursue judicial action or sanctions for their own protection and that of the entire campus community. Complete details on the university’s policy and reporting procedure are included on the university’s website at www.case.edu/provost/sexualconduct

SMOKING POLICY
The university has accepted the opinion of the Surgeon General that smoking is the largest preventable cause of illness and premature death. Since the university has substantial commitments to health-related research and teaching, it has a parallel commitment to protect the health environment of students, employees and guests.

Therefore, and in compliance with the State of Ohio smoking ban set out in Chapter 3794 of the Ohio Revised Code, the university does not permit smoking in any of its buildings or structures, including in residence halls or in university vehicles. In addition, all outside walkways and grounds of university property are smoke-free, except for specific university-designated smoking areas. The medical, dental and nursing schools and the health sciences podium and the health sciences garage are entirely smoke-free and do not have any university-designated smoking areas.
PHYSICAL EDUCATION
AND ATHLETICS
The Veale Convocation, Recreation and Athletic Center
Phone: 216-368-2867/2420
http://studentaffairs.case.edu/athletics/default.html

The Department of Physical Education and Athletics offers the student a variety of opportunities from challenging academic classes to vigorous recreational activities.

Case Western Reserve University sponsors 19 intercollegiate varsity sports. These are football, soccer, cross country, basketball, wrestling, swimming, baseball, tennis, and indoor and outdoor track for men and volleyball, basketball, swimming, indoor and outdoor track, tennis, cross country, soccer, and softball for women.

The Spartans are charter members of the University Athletic Association, (UAA), sharing the belief that academic excellence and athletic excellence are equally important. The UAA includes Brandeis University, Carnegie Mellon University, Emory University, New York University, University of Chicago, University of Rochester, and Washington University in St. Louis.

The department sponsors a variety of intramural and club sport activities, including archery, cheerleading, crew, cycling, fencing, ice hockey, lacrosse, kendo, kung fu, squash, table tennis, taekwondo, ultimate frisbee, and volleyball. Sport clubs are available to all students, faculty, and staff. Intramural competition is available in more than 40 activities, and more than one-half of undergraduates participate for relaxation, physical fitness, and a chance to improve skills.

FACULTY
Freeman Blade, B.S.
(Instructor)
Eastern Montana State College
Assistant Women’s Basketball Coach

Chris Conlon, M.A.
(Instructor)
Johns Hopkins University
Head Men’s and Women’s Swim Coach

Tiffany Crooks, B.S.
(Ashland University)

Greg Debeljak, M.A.
(John Carroll University)
Instructor
Head Football Coach

Robert Del Rosa, M.A.
(Western Reserve College)
Instructor
Assistant Director of Athletics
Head Wrestling Coach

Dave Diles, Ed.D.
(University of Michigan)
Director of Athletics and Chair, Department of Physical Education and Athletics

Matt Engleander, B.A.
(The College of Wooster)
Instructor
Head Baseball Coach

Karen Farrell, M.S.
(University of Massachusetts at Amherst)
Instructor
Head Volleyball Coach
Assistant Athletic Director/SWA

Susan Higgins, M.A.
(Minnesota University at Mankato)
Instructor
Head Athletic Trainer

David M. Hutter, Ph.D.
(The Ohio State University)
Professor

Patrick Kennedy, M.S.
(University of Maryland)
Associate Professor
Assistant Athletic Director
Director of Intramurals and Coordinator of Club Sports

Erin Lake, M.Ed.
(Bowling Green State University)
Instructor
Assistant Athletic Trainer

Kathy Lanese, B.S.
(Ohio University)
Instructor
Head Men’s and Women’s Cross Country Coach
Assistant Women’s Track and Field Coach

Marcus Macalla, M.A.
(John Carroll University)

Instructor
Assistant Football Coach

Sean McDonnell, M.A.
(LeMoyne College)
Instructor
Head Men’s Basketball Coach

Todd McGuinness, B.S.
(Bethany College)
Instructor
Assistant Men’s Basketball Coach

Mina Moore, B.S.
(Wayne State University)
Instructor
Associate Director, Intramurals

Dan Palmer, M.A.
(N.E. Illinois University)
Instructor
Head Men’s Soccer Coach

Jennifer Reimer, M.Ed.
(Bowling Green State University)
Instructor
Head Women’s Basketball Coach

Stephen Rubin, B.A.
(Emory University)
Instructor
Head Men’s and Women’s Track Coach

Jerry Schuplinski, M.A.
(John Carroll University)
Instructor
Assistant Football Coach

Chris Shenberger, M.S.
(Georgia State University)
Instructor
Assistant Athletic Trainer

Derek Slesh, M.A.
(Cleveland State University)
Instructor
Assistant Football Coach

Todd Wojtowski, MBA
(The Citadel)
Instructor
Head Men’s and Women’s Tennis Coach

Frank Zatko, Ph.D.
(Case Western Reserve University)
Instructor
Assistant Men’s and Women’s Swim Coach
LIFETIME SPORTS PROGRAM

The department has designed an instructional program of modern activities and lifetime sports. Each semester, fifteen to twenty-five co-educational lifetime sports classes are offered. Freshmen, who have a one-year physical education requirement, have first priority in electing PHED 010 to 199. Others who have completed the requirement may audit classes.

A number of popular, advanced lifetime sports activities are also offered for one hour of academic credit. Advanced skills, strategy, and coaching are taught (PHED 200 to 299).

RECREATIONAL ACTIVITIES AND INTERCOLLEGIATE ATHLETICS

The intramural program provides a continuous schedule of activities throughout the year. Individual and team sports are available to students in several divisions: university housing, fraternity, women, coed, graduate, and open. Intercollegiate varsity athletic competition is available in ten sports for men and nine sports for women.

UNDERGRADUATE (PHED)

Course Descriptions

PHED 10A. Cardio Games (First Half) (0)
Cardio Games emphasizes conditioning of the aerobic and anaerobic systems through fun and energetic games such as Ultimate Frisbee, Tag, Dodge Ball, Flicker Ball and more. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 10B. Cardio Games (Second Half) (0)
Cardio Games emphasizes conditioning of the aerobic and anaerobic systems through fun and energetic games such as Ultimate Frisbee, Tag, Dodge Ball, Flicker Ball and more. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 11A. Jump Rope Training (First Half) (0)
This class is designed to help students develop quickness, agility, balance, strength, power, and endurance through jump rope training. Students will learn rope-handling skills, jumping techniques and training routines to help supplement training for fitness and performance. Workouts and progressions are included for warm-up, cool-down, fitness components and sport-specific training. Prereq: Undergraduate degree seeking student.

PHED 11B. Jump Rope Training (Second Half) (0)
This class is designed to help students develop quickness, agility, balance, strength, power, and endurance through jump rope training. Students will learn rope-handling skills, jumping techniques and training routines to help supplement training for fitness and performance. Workouts and progressions are included for warm-up, cool-down, fitness components and sport-specific training. Prereq: Undergraduate degree seeking student.

PHED 12A. Badminton (First Half) (0)
This class provides the student with the basic skills, footwork and strategies necessary to play the sport of badminton. Emphasis is placed on skill development through instruction and drills as well as singles and doubles match play. This class is appropriate for all students. Students with special needs can be accommodated. Prereq: Undergraduate degree seeking student.

PHED 12B. Badminton (Second Half) (0)
This class provides the student with the basic skills, footwork and strategies necessary to play the sport of badminton. Emphasis is placed on skill development through instruction and drills as well as singles and doubles match play. This class is appropriate for all students. Students with special needs can be accommodated. Prereq: Undergraduate degree seeking student.

PHED 13A. Rock Wall Climbing (First Half) (0)
This course is designed to give students a comprehensive introduction to the skills, safely, terminology and equipment used in the sport of recreational activity of rock climbing. Prereq: Undergraduate degree seeking student.

PHED 13B. Rock Wall Climbing (Second Half) (0)
This course is designed to give students a comprehensive introduction to the skills, safely, terminology and equipment used in the sport of recreational activity of rock climbing. Prereq: Undergraduate degree seeking student.

PHED 14A. Indoor Rowing (First Half) (0)
This course introduces the student to basic indoor rowing techniques, skills, and equipment. Students will learn conditioning programs to prepare the student to continue in recreational, fitness or competitive rowing programs. Prereq: Undergraduate degree seeking student.

PHED 14B. Indoor Rowing (Second Half) (0)
This course introduces the student to basic indoor rowing techniques, skills, and equipment. Students will learn conditioning programs to prepare the student to continue in recreational, fitness or competitive rowing programs. Prereq: Undergraduate degree seeking student.

PHED 15A. Cross Country Skiing (First Half) (0)
Prereq: Undergraduate degree seeking student.

PHED 19A. Golf (First Half) (0)
Prereq: Undergraduate degree seeking student.

PHED 19B. Golf (Second Half) (0)
Prereq: Undergraduate degree seeking student.

PHED 20A. Cross Country Skiing (Second Half) (0)
Prereq: Undergraduate degree seeking student.

PHED 21A. Hatha Yoga (First Half) (0)
This course provides an introduction to Hatha Yoga, presenting body awareness, basic philosophy, breathwork, postures and meditation techniques. This class is appropriate for all students. Prereq: Undergraduate degree seeking student.

PHED 21B. Hatha Yoga (Second Half) (0)
This course provides an introduction to Hatha Yoga, presenting body awareness, basic philosophy, breathwork, postures and meditation techniques. This class is appropriate for all students. Prereq: Undergraduate degree seeking student.

PHED 22A. Intermediate Hatha Yoga (First Half) (0)
This course utilizes the basics of Hatha Yoga including body awareness, philosophy, breathwork, and postures with emphasis on increased strengthening, increased aerobic segments, and more challenging postures. This class is appropriate for all students. Prereq: Undergraduate degree seeking student.

PHED 22B. Intermediate Hatha Yoga (Second Half) (0)
This course utilizes the basics of Hatha Yoga including body awareness, philosophy, breathwork, and postures with emphasis on increased strengthening, increased aerobic segments, and more challenging postures. This class is appropriate for all students. Prereq: Undergraduate degree seeking student.

PHED 23A. Aquatic Volleyball (First Half) (0)
Prereq: Undergraduate degree seeking student.

PHED 23B. Aquatic Volleyball (Second Half) (0)
Prereq: Undergraduate degree seeking student.

PHED 24A. Jogging (First Half) (0)
Prereq: Undergraduate degree seeking student.

PHED 24B. Jogging (Second Half) (0)
Prereq: Undergraduate degree seeking student.

PHED 25A. Power Volleyball (First Half) (0)
This class introduces volleyball skills, techniques, strategies, rules and scoring. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 25B. Power Volleyball (Second Half) (0)
This class introduces volleyball skills, techniques, strategies, rules and scoring. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 26A. Racquetball (First Half) (0)
This course teaches racquetball skills and strategies for team and individual play. Course content includes terminology, skill development, scoring, etiquette and safety. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 26B. Racquetball (Second Half) (0)
This course teaches racquetball skills and strategies for team and individual play. Course content includes terminology, skill development, scoring, etiquette and safety. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 27A. Indoor Group Cycling (First Half) (0)
A stationary cycling program set to motivational music. Students will learn how to use and set up the bike and how to create a challenging workout using sprints, jumps and climbs. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 27B. Indoor Group Cycling (Second Half) (0)
PHED 28A. Squash (First Half) (0)
Students will be introduced to the skills, techniques and strategies necessary to play the sport of squash. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 28B. Squash (Second Half) (0)
Students will be introduced to the skills, techniques and strategies necessary to play the sport of squash. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 30A. Swimming - Endurance (First Half) (0)
This class is for individuals who have mastered intermediate swimming skills and wish to develop advanced swimming skills and greater swimming endurance. Prereq: Undergraduate degree seeking student.

PHED 30B. Swimming - Endurance (Second Half) (0)
This class is for individuals who have mastered intermediate swimming skills and wish to develop advanced swimming skills and greater swimming endurance. Prereq: Undergraduate degree seeking student.

PHED 31A. Tennis (First Half) (0)
Students will learn the tennis skills and strategies necessary for both singles and doubles play. Emphasis is placed on stroke development, rules, scoring and etiquette. This class is appropriate for all students. Prereq: Undergraduate degree seeking student.

PHED 31B. Tennis (Second Half) (0)
Students will learn the tennis skills and strategies necessary for both singles and doubles play. Emphasis is placed on stroke development, rules, scoring and etiquette. This class is appropriate for all students. Prereq: Undergraduate degree seeking student.

PHED 34A. Weight Training (First Half) (0)
This class focuses on muscular strength and endurance training through individualized weight training programs. Emphasis is placed on appropriate use of equipment and safety procedures. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 34B. Weight Training (Second Half) (0)
This class focuses on muscular strength and endurance training through individualized weight training programs. Emphasis is placed on appropriate use of equipment and safety procedures. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 40A. Basketball (First Half) (0)
This class introduces basketball skills, techniques, rules and basic offense and defense. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 40B. Basketball (Second Half) (0)
This class introduces basketball skills, techniques, rules and basic offense and defense. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 41A. Softball (First Half) (0)
Prereq: Undergraduate degree seeking student.

PHED 42B. Indoor Soccer (Second Half) (0)
Students will learn the skills, techniques and strategies to play the sport of indoor soccer. This class is appropriate for most students. Prereq: Undergraduate degree seeking student.

PHED 44A. Core Yoga (1st Half) (0)
This course combines Hatha Yoga postures, Pilates exercises, body awareness and breathwork while focusing on deep stabilizing abdominal muscles. Students will combine stretching and strengthening to improve posture and flexibility and create balance in the physical body. Students will learn slow, controlled movements to help tone and condition. Prereq: Undergraduate degree seeking student.

PHED 44B. Core Yoga (2nd Half) (0)
This course combines Hatha Yoga postures, Pilates exercises, body awareness and breathwork while focusing on deep stabilizing abdominal muscles. Students will combine stretching and strengthening to improve posture and flexibility and create balance in the physical body. Students will learn slow, controlled movements to help tone and condition. Prereq: Undergraduate degree seeking student.

PHED 45A. Introduction to Speed and Agility Training (0)
This introductory course is intended for the student with an interest in training of speed and agility specific to their sport interest. The course will focus on the aspects of physical training necessary for the development of speed and agility and improved athletic performance. Prereq: Undergraduate degree seeking student.

PHED 45B. Introduction to Speed and Agility Training (0)
This introductory course is intended for the student with an interest in training of speed and agility specific to their sport interest. The course will focus on the aspects of physical training necessary for the development of speed and agility and improved athletic performance. Prereq: Undergraduate degree seeking student.

PHED 50A. Personal Safety Awareness (First Half) (0)
This class focuses on safety and preventative techniques. Emphasis is placed on self-protection. This class is appropriate for all students. Prereq: Undergraduate degree seeking student.

PHED 50B. Personal Safety Awareness (Second Half) (0)
This class focuses on safety and preventative techniques. Emphasis is placed on self-protection. This class is appropriate for all students. Prereq: Undergraduate degree seeking student.

PHED 55A. Cardio-Fitness (First Half) (0)
This class presents the components of physical fitness through conditioning activities utilizing equipment such as stairclimbers, treadmills, and elliptical trainers. Students will evaluate their fitness levels and learn how to put together an individualized workout program. This class is appropriate for all students. Prereq: Undergraduate degree seeking student.

PHED 55B. Cardio-Fitness (Second Half) (0)
This class presents the components of physical fitness through conditioning activities utilizing equipment such as stairclimbers, treadmills, and elliptical trainers. Students will evaluate their fitness levels and learn how to put together an individualized workout program. This class is appropriate for all students. Prereq: Undergraduate degree seeking student.

PHED 100. Independent Activity (0 - 10)
This course is designed to allow the student to write individual fitness goals, compose an individual fitness program specific to the goals and execute the individual program. Students are required to participate in a pre and post-testing program and must achieve a minimum of 75% for each test component (national norms) in order to participate in Independent Activity. The course instructor must approve all programs. The student will be required to maintain a detailed activity log.

PHED 105. CPR/First Aid (0)
Students will learn the basic first aid and CPR skills necessary to act in an emergency. Automated external defibrillation training is included. This class involves both lecture and hands-on work. Students will have the opportunity to achieve Basic Rescuer certification at the completion of the class.

PHED 108. Fencing (0)
Fencing is the art of swordsmanship. Students will learn fencing skills such as on guard, lunge, attack, parry and touch. Students will learn the rules of competition and have the opportunity to compete during class time.

PHED 111. Sport Orienteering/Rock Wall Climbing (0)
This course combines the sport of orienteering in which orienteers use a map and compass to locate points in the landscape and the activity of rock climbing.

PHED 120. Skin and Scuba Diving - Advanced students. Prereq: Undergraduate degree seeking student.
PHED 127. Water Safety Instructors (0)
Recommended preparation: Emergency Water Safety or Lifeguarding Certificate.

PHED 129. Life Guarding (0)
Recommended preparation: Advanced swimming skills.

PHED 130. Wellness (0)
This lecture class teaches the components of physical fitness as well as evaluation techniques, fitness assessment, body composition, nutrition and weight control information. This class is appropriate for all students.

PHED 131. Personal Fitness (0)
Personal Fitness is a full semester class that teaches the components of physical fitness through both lecture and activity. Students will assess their fitness levels and learn conditioning activities to improve flexibility, cardiovascular endurance, muscular strength and endurance. Nutrition, weight control and concepts of wellness are covered in this class. This class is appropriate for most students.

PHED 140. Modern Jazz Dance (0)

PHED 141. Dance (0)
This course is designed to introduce the student to dance. Students will be exposed to a variety of dances including contemporary, jazz, folk and formal dancing. Students will learn how choreography is mounted and how dancers remember it. The class is appropriate for beginners as well as students with dance experience.

PHED 142. Social Dance (0)

PHED 170. Varsity Baseball (0)

PHED 171. Varsity Basketball (Men) (0)

PHED 172. Varsity Basketball (Women) (0)

PHED 174. Varsity Cross Country (Men) (0)

PHED 175. Varsity Cross Country (Women) (0)

PHED 178. Varsity Football (0)

PHED 180. Varsity Soccer (Men) (0)

PHED 181. Varsity Soccer (Women) (0)

PHED 182. Varsity Swimming (Men) (0)

PHED 183. Varsity Swimming (Women) (0)

PHED 184. Varsity Tennis (Men) (0)

PHED 185. Varsity Tennis (Women) (0)

PHED 186. Varsity Track and Field (Men) (0)

PHED 187. Varsity Track and Field (Women) (0)

PHED 188. Varsity Volleyball (0)

PHED 189. Varsity Wrestling (0)

PHED 190. Varsity Softball (Women) (0)

PHED 203. Body Conditioning - Advanced (1)

PHED 204. CPR/First Aid (1)
Students will learn the basic first aid and CPR skills necessary to act in an emergency. Automated external defibrillation training is included. This class involves both lecture and hands-on work. Students will have the opportunity to achieve Basic Rescuer certification at the completion of the class. This class section does not satisfy the Physical Education requirement.

PHED 208. Racquetball - Advanced (1)

PHED 211. Skin and Scuba Diving - Advanced (1)
Recommended preparation: Skin and Scuba Certification.

PHED 215. Water Safety Instructors (1)
Recommended preparation: Emergency Water Safety or Lifeguarding Certificate.

PHED 216. Weight Training II (1)
This class is for the student with weight training experience and/or the student who has successfully completed the basic weight training program and wishes to continue training in an advanced program. Advanced skill development, program development and safety are emphasized. This class section does not satisfy the Physical Education requirement.

PHED 217. Life Guarding (1)
Advanced physical education activities. Advanced instruction in sports, limited to upperclassmen. This course may lead to certification in lifeguarding. Recommended preparation: Advanced swimming skills.

PHED 218. Wellness (1)

PHED 219. Weight Training III (1)
Prereq: PHED 216.

PHED 320. Psychology of Sport (2)
The major psychological dimension underlying an individual's participation in sport. Selected areas that influence the acquisition of physical skill and performance in sports.

PHED 325. Officiating Basketball (2)
Administrative procedures, promotion, managerial relationships, scheduling, tournaments, budgeting, scoring systems, and officiating.

PHED 332. Introduction to Sports Medicine (3)
This class provides a detailed introduction to the foundation of Sports Medicine. Students will understand the complexities of sports medicine and athletic training through classroom lecture, structured laboratory and clinical hours. Topics covered in this class include roles and responsibilities of the sports medicine team, injury pathology, injury prevention, evaluation and management of injury.

PHED 334. Orthopedic Assessment of the Upper Extremity (3)
This class provides students with hands on experience that prepares them to perform orthopedic assessments within the field of athletic training. Students learn to take medical histories, palpate bony and soft structures, perform range of motion, neu-
**DEGREE PROGRAMS OFFERED**

a. Available only as a second major.
b. Includes dietetics.
c. The Medical Scientist Training Program.
d. Combined degree by special arrangement for selected students who hold acceptances in the School of Medicine.
e. Degrees conferred jointly by the Mandel School of Applied Social Sciences and the Weatherhead School of Management in association with the Mandel Center for Nonprofit Organizations.
f. Available as the undergraduate portion of the Bachelor of Science in Engineering/Master of Science program.
g. Available as the graduate portion of the Bachelor of Science in Engineering/Master of Science program.
h. Joint five-year Doctor of Medicine/Master of Science

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### Degree Programs Offered

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<td>Master of Public Health</td>
<td>Master of Public Health/Master of Science in Nursing (Infection Control)</td>
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<td>Master of Public Health</td>
<td>Master of Public Health/Master of Arts (Anthropology)</td>
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<td>Master of Public Health</td>
<td>Master of Public Health/Master of Arts (Bioethics)</td>
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<td>Master of Public Health/Doctor of Philosophy (Anthropology)</td>
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<td>Public Health Nutrition</td>
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<td>Religious Studies</td>
<td>Bachelor of Arts</td>
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<td>Doctor of Philosophy</td>
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<td>Social Work</td>
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<td>Master of Science in Social Administration</td>
<td>Master of Science in Social Administration/Juris Doctor</td>
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<td>Master of Science in Social Administration/Master of Arts (Bioethics)</td>
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<td>Bachelor of Arts/Master of Arts</td>
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<td>Doctor of Philosophy</td>
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<td>Spanish</td>
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<td>Statistics</td>
<td>Bachelor of Arts</td>
<td>Master of Science in Statistics (admission is currently suspended for both degrees)</td>
<td>Bachelor of Arts/Master of Science</td>
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<td>Bachelor of Science in Statistics</td>
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<td>Master of Business Administration/Master of Science in Management-Supply Chain</td>
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<td>Systems Biology</td>
<td>Bachelor of Science</td>
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<td>Systems and Control Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science in Engineering (admission is currently suspended for both degrees)</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
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# Degree Programs Offered

<table>
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<tr>
<th>Field of Study</th>
<th>Undergraduate</th>
<th>Professional/Graduate</th>
<th>Combined</th>
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<tr>
<td>Teacher Education</td>
<td>Bachelor of Arts</td>
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<td>Theater Arts</td>
<td>Bachelor of Arts</td>
<td>Master of Fine Arts</td>
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<td>Women's and Gender Studies</td>
<td>Bachelor of Arts</td>
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<td>World Literature</td>
<td>Bachelor of Arts</td>
<td>Master of Arts</td>
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<td>(English and French)</td>
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</table>
UNDERGRADUATE STUDIES

Academic Programs, Requirements and Regulations

Office of Undergraduate Studies
357 Sears Building
Phone 216-368-2926; Fax 216-368-4718
E-mail: UGStudies@case.edu
http://www.case.edu/provost/ugstudies/undstud.htm

ADMINISTRATION

Jeffrey Wolcowitz, Ph.D.
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(Kent State University)
Assistant Dean for First-Year Students

Steven P. Scherger, M.A.
(The Ohio State University)
Coordinator for First-Year Student Academic Affairs

Claudia C. Anderson, B.A.
(Youngstown State University)
Assistant Dean of Undergraduate Studies

Nancy A. Diulio, Ph.D.
(The Pennsylvania State University
College of Medicine)
Assistant Dean of Undergraduate Studies

Lynnmarie Hamel, M.Ed., J.D.
(Cleveland State University, Case Western Reserve University)
Assistant Dean of Undergraduate Studies

Joseph W. Pieri, M.S.
(Northeastern University)
Assistant Dean of Undergraduate Studies

Julie M. Petek, Ph.D.
(Kent State University)
Director of Degree Audit and Data Service

Margaret N. Clark, M.A.
(Case Western Reserve University)
Degree Audit and Information Services Analyst

Jane Buder Shapiro, Ph.D.
(Case Western Reserve University)
Health Professions Advisor

JoAnne Urban Jackson, J.D.
(Northwestern University)
Pre-Law Advisor

Case Western Reserve University confers baccalaureate degrees based on programs offered by the faculties of the Case School of Engineering, the College of Arts and Sciences, the Frances Payne Bolton School of Nursing, the School of Medicine, and the Weatherhead School of Management. In addition, the university offers several baccalaureate programs jointly with the Cleveland Institute of Art and the Cleveland Institute of Music. The faculties and administration are dedicated to offering educational programs that enable undergraduates to achieve disciplinary literacy in one or more major fields, to acquire educational breadth through study across the natural sciences, humanities and arts, and social sciences, and to learn to think critically and to communicate effectively. Furthering the university mission, the educational programs aim to foster the development of qualities of integrity, creativity, leadership, and societal engagement.

The bachelor's degree programs engage students in in-depth study in one field (the major), as well as general education or core requirements. Overlap among the general education and core curricula for the various bachelor's degree programs allows students flexibility in the choice of majors and degree program. Foundational courses and seminars introduce students to modes of inquiry, thought, and communication in the natural sciences, humanities and arts, and social sciences.

Advisors for first-year students, departmental advisors, other faculty, and deans assist students in selecting from approximately sixty alternative curricula and major concentrations a field of study suited to each student's interests and qualifications. Highly motivated and responsible students whose educational and career goals are better served through an individualized course of study may pursue academic programs of their own design through a Dean's Approved Major.

Students with broad educational interests and goals may pursue concurrently two or more majors or the Bachelor of Arts degree or two or more majors for the Bachelor of Science in Engineering degree, or may earn two bachelor's degrees, completing both a Bachelor of Arts degree and a Bachelor of Science degree, or fulfilling the requirements for two Bachelor of Science degrees. The Bachelor of Music degree offered by the Cleveland Institute of Music may be combined with either a Bachelor of Arts or a Bachelor of Science degree. Qualified students who wish to accelerate their undergraduate and graduate or professional studies may earn the opportunity to begin in the senior year advanced study toward a graduate or professional degree.

The university provides undergraduates with a rich variety of experiential learning opportunities off campus as well as on campus and in University Circle. Programs that engage students in curriculum-related employment include the Cooperative Education Program, the Practicum Program, and internships. Study Abroad, the exchange program with Fisk University, and the Washington Semester immerse students in educational environments that build global and national knowledge and perspective. Research opportunities for undergraduates abound at the university, in University Circle institutions, and in Cleveland. Individual departments offer independent study opportunities to motivated and qualified students; some departments offer courses that incorporate practical field experience or community service. The location of the university in University Circle, with its outstanding array of cultural, educational, and health care institutions, and the proximity and accessibility of the university's various professional schools and their facilities enable undergraduates to draw upon diverse and distinctive resources to enrich their education.

DEGREE PROGRAMS

Case Western Reserve University offers a broad range of programs in the liberal arts and sciences, engineering, management, accountancy, and nursing leading to the Bachelor of Arts (B.A.), and the Bachelor of Science (B.S.) degrees. These programs provide depth through concentrated study in a major field and breadth through the fulfillment of general education or core curriculum requirements, and open electives.

The B.A. is available in more than forty fields in the humanities and arts, the social and behavioral sciences, and the natural sciences and mathematics. In addition, B.S. programs are offered in accounting, computer science, the natural sciences, mathematics, statistics, art education, music education, management, nursing, and nutrition. The B.S. in Engineering is available in twelve major fields.
UNDERGRADUATE STUDIES

The Bachelor of Music (B.M.) degree is offered through the Joint Program in Music of Case Western Reserve University and the Cleveland Institute of Music. Students who are candidates for the B.M. enroll in the Cleveland Institute of Music. Listed below are all the undergraduate degrees offered by the university.

Bachelor of Arts

Bachelor of Science in:

- Accounting
- Applied Mathematics
- Art Education
- Astronomy
- Biochemistry
- Biology
- Chemistry
- Computer Science
- Geological Sciences
- Management
- Mathematics
- Mathematics and Physics
- Music Education
- Nursing
- Nutrition
- Nutritional Biochemistry and Metabolism
- Physics
- Statistics
- Systems Biology

Bachelor of Science in Engineering Major fields:

- Aerospace Engineering
- Biomedical Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Engineering Physics
- Materials Science and Engineering
- Mechanical Engineering
- Polymer Science and Engineering
- Systems and Control Engineering
- Engineering (undesignated)

With the exceptions of engineering physics and the undesignated major in engineering, all of the engineering programs listed above are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET, Inc.).

GENERAL REQUIREMENTS FOR ALL BACHELOR’S DEGREES

The bachelor’s degree programs require students to study one field in depth (the major) and to complete general education requirements or a core curriculum as appropriate to the major field and degree program selected. There is overlap among core curricula and general education requirements, which allows students flexibility in the choice of majors and degree programs.

Every candidate for a baccalaureate degree from the university must:

a) complete a foundation curriculum (core curriculum or general education requirements), as specified for the degree sought, that incorporates the requirements of the Seminar Approach to General Education and Scholarship (SAGES);

b) complete a course of studies with a cumulative grade point average of no less than 2.000 for work taken at Case Western Reserve University;

c) earn in residence at Case Western Reserve University a minimum of 60 semester hours, of which at least 30 must be earned after the student achieves senior status; and

d) complete two semesters of physical education. This is completed through a combination of half and/or full semesters in Physical Education activity courses.

There are four foundation curricula that incorporate the SAGES curricular requirements:

1. Arts and Sciences General Education Requirements, required for the Bachelor of Arts (B.A.) and the following Bachelor of Science (B.S.) degrees: applied mathematics, art education, astronomy, biochemistry, biology, chemistry, geological sciences, mathematics, mathematics and physics, music education, nutrition, nutritional biochemistry and metabolism, physics, statistics and systems biology.

2. Engineering Core Curriculum, required for the Bachelor of Science in Engineering (B.S.E.) degree. Required, with specific course exceptions, for the Bachelor of Science (B.S.) degree in computer science.

3. School of Nursing General Education Requirements, required of all candidates for the Bachelor of Science in Nursing (B.S.N.) degree.

4. Weatherhead School of Management General Education Requirements, required of students who are candidates for the Bachelor of Science (B.S.) degree in accounting, and in management.

SAGES

The Seminar Approach to General Education and Scholarship (SAGES) provides a foundation in critical thinking, written and oral communication, the use of information, quantitative reasoning, engagement with ethical issues and diversity, and exposure to experimental and theoretical approaches to understanding human culture and behavior, scientific knowledge, and methods of research through the following:

1. First Seminar, taken in the first semester, introduces students to the seminar format through reading, discussion, and intensive writing, and incorporates activities with University Circle institutions. First Seminar will be selected from offerings in the Life of the Mind, the Natural World, the Social World, or the Symbolic World.

*Transfer Students only: Transfer students who have completed the English composition/expository writing requirement with a grade of C or higher at the college/university at which they previously matriculated will receive transfer credit for FSCC T100 (3 – 6 semester hours) and will be required to complete a supplemental 1-semester-hour SAGES introductory seminar – FSTS 100.

2. Two University Seminars, taken after the First Seminar and before the end of the student’s second year, and selected from seminars that address specific topics that fall under broad themes: Thinking About the Social World, Thinking About the Symbolic World, Thinking About the Natural World.

3. Writing Portfolio, comprising writing assignments selected from the First Seminar and University Seminars. The Writing Portfolio is submitted for evaluation after completing the final University Seminar. Writing competence must be established in order to fulfill the university’s English Composition requirement for graduation.

4. Department Seminar, generally taken in the junior year in the student’s major field, that focuses on discipline-specific methods and modes of inquiry and communication.

5. Senior Capstone, a one- or two-semester capstone project integrating the knowledge, initiative, problem-solving skills, and powers of communication developed by the student. Substantial writing and a final public presentation are required.

Information about specific department seminars and capstones is available from department academic representatives and on the searchable schedule of classes website at:
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REQUIREMENTS FOR SPECIFIC DEGREES

Students are expected to complete a bachelor’s degree in a timely fashion and will ordinarily be subject to the degree requirements in place at the time of matriculation at Case Western Reserve University, although they may choose to update their requirements to those included in a later Handbook for Undergraduate Students. If a student extends study towards a bachelor’s degree beyond 10 years after first matriculation as an undergraduate student, the major-field department(s) will review the student’s academic record and may update major field requirements. Also, if the student has not already completed the applicable general education requirements in place at the time of matriculation, the appropriate dean in the school offering the major will also review the student’s academic record and may update general education requirements.

BACHELOR OF ARTS DEGREE

(College of Arts and Sciences)

Candidates for the Bachelor of Arts degree, in addition to meeting the general requirements for bachelor’s degrees as described above, must also complete the following requirements:

1. A minimum of 120 semester hours earned.
   a) No more than 42 hours beyond the 100 level in any one department may be applied to the 120 hour total.
   b) The 120 semester hours must include at least 90 semester hours in arts and sciences. These credits may be drawn from those offered by the College of Arts and Sciences as well as those in economics, biochemistry, nutrition and computer science. (Students completing both a B.A. and B.S. degree are exempted from six hours of the 90 hour arts and sciences requirement for the B.A.)
2. The SAGES General Education Requirements of the College of Arts and Sciences.
3. A minimum of 30 semester hours of courses at the 300-400 level.
4. The requirements for a major as specified in this bulletin for each department or program. A major requires a minimum of 30 semester hours, at least 24 of which are taken in the major department or program. For all courses taken in the major department and for which grades are averaged, and for all courses taken to satisfy major requirements and for which grades are averaged, a B.A. candidate must earn a minimum cumulative average of 2.0. Major requirements include all required and elective work completed in the major department combined with required courses completed in related fields. Transfer students must complete at Case Western Reserve University at least half the hours required in the major department.

Major Concentrations Available for the B.S.

- American Studies*
- Anthropology
- Art History
- Asian Studies (including Asian language)
- Asian Studies (without Asian language)*
- Astronomy
- Biochemistry
- Biology
- Chemistry
- Classics
- Cognitive Science
- Communication Sciences
- Computer Science
- Economics
- English
- Environmental Geology
- Environmental Studies*
- Evolutionary Biology*
- French
- French and Francophone Studies
- Geological Sciences
- German
- German Studies
- Gerontological Studies*
- History
- History and Philosophy of Science
- International Studies
- Japanese Studies
- Mathematics
- Music
- Natural Sciences*
- Nutrition
- Nutritional Biochemistry and Metabolism
- Philosophy
- Physics
- Political Science
- Pre-Architecture*
- Psychology
- Religious Studies
- Sociology
- Spanish
- Statistics
- Teacher Education*
- Theater Arts
- Women's and Gender Studies
- World Literature

*indicates may be taken only as a second major

Any student interested in developing for the B.A. a major of his or her own design may submit, before the end of the sophomore year, a program proposal to the Office of Undergraduate Studies for approval by the Dean’s Committee.

BACHELOR OF SCIENCE DEGREE

(College of Arts and Sciences)

Candidates for the Bachelor of Science degrees, in addition to meeting the general requirements for bachelor’s degrees as described above, must also complete the following requirements:

1. A minimum of 120-133 hours as specified by the requirements for each B.S. program.
2. A minimum of 30 semester hours of courses at the 300-400 level.
3. The SAGES General Education Requirements of the Arts and Sciences. For some B.S. programs, the SAGES General Education Requirements of the Arts and Sciences have been modified and incorporated into the degree requirements as presented in this bulletin in the section devoted to each department or program.
4. The requirements for a major field as presented in this bulletin in the section devoted to each department or program. For all courses taken in the major department and for which grades are averaged, and for all courses taken to satisfy major requirements and for which grades are averaged, a candidate for a B.S. from the College of Arts and Sciences must earn a minimum cumulative average of 2.0. Major requirements include all required and elective work completed in the major department combined with required courses completed in related fields. Transfer students must complete at Case Western Reserve University at least half the hours required for the major.

Major Concentrations for the B.S.

- Applied Mathematics
- Art Education
- Astronomy
- Biochemistry
- Biology
- Chemistry
- Geological Sciences
- Mathematics
SAGES GENERAL EDUCATION REQUIREMENTS OF THE COLLEGE OF ARTS AND SCIENCES

SAGES is an innovative undergraduate experience designed to establish foundations for academic inquiry. Students fulfill their College of Arts and Sciences General Education Requirements with a sequence of specially developed seminars and selected courses. Course credit earned by Advanced Placement, International Baccalaureate, proficiency examinations, and transfer may be used to satisfy general education requirements.

SAGES Program Seminars

(13 semester hours)

The First Seminar*

(4 semester hours, to be taken in the first semester of enrollment)

The First Seminar focuses on the development of critical thinking and communication skills through the use of a variety of approaches, media, and perspectives to explore the human mind and the nature of inquiry. This course is designed to strengthen writing and analytical skills while building a foundation in ethics, information literacy, and cultural diversity. Select from:

First Seminar: The Life of the Mind (FSCC 100) or First Seminar: Natural World (FSNA 1xx) or First Seminar: Symbolic World (FSSY 1xx)

*Transfer Students only: Transfer students who have completed the English composition/expository writing requirement with a grade of C or higher at the college/university at which they previously matriculated will receive transfer credit for FSCC T100 (3 – 6 semester hours) and will be required to complete a supplemental 1-semester hour SAGES introductory seminar – FSTS 100.

University Seminars

(6 semester hours, minimum of two seminars, to be completed in the first two years of enrollment as specified below)

After completion of the First Seminar, students must complete two University Seminars, with each seminar selected from a different thematic group and from a thematic group different from that of the student’s First Seminar. Each University Seminar explores one of three themes, with the content determined according to the interests of the faculty. University Seminars provide continued experience in critical reading, writing, and oral communication as well as information literacy, ethics, and cultural diversity. Select from:

University Seminar: Thinking About the Natural World (USNA 2xx); University Seminar: Thinking About the Social World (USSO 2xx); University Seminar: Thinking About the Symbolic World (USSY 2xx)

Department Seminar

(3 semester hours)

The Department Seminar includes seminar-based discussion as well as instruction and experience in the kinds of writing characteristic of the Department Seminar’s discipline. The Department Seminar may be taken in the department of the student’s major or in another department. A course used to fulfill the Department Seminar requirement may not also be used to fulfill a Breadth Requirement.

University Composition Requirement

Students develop a Writing Portfolio comprised of final graded writing assignments from the First Seminar and University Seminars. The Writing Portfolio is submitted for evaluation after completing the final University seminar. Writing competence must be established in order to fulfill the university’s English Composition requirement for graduation.

Physical Education

(Must total 2 full semesters at zero credits)

Students choose from half- and full-semester course offerings to be completed in the first year.

Breadth Requirements

(18 semester hours – minimum of six 3- or 4-semester hour courses)

NOTE: Two courses used to fulfill requirements for the major also may be used to fulfill the breadth requirements.

Arts and Humanities

(6 – 8 semester hours)

Two 3- or 4-semester hour Arts and Humanities courses. Select from:

Arabic (ARAB), Art History (ARTH), Art Studio (ARTS), Chinese (CHIN), Classics (CLSC), Dance (DANC), English (ENGL), French (FRCH), German (GRMN), Greek (GREK), Hebrew (HBRW), History (HSTY), Italian (ITAL), Japanese (JAPN), Latin (LATN), Music - General (MUGN), Music - History (MUHM), Music - Theory (MUTH), Philosophy (PHIL), Portuguese (PORT), Religion (RLGN), Russian (RUSN), Spanish (SPAN), Theatre (THTR), World Literature (WLIT)

Natural and Mathematical Sciences

(6 - 8 semester hours)

Two 3- or 4-semester hour Natural and Mathematical Science courses. Select from:

Astronomy (ASTR), Biochemistry (BIOC), Biology (BIOL), Chemistry (CHEM), Geology (GEOL), Mathematics (MATH), Nutrition (NTRN), Physics (PHYS), Statistics (STAT)

Social Sciences

(6 semester hours)

Two 3-semester hour Social Science courses. Select from:

Anthropology (ANTH), Cognitive Science (COGS), Communication Sciences (COSI), Economics (ECON), Political Science (POSC), Psychology (PSCL), Sociology (SOCI)

Quantitative Reasoning

(3 – 4 semester hours)

Each student must complete at least one 3- or 4-semester hour course identified as a mathematical reasoning course. Such a course may also be used to fulfill a major or minor requirement, and/or one of the breadth requirements. Select from:

ANTH 319, ENGR 131, MATH 121, 123, 125, 150, PHIL 201, PSCI 282, STAT 201

Global and Cultural Diversity

(3 – 4 semester hours)

Each student must complete at least one 3- or 4-semester hour course identified as a global and cultural diversity course. Such a course may also be used to fulfill a major requirement and/or one of the breadth requirements. Select from:

include and specify a senior capstone. Courses meeting this requirement include the

SAGES Senior Capstone (3 - 6 semester hours)
The Senior Capstone assimilates the knowledge and skills gained throughout the educational process. Students engage in a unique one or two-semester experience designed in consultation with a faculty member. Each Senior Capstone must include key elements:

a) Demonstration of critical thinking and writing skills;
b) Regular oversight by the Capstone advisor;
c) Periodic reporting of progress;
d) Regular writing (e.g., drafts, progress reports, critiques) throughout the project including a final written report which may be a thesis or equivalent document associated with the project or activity (e.g., such pursuits as performance, experiment, live case analysis, or creative writing), as approved by the department of capstone origin;
e) Oral reports including a final public presentation at the Senior Capstone Fair, a conference, a performance, a public lecture, a teaching presentation, or other, as approved by the department of capstone origin.

Courses meeting this requirement include the designation “Approved SAGES Capstone” in their course descriptions. Some majors include and specify a senior capstone.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

(Case School of Engineering) Candidates for the Bachelor of Science in Engineering (B.S.E.) degree, in addition to meeting the general requirements for bachelor’s degrees as described above, must also complete the following requirements:

1. A minimum of 128-133 hours as specified by the requirements for each B.S.E. program.
2. The SAGES Engineering Core Curriculum.
3. The requirements for the specific engineering major as presented in this bulletin in the section devoted to each department or program.

Major Fields Available for the B.S.E.
- Aerospace Engineering
- Biomedical Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Engineering Physics
- Materials Science and Engineering
- Mechanical Engineering
- Polymer Science and Engineering
- Systems and Control Engineering
- Engineering (undesignated)

With the exceptions of engineering physics and the undesignated major in engineering, all of the engineering programs listed above are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

BACHELOR OF SCIENCE IN COMPUTER SCIENCE DEGREE

(Case School of Engineering) Candidates for the Bachelor of Science in Computer Science degree, in addition to meeting the general requirements for bachelor’s degrees as described above, must also complete the following requirements:

1. A minimum of 127 hours.
2. The SAGES Engineering Core Curriculum, with the exception of ENGR 200, ENGR 210 and ENGR 225.
3. The requirements for the computer science major as presented in this bulletin.

SAGES ENGINEERING CORE CURRICULUM OF THE CASE SCHOOL OF ENGINEERING

The SAGES Engineering Core curriculum of the Case School of Engineering provides a foundation in mathematics and sciences for programs in engineering and in computer science leading to the Bachelor of Science degree. The Engineering Core Curriculum is also designed to develop communication skills and to provide a body of work in the humanities and social sciences.

SAGES is an innovative undergraduate experience designed to establish foundations for academic inquiry. Students fulfill their Case School of Engineering General Education Requirements with a sequence of specially developed seminars and selected courses. Course credit earned by Advanced Placement, National Baccalaureate, proficiency examination, and transfer may be used to satisfy general education requirements.

SAGES Program Seminars (13 semester hours)

The First Seminar* (4 semester hours, to be taken in the first semester of enrollment)

The First Seminar focuses on the development of critical thinking and communication skills through the use of a variety of approaches, media, and perspectives to explore the human mind and the nature of inquiry. This course is designed to strengthen writing and analytical skills while building a foundation in ethics, information literacy, and cultural diversity. Select from:

First Seminar: The Life of the Mind (FSCC 100) or First Seminar: Natural World (FSNA 1xx) or First Seminar: Social World (FSSY 1xx) or First Seminar: Symbolic World (FSSY 1xx)

*Transfer Students only: Transfer students who have completed the English composition/expository writing requirement with a grade of C or higher at the college/university at which they previously matriculated will receive transfer credit for FSCC T100 (3 – 6 semester hours) and will be required to complete a supplemental 1-semester hour SAGES introductory seminar – FSTS 100.

University Seminars (6 semester hours, minimum of two seminars, to be completed in the first two years of enrollment as specified below)

After completion of the First Seminar, students must complete two University Seminars, with each seminar selected from a different thematic group and from a thematic group different from that of the student’s First Seminar. Each University Seminar explores one of three themes, with the content determined according to the interests of the faculty. University Seminars provide continued experience in critical reading, writing, and oral communication as well as information literacy, ethics, and cultural diversity. Select from:

- University Seminar: Thinking About the Natural World (USNY 2xx)
- University Seminar: Thinking About the Social World (USSO 2xx)
- University Seminar: Thinking About the Symbolic World (USSS 2xx)

Department Seminar (3 semester hours)
The Department Seminar includes seminar-based discussion as well as instruction and ex-
Breadth Requirements–Humanities and Social Sciences
(15 semester hours)
ENGL 398 (2 semester hours) and ENGR 398 (1 semester hour) and at least 12 semester hours comprised of four 3-semester hour courses or three 4-semester hour courses selected from:

- Humanities: Arabic (ARAB), Art History (ARTH), Art Studio (ARTS), Chinese (CHIN), Classics (CLSC), Dance (DANC), English (ENGL), French (FRCH), German (GRMN), Greek (GREQ), Hebrew (HBRW), History (HSTY), Italian (ITAL), Japanese (JAPN), Latin (LATN), Music: General (MUGN), Music: History (MUHI), Music: Theory (MUTH), Philosophy (PHIL), Portuguese (PORT), Religion (RLGN), Russian (RUSN), Spanish (SPAN), Theater (THTR), World Literature (WLTI)

and/or

- Social Sciences: Anthropology (ANTH), Cognitive Science (COGS), Communication Sciences (COSI), Economics (ECON), Political Science (POSC), Psychology (PSCL), Sociology (SOCI)

SAGES Senior Capstone
(3 – 6 semester hours)
The Senior Capstone assimilates the knowledge and skills gained throughout the educational process. Students engage in a unique one or two semester experience designed in consultation with a faculty advisor. Each Senior Capstone must include key elements:

a) Demonstration of critical thinking and writing skills;
b) Regular oversight by the Capstone advisor;
c) Periodic reporting of progress;
d) Regular writing (e.g., drafts, progress reports, critiques) throughout the project including a final written report which may be a thesis or equivalent document associated with the project or activity (e.g., such pursuits as performance, experiment, live case analysis, or creative writing), as approved by the department of capstone origin;
e) Oral reports including a final public presentation at the Senior Capstone Fair, a conference, a performance, a public lecture, a teaching presentation, or other, as approved by the department of capstone origin.

Courses meeting this requirement include the designation “Approved SAGES Capstone” in their course descriptions. Some majors include and specify a senior capstone.

BACHELOR OF SCIENCE IN NURSING DEGREE

(Frances Payne Bolton School of Nursing)
Candidates for the Bachelor of Science in Nursing (B.S.N.) degree, in addition to meeting the general requirements for bachelor’s degrees as described above, must also complete the following requirements:

1. A minimum of 124 hours
2. The SAGES General Education Requirements for the School of Nursing
3. The requirements for the major in nursing as presented in this bulletin
4. For all courses taken in nursing and science, a minimum grade of C

SAGES GENERAL EDUCATION REQUIREMENTS OF THE FRANCES PAYNE BOLTON SCHOOL OF NURSING

The SAGES General Education Requirements of the Frances Payne Bolton School of Nursing are based upon the SAGES General Education Requirements of the College of Arts and Sciences, and provide a broad educational foundation for the Bachelor of Science in Nursing program.

SAGES is an innovative undergraduate experience designed to establish foundations for academic inquiry. Students fulfill their Frances Payne Bolton School of Nursing General Education Requirements with a sequence of specially developed seminars and selected courses. Course credit earned by Advanced Placement, International Baccalaureate, proficiency examinations, and transfer may be used to satisfy general education requirements.

SAGES Program Seminars
(13 semester hours)
The First Seminar
(4 semester hours, to be taken in the first semester of enrollment)
The First Seminar focuses on the development of critical thinking and communication skills through the use of a variety of approaches, media, and perspectives to explore the human mind and the nature of inquiry. This course is designed to strengthen writing and analytical skills while building a foundation in ethics, information literacy, and cultural diversity. Select from:

First Seminar: The Life of the Mind (FSCC 100) or First Seminar: Natural World (FSNA 1xx) or First Seminar: Social World (FSWO 1xx) or First Seminar: Symbolic World (FSST 1xx)

*Transfer Students only: Transfer students who
have completed the English composition/expository writing requirement with a grade of C or higher at the college/university at which they previously matriculated will receive transfer credit for FSCC T100 (3 – 6 semester hours) and will be required to complete a supplemental 1-semester hour SAGES introductory seminar – FSTS 100.

University Seminars

(6 semester hours, minimum of two seminars, to be completed in the first two years of enrollment as specified below)

After completion of the First Seminar, students must complete two University Seminars, with each seminar selected from a different thematic group and from a thematic group different from that of the student’s First Seminar. Each University Seminar explores one of three themes, with the content determined according to the interests of the faculty. University Seminars provide continued experience in critical reading, writing, and oral communication as well as information literacy, ethics, and cultural diversity. Select from:

University Seminar: Thinking About the Natural World (USNA 2xx); University Seminar: Thinking About the Social World (USSO 2xx); University Seminar: Thinking About the Symbolic World (USSY 2xx)

Department Seminar

(3 semester hours)

The Department Seminar includes seminar-based discussion as well as instruction and experience in the kinds of writing characteristic of the Department Seminar’s discipline. The Department Seminar may be taken in the department of the student’s major or in another department. A course used to fulfill the Department Seminar Requirement may not also be used to fulfill a Breadth Requirement.

University Composition Requirement

Students develop a Writing Portfolio comprised of final graded writing assignments from the First Seminar and University Seminars. The Writing Portfolio is submitted for evaluation after completing the final University seminar. Writing competence must be established in order to fulfill the university’s English Composition requirement for graduation.

Physical Education

(Must total 2 full semesters at zero credits)

Students choose from half- and full-semester course offerings to be completed in the first year.

Breadth Requirements

(at least 30 semester hours – minimum of ten 3 or 4-semester hour courses)

NOTE: Two courses used to fulfill requirements for the major also may be used to fulfill the breadth requirements.

Arts and Humanities

(6 – 8 semester hours)

Two 3- or 4-semester hour Arts and Humanities courses. Select from:

Arabic (ARAB), Art History (ARTH), Art Studio (ARTS), Chinese (CHIN), Classics (CLSC), Dance (DANC), English (ENGL), French (FRCH), German (GRMN), Greek (GREK), Hebrew (HBRW), History (HSTY), Italian (ITAL), Japanese (JAPN), Latin (LATN), Music - General (MUGN), Music - History (MUHI), Music - Theory (MUTH), Philosophy (PHIL), Portuguese (PORT), Religion (RLGN), Russian (RUSN), Spanish (SPAN), Theater (THTR), World Literature (WLIT)

Natural and Mathematical Sciences

(18 semester hours)

(a) Mathematical Reasoning and Analysis (3 semester hours)

ANTH 319 or PSCI 282 or STAT 201

A student who successfully completes any one of these courses is not eligible to enroll in or receive credit for either of the other two.

(b) Natural Sciences (15 semester hours)

BIOL 114, BIOL 116, BIOL 117, BIOL 119, BIOL 121

Social Sciences

(6 semester hours)

(a) SOCI 203 or approved course in human growth and development

(b) Any other 3-semester hour Social Science course. Select from:

Anthropology (ANTH), Cognitive Science (COGS), Communication Sciences (COSI), Economics (ECON), Political Science (POSC), Psychology (PSCL), Sociology (SOCI).

SAGES Senior Capstone

(3 – 6 semester hours)

The Senior Capstone assimilates the knowledge and skills gained throughout the educational process. Students engage in a unique one or two semester experience designed in consultation with a faculty member. Each Senior Capstone must include key elements:

a) Demonstration of critical thinking and writing skills;

b) Regular oversight by the Capstone advisor;

c) Periodic reporting of progress;

d) Regular writing (e.g. drafts, progress reports, critiques) throughout the project including a final written report which may be a thesis or equivalent document associated with the project or activity (e.g., such pursuits as performance, experiment, live case analysis, or creative writing), as approved by the department of capstone origin; and

e) Oral reports including a final public presentation at the Senior Capstone Fair, a conference, a performance, a public lecture, a teaching presentation, or other, as approved by the department of capstone origin.

Courses meeting this requirement include the designation “Approved SAGES Capstone” in their course descriptions. Some majors include and specify a senior capstone.

BACHELOR OF SCIENCE DEGREE

(Weatherhead School of Management)

Candidates for the Bachelor of Science in Accounting and the Bachelor of Science in Management degrees, in addition to meeting the general requirements for bachelor’s degrees as described above, must also complete the following requirements:

1. A minimum of 122 hours.

2. The Weatherhead School of Management SAGES General Education Requirements.

3. A minimum of 30 semester hours of courses at the 300-400 level.

4. The requirements for a major field as presented in this bulletin in the section devoted to each department or program. For all courses taken in the major department and for which grades are averaged, and for all courses taken to satisfy major requirements and for which grades are averaged, a candidate for a B.S. from the Weatherhead School of Management must earn a minimum cumulative average of 2.000. Major requirements include all required and elective work completed in the major department combined with required courses completed in related fields. Transfer students must complete at Case Western Reserve University at least half the hours required for the major.

Bachelor of Science degrees conferred by the Weatherhead School of Management are offered in the following fields:

• Accounting

• Management
SAGES GENERAL EDUCATION REQUIREMENTS OF THE WEATHERHEAD SCHOOL OF MANAGEMENT

The SAGES General Education Requirements of the Weatherhead School of Management are based upon the SAGES General Education Requirements of the College of Arts and Science, and provide a broad educational foundation for programs in accounting and management, leading to the Bachelor of Science degree.

SAGES is an innovative undergraduate experience designed to establish foundations for academic inquiry. Students fulfill their Weatherhead School of Management General Education Requirements with a sequence of specially developed seminars and selected courses. Course credit earned by Advanced Placement, International Baccalaureate, proficiency examinations, and transfer may be used to satisfy general education requirements.

SAGES Program Seminars
(13 semester hours)

The First Seminar (4 semester hours, to be taken in the first semester of enrollment)
The First Seminar focuses on the development of critical thinking and communication skills through the use of a variety of approaches, media, and perspectives to explore the human mind and the nature of inquiry. This course is designed to strengthen writing and analytical skills while building a foundation in ethics, information literacy, and cultural diversity. Select from:

First Seminar: The Life of the Mind (FSCC 100)
First Seminar: Natural World (FSNA 1xx)
First Seminar: Symbolic World (FSSY 1xx)

*Transfer Students only: Transfer students who have completed the English composition/expository writing requirement with a grade of C or higher at the college/university at which they previously matriculated will receive transfer credit for FSCC T100 (3 – 6 semester hours) and will be required to complete a supplemental 1-semester hour SAGES introductory seminar – FSTS 100.

University Seminars
(6 semester hours, minimum of two seminars, to be completed in the first two years of enrollment as specified below) After completion of the First Seminar, students must complete two University Seminars, with each seminar selected from a different thematic group and from a thematic group different from that of the student’s First Seminar. Each University Seminar explores one of three themes, with the content determined according to the interests of the faculty. University Seminars provide continued experience in critical reading, writing, and oral communication as well as information literacy, ethics, and cultural diversity. Select from:

University Seminar: Thinking About the Natural World (USNA 2xx)
University Seminar: Thinking About the Symbolic World (USSY 2xx)

Department Seminar
(3 semester hours)
The Department Seminar includes seminar-based discussion as well as instruction and experience in the kinds of writing characteristic of the Department Seminar’s discipline. The Department Seminar may be taken in the department of the student’s major or in another department. A course used to fulfill the Department Seminar Requirement may not also be used to fulfill a Breadth Requirement.

University Composition Requirement
Students develop a Writing Portfolio comprised of final graded writing assignments from the First Seminar and University Seminars. The Writing Portfolio is submitted for evaluation after completing the final University seminar. Writing competence must be established in order to fulfill the University’s English Composition requirement for graduation.

Physical Education
(Must total 2 full semesters at zero credits)
Students choose from half-semester and full-semester course offerings to be completed in the first year.

Breadth Requirements
(at least 27 semester hours – minimum of nine 3 or 4-semester hour courses)
NOTE: Two courses used to fulfill requirements for the major also may be used to fulfill the breadth requirements.

Arts and Humanities
(6 – 8 semester hours)
Two 3- or 4-semester hour Arts and Humanities courses. Select from:

Arabic (ARAB), Art History (ARTH), Art Studio (ARTS), Chinese (CHIN), Classics (CLSC), Dance (DANC), English (ENGL), French (FRCH), German (GRMN), Greek (GREK), Hebrew (HBRW), History (HSTY), Italian (ITAL), Japanese (JAPN), Latin (LATN), Music - General (MUGN), Music - History (MUH), Music - Theory (MUTH), Philosophy (PHIL), Portuguese (PORT), Religion (RLGN), Russian (RUSN), Spanish (SPAN), Theater (THTR), World Literature (WLIT)

Natural and Mathematical Sciences
(17 semester hours)
MATH 125, MATH 126, STAT 207
Any two 3- or 4-semester hour Natural Science courses. Select from:

Astronomy (ASTR), Biochemistry (BIOC), Biology (BIOL), Chemistry (CHEM), Geology (GEOL), Nutrition (NTRN), Physics (PHYS)

Social Sciences
(6 semester hours)
Management majors:
Any two 3-hour Social Science courses except ECON 102*, ECON 103*, or ECON 326**. Select from:

Anthropology (ANTH), Cognitive Science (COGS), Communication Sciences (COSI), Economics (ECON), Political Science (POSC), Psychology (PSCL), Sociology (SOCI)

Accounting majors
COSI 200 or COSI 280, and any 3-semester hour Social Science course except ECON 102* or ECON 103*. Select from:

Anthropology (ANTH), Cognitive Science (COGS), Communication Sciences (COSI), Economics (ECON), Political Science (POSC), Psychology (PSCL), Sociology (SOCI)

**ECON 102 and 103 are included in Accounting and Management major requirements.

**ECON 326 is a Management major requirement.

SAGES Senior Capstone
(3 – 6 semester hours)
The Senior Capstone assimilates the knowledge and skills gained throughout the educational process. Students engage in a unique one or two semester experience designed in consultation with a faculty member. Each Senior Capstone must include key elements:

a) Demonstration of critical thinking and writing skills;
b) Regular oversight by the Capstone advisor;
c) Periodic reporting of progress;
d) Regular writing (e.g. drafts, progress re-
ports, critiques) throughout the project including a final written report which may be a thesis or equivalent document associated with the project or activity (e.g., such pursuits as performance, experiment, live case analysis, or creative writing), as approved by the department of capstone origin; and e) Oral reports including a final public presentation at the Senior Capstone Fair, a conference, a performance, a public lecture, a teaching presentation, or other, as approved by the department of capstone origin.

Courses meeting this requirement include the designation “Approved SAGES Capstone” in their course descriptions. Some majors include and specify a senior capstone.

DUAL UNDERGRADUATE DEGREE PROGRAMS

To qualify for two undergraduate degrees, i.e., a B.A. and a B.S. degree, or two B.S. degrees, a student must satisfy all requirements for each degree, and complete for the second degree thirty semester hours of study beyond the hours required for the first degree. A student may, however, complete two or more Arts and Sciences majors within the 120 hour minimum requirement for the B.A. degree; or two or more Engineering majors within the 128-133 hour minimum requirement for the B.S. in Engineering degree. Students completing both a B.A. and a B.S. degree are exempted from six hours of the 90 hour arts and sciences requirement for the B.A. A student pursuing two degrees is encouraged to meet with a dean in the Office of Undergraduate Studies, 357 Sears Bldg., to discuss requirements. Students who seek a dual-degree program that involves the B.M. must meet Cleveland Institute of Music and Case Western Reserve admission requirements, and seek approval of both the Cleveland Institute of Music and Case Western Reserve University.

MINORS

For the degrees described above, minors are not required. However, students have the option of completing a minor in a discipline other than the major. A minor concentration normally requires 15-18 semester hours and will be indicated on a student’s transcript if the requirements, as outlined below, are fulfilled:

1. A minor program shall consist of no fewer than 15 and no more than 18 semester hours of specified course work.
2. The responsibility for designating the requirements for a minor shall lie with the department offering the minor.
3. With the exception of minors offered by the Case School of Engineering, students must earn a minimum cumulative average of 2.000 for all courses taken to satisfy minor requirements and for which grades are averaged. Transfer students who wish to complete a minor must complete at Case Western Reserve University at least half the requirements for the minor.

Minor Concentrations

- Accounting
- American Studies
- Anthropology
- Art History
- Art Studio (Art Studio/Photography)
- Artificial Intelligence
- Asian Studies
- Astronomy
- Banking and Finance
- Biochemistry
- Biology
- Biomedical Engineering*
- Chemical Engineering*
- Chemistry
- Childhood Studies
- Chinese
- Civil Engineering*
- Classics
- Cognitive Science
- Communication Sciences
- Computer Engineering*
- Computer Gaming*
- Computer Science (for B.A.)
- Computer Science (for B.S.)*
- Dance
- Economics
- Electrical Engineering*
- Electronics (for B.A.)
- English
- Entrepreneurial Studies
- Environmental Studies
- Ethnic Studies
- Evolutionary Biology
- Film
- French
- French and Francophone Studies
- Geological Sciences
- German
- German Studies
- Gerontological Studies
- Health Communication
- History
- History and Philosophy of Science
- History of Technology and Science
- Italian
- Japanese
- Judaic Studies
- Management Information and Decision Systems
- Marketing
- Materials Science and Engineering*
- Mathematics
- Music
- Natural Sciences
- Nutrition
- Philosophy
- Physics
- Political Science
- Polymer Science and Engineering*
- Pre-Architecture
- Psychology
- Public Policy
- Religious Studies
- Russian
- Sociology
- Spanish
- Sports Medicine
- Statistics
- Systems and Control Engineering*
- Theater Arts
- Women’s and Gender Studies
- World Literature

*minor based on SAGES Engineering Core

EXPERIENTIAL LEARNING

Inside and outside the classroom, Case Western Reserve University offers undergraduates a variety of experiences that are built on a process of guided inquiry, preparation, action and reflection. Many research, internship, and employment opportunities are aligned with academic programs. Linguistic and cultural immersion characterize the study abroad experience. Courses that incorporate community service or internships into the curriculum forge links between Case Western Reserve undergraduates and schools, neighborhoods, businesses, and governmental and health care institutions in Cleveland and elsewhere.

COURSE-BASED EXPERIENTIAL LEARNING

In disciplines as diverse as psychology, journalism, engineering, Spanish, Russian, nursing, anthropology, history, and biology, Case Western Reserve students engage in experiential learning beyond the on-campus classrooms and laboratories. Experiences that form the basis for reflection and synthesis under the guidance of faculty include working with hospitalized children, designing engineering solutions for a problem presented by a municipal-
THE COLLEGE SCHOLARS PROGRAM

The College Scholars Program, instituted in 1997, is a two-year academic enhancement program open to undergraduates interested in forming a community of learners dedicated both to excellence in individual intellectual pursuits and applying classroom learning to larger world concerns. The program emphasizes broad interdisciplinary learning beyond the requirements of professional or disciplinary competence, connection of academic learning to the larger society, and development of a sense of the relationship between service and leadership. College scholars collaborate with faculty in the design, operation, and evaluation of the curriculum. The program takes up the equivalent of one course for each of four semesters.

ARSC 201. Introduction to College Scholars I (3)
First course for students already admitted to the College Scholars Program. Principles and practice of leadership, learning styles, ethical decision making, group dynamics, and communication skills.

ARSC 301. College Scholars Colloquia I (3)
Students in the second year of the College Scholars Program, in conjunction with CSP faculty, select topics for interdisciplinary study, construct curricula, and invite visiting speakers.

ARSC 302. College Scholars Colloquia II (3)
Continuation of ARSC 301. Multidisciplinary study of selected topics.

ARSC 397. CSP Senior Project I (3)
Year-long independent study project under the guidance of CSP faculty. In the first semester, preproposals are approved and funded and work commences. In the second semester, work is completed and at year end a public presentation of results is made.

International Experience
Qualified students may participate in programs of study or practical experience that immerse them in the culture and language of another country. Up to 36 semester hours of credit may be granted for study as an exchange student at an established foreign university with which Case Western Reserve has an exchange program.

GLOBAL ENGINEERING EXCHANGE PROGRAM (GE3)

The Global Engineering Education Exchange (GE3) program enables qualified engineering and computer science students to receive up to 36 semester hours of academic credit for courses taken at selected engineering institutions and universities in Europe, Asia, Mexico, and Australia, and to have an internship experience in a foreign setting. The program is administered by the Institute for International Education in collaboration with an international consortium of universities that offer engineering that includes Case Western Reserve. Students participating in exchange programs pay tuition to Case Western Reserve University and maintain their student status during the period of the exchange. Information about the GE3 program is available from the study abroad advisor in the Office of Undergraduate Studies.

BILATERAL EXCHANGE PROGRAMS

Case Western Reserve University has bilateral exchange agreements enabling students from overseas institutions to attend the University as visiting students and permitting Case Western Reserve undergraduates to receive academic credit for study at the following institutions:

- University of Lancaster, UK (all majors)
- University of Manchester, UK (humanities, social sciences)
- University of Sheffield, UK (all majors)
- University of Sydney, Australia (management, accounting, economics, sociology, political science)
- ESC de Montpellier, France (management, accounting)
- University of Frankfurt, Germany (management, accounting)
- Universidad Carlos III, Spain (management, economics)
- Bilkent University, Turkey (all majors)
- National Cheng Kung University, Taiwan (all majors)
- National University of Singapore (all majors)
- Chulalongkorn University, Thailand (engineering)

Case Western Reserve undergraduates participating in exchange programs pay tuition to Case Western Reserve University and maintain their student status during the period of the exchange. Information about bilateral exchange programs with other overseas universities is available from the study abroad advisor in the Office of Undergraduate Studies.

STUDY ABROAD

Full-time undergraduate students who have earned a 3,000 grade point average at the university are eligible to apply for study abroad. Up to 36 semester hours of credit may be granted for study at an established foreign university or for approved foreign study programs offered through accredited American universities. The selection of location and institution for study abroad is made in consultation with the study abroad advisor in the Office of Undergraduate Studies, and must be approved by the Office of Undergraduate Studies and the student's major advisor. Students participating in study abroad pay tuition to Case Western Reserve University and maintain their student status during the period of study abroad. Financial aid may be applied to study abroad.

In recent years, Case Western Reserve University undergraduates have studied in Argentina, Australia, Austria, Chile, Denmark, England, Finland, France, Germany, Ghana, India, Ireland, Israel, Italy, Japan, Kenya, Nepal, the Netherlands, New Zealand, Russia, Scotland, Senegal, South Africa, Spain and Sweden.

UNDERGRADUATE COURSES

Some Case Western Reserve courses for undergraduates incorporate short-term overseas experience into the curriculum. Students are encouraged to seek such opportunities by contacting academic departments of interest.

RESEARCH EXPERIENCE

Independent Study and Honors
Most departments offer courses in independent study to their qualified majors. These are advanced level courses and require departmental approval. Students pursuing research under the guidance of a faculty member may register for “Undergraduate Research” and receive degree credit. A number of majors offer outstanding upperclass students the opportunity to follow an honors program by pursuing independent research and special study in seminars. Those who qualify receive the bachelor’s degree with honors in the majors.

Undergraduate Research
SOURCE: Support of Undergraduate Research & Creative Endeavors
Research experience enables students to start from a base of established knowledge to for-
Cooperative Education (Co-op) is a formal program for one-time community service projects. Study tutoring; and schedules Days of Service coordinates on-going volunteer and work-based courses and SAGES capstone projects; assists faculty and students in designing and implementing community-SERVES projects; assists faculty and students acquire positions in various organizations and gain a better understanding of career objectives and academic goals.

Co-op assignments are full-time work experiences that alternate with course work. Students are encouraged to complete two seven-month co-op periods, consisting of a summer and contiguous spring or fall semester. Employers prefer seven month assignments as the duration allows students to become involved with challenging projects related to their field of study. While the co-op experience is voluntary and non-credit, it may lead to credit for engineering senior projects with approval from the student’s major department.

Students are eligible to co-op after their second year, although schedules vary among departments. Binary and transfer students must complete at least one semester of course work at the university prior to admission to the Co-op Program. The Co-op Program does not involve any additional course work, but merely rearranges the academic course load. One faculty member in each participating department serves as the co-op advisor and provides details regarding the optimal semesters for students to be on co-op assignment.

More than 450 employers throughout the United States have expressed interest in participating in the Co-op Program and offer challenging assignments that can lead to offers for permanent employment upon graduation. Generally, organizations pay co-op students approximately two-thirds of the starting salary of a new graduate. In addition to the financial compensation that students receive while on co-op assignment, students often benefit from the higher starting salaries and greater lifetime earnings that can result from the experience acquired from co-op assignments.

Prior to obtaining a co-op position, students are assisted with identifying organizations of interest, designing a professional resume, and refining interviewing skills. The Co-op Program staff will arrange interviews for students with a variety of organizations.

A student who secures a co-op assignment must register for the non-credit Cooperative Education course which will appear on the student’s academic transcript. Registration for Co-op maintains the student’s full-time student status. During the period of the co-op assignment, repayment of student loans is deferred. Academic scholarships are also deferred until the student returns to campus and enrolls for classes. Students begin the co-op process by attending a Co-op Orientation meeting which provides an explanation of the co-op process and necessary paperwork regarding registration, financial aid, housing, and health services. The Co-op Program is housed in the Case School of Engineering and is accredited by the Accreditation Council for Cooperative Education.

PROFESSIONAL PRACTICUM
Practicum is an experiential learning collaboration between a student, an employer, and the student’s practicum advisor (a faculty member), which is coordinated by the Career Center’s Experiential Learning Specialist. The program is open to undergraduate students enrolled in the College of Arts and Sciences and/or the Weatherhead School of Management. The primary goal of a practicum is the intellectual, personal and professional growth of the student. In order to ensure that this goal is achieved, the involved collaborators establish and agree upon learning objectives prior to the start of the practicum. These objectives are reviewed throughout the semester, and the student’s progress is evaluated at both the mid-point and end of the practicum.

While completing a practicum assignment, a student works full-time for a minimum of 14 weeks in a professional setting and does not take classes. The student will maintain full-time student status during the practicum period. Though credit is not awarded, students who successfully complete the practicum assignment will receive transcript notation. A student may participate in up to two practica, but it is recommended that at least one intervening semester be spent on campus. Students interested in participating in a practicum should contact the Career Center a semester prior to the intended practicum assignment.

Washington Center Program
Students receive credit for interning in Washington, D.C., through the Washington Center Program. The emphasis is on practical ex-
experience in the form of a full-time internship which provides the opportunity for intensive research.

For participating in a semester-length program during the fall and spring semester, students receive nine credit hours for their internship course (WASH 002A). For a summer internship, students receive three credit hours (WASH 002D). In addition, students receive three credit hours for developing a portfolio based on their internship experiences (WASH 002B). Also, as part of the Washington Center program, students participate in a seminar and attend a weekly lecture/discussion group (WASH 002C). The credits earned can be counted as general electives or applied to a student’s major or minor, with the prior consent of the individual departments.

WASH 2A. Washington Center Internship (9)
Credit for semester-length internship experience taken as part of the Washington Center Program during Fall or Spring terms.

WASH 2B. Washington Center - Politics and Public Policy Course (3)
Credit for the Politics and Public Policy course taken as part of the Washington Center Program.

WASH 2C. Washington Center - Portfolio (3)
Credit for the student’s portfolio taken as part of the Washington Center Program.

WASH 2D. Washington Center Summer Internship (3)
Credit for semester-length internship experience taken as part of the Washington Center Program during Summer term.

COLLABORATIVE PROGRAMS WITH OTHER COLLEGES

The Binary (3+2) Program in Engineering
The Binary (3+2) Program allows outstanding students to begin their studies at a liberal arts college/university for three years and pursue an engineering degree at Case Western Reserve University for two years. Students graduate with a baccalaureate degree from their first college along with a Bachelor of Science in Engineering from Case Western Reserve University. The combination of the liberal arts education comprised of mathematics, science, humanities, and social sciences, followed by a professional orientation in engineering, provides the binary student with a unique set of skills for their professional career.

In the first three years, students are to fulfill the required mathematics, science, humanities, and social science courses that are comparable to courses at Case.

Students must maintain a 3.000 overall grade point average and a 3.000 in mathematics and science at their liberal arts college. Binary students generally complete 90 semester hours or 135 quarter hours at their college prior to matriculating at Case. Binary applications are to be submitted during the student’s third year. Binary students enter Case as third-year engineering students.

PREPARATION AND ADVISING
At each partner college, a faculty member is designated as the advisor for the Binary Program. Students are encouraged in their first year to meet with the advisor to plan a three-year curriculum that provides a seamless transition to Case Western Reserve University.

At Case, one faculty member in each engineering department serves as the liaison for the students in the major they have selected. These faculty will guide the students in the selection of the courses needed to complete an engineering degree at Case. The Office of Undergraduate Studies reviews and approves all transfer credits from the liberal arts college.

The Binary Program is coordinated through the Office of Engineering Student Programs (OESP) housed in the Dean’s Office of the Case School of Engineering. In addition to the major department of study, the OESP will serve as the “home” for the students and assist them with scholarships and financial aid, experiential opportunities, extra-curricular involvement, and any other areas of interest as the binary students transition to Case.

ACADEMIC GUIDELINES
Coursework taken at the liberal arts college should include the following:

2. Physics: Courses equivalent to one and one half years of physics: PHYS 121, 122 – General Physics I - Mechanics, General Physics II – Electricity & Magnetism with laboratories.
4. Computer Programming: Course(s) covering elementary computer programming with a laboratory for the development of programming skills in Java (ENGR 131 – Elementary Computer Programming).
5. Natural Science: Mathematics or Statistics courses as designated by major department.
6. Humanities and Social Sciences: Must complete at least 21 semester hours of humanities and social science courses.
7. English: Must complete English courses with college level writing proficiency.
8. Physical Education: Complete all physical education requirements at the liberal arts college.

Students may complete courses in one of the basic engineering science areas that will provide background to their studies at Case Western Reserve University. These courses should have the approval of the faculty liaison both at the liberal arts college/university and Case.

For additional information on the Binary Program and the various curricula, please review the website at www.oesp.case.edu/binary

Binary partnerships exist with the following colleges and universities:

1. Albion College, Albion, Michigan
2. Allegheny College, Meadville, Pennsylvania
3. Baldwin-Wallace College, Berea, Ohio
4. Bates College, Lewiston, Maine
5. Bethany College, Bethany, West Virginia
6. Capital University, Columbus, Ohio
7. Centenary College, of Louisiana Shreveport, Louisiana
8. Clarion University, Clarion, Pennsylvania
9. College of Charleston, Charleston, South Carolina
10. College of Wooster, Wooster, Ohio
11. Dickinson College, Carlisle, Pennsylvania
12. Duquesne University, Pittsburgh, Pennsylvania
13. Kenyon College, Gambier, Ohio
14. Lebanon Valley College, Annville, Pennsylvania
15. Marietta College, Marietta, Ohio
16. Miami University, Oxford, Ohio
17. Monmouth College, Monmouth, Illinois
18. Muskingum College, New Concord, Ohio
19. Notre Dame College, South Euclid, Ohio
20. Oberlin College, Oberlin, Ohio
21. Ohio Wesleyan University, Delaware, Ohio
22. Otterbein College, Westerville, Ohio
23. State University of New York, Brockport, New York
24. State University of New York, Cortland, New York
Cross Registration in Northeast Ohio

If approved by the Office of Undergraduate Studies, full-time undergraduates in good academic standing may cross-register at Baldwin-Wallace College, Chanceller University, the Cleveland Institute of Art, the Cleveland Institute of Music, Cleveland State University, Cuyahoga Community College, Hiram College, John Carroll University, Lake Erie College, Lakeland Community College, Lorain County Community College, Notre Dame College of Ohio, and Ursuline College for one course per semester. Approval is normally limited to courses that are not offered at Case Western Reserve University. To cross-register at the Cleveland Institute of Art, a student must have permission from the university’s director of art studios.

Fisk University Exchange Program

An exchange program between Fisk University and Case Western Reserve University enables up to four Case Western Reserve students to spend a semester as visiting students at Fisk each year. Up to four Fisk students may spend a semester at Case Western Reserve each year. Fisk University was founded in 1866 as the first integrated, coeducational school in the United States, and, at its founding, focused on providing a quality liberal arts education to the children of former slaves. Fisk University has a distinguished history as a liberal arts institution. Fisk University was the first historically black college to have chapters of the Phi Beta Kappa and Mortar Board national honorary societies.

Case Western Reserve students who participate in the Case Western Reserve-Fisk Exchange pay tuition to Case Western Reserve University, pay the Fisk room and board fees, and maintain their student status during the period of the exchange. Information about the exchange program is available from the exchange advisor in the Office of Undergraduate Studies.

Joint Program in Art Education

The joint program in art education of Case Western Reserve University and the Cleveland Institute of Art (CIA) enrolls students pursuing the B.S. in Art Education, combining studio art courses at the Cleveland Institute of Art with liberal arts and education courses at Case Western Reserve University. Admission to the program requires application to Case Western Reserve University and presentation of an art portfolio to the Cleveland Institute of Art; credentials must be acceptable to both institutions. For program details, see the section on Art Education in this Bulletin and in the Handbook for Undergraduate Students.

Joint Program in Music

All programs in music are conducted jointly by Case Western Reserve University and the Cleveland Institute of Music, and provide the intimacy and specialization of a professional conservatory, together with the resources of a comprehensive university. Students pursuing a major in music or music education take music theory and lessons at the Cleveland Institute of Music, and take music history and other liberal arts and music education courses at Case Western Reserve University. Students pursuing the B.A. with a major in music, or the B.S. in Music Education apply to and enroll in Case Western Reserve University, while students seeking the B.M. degree apply to and enroll in the Cleveland Institute of Music. For program details, see the Department of Music section in this Bulletin and in the Handbook for Undergraduate Students.

Joint Program in Teacher Licensure

Ohio teacher licensure may be attained by those undergraduate students who complete the approved curriculum of the Case Western Reserve University/John Carroll University Joint Program in Teacher Licensure. Adolescence/Young Adult Teacher Licensure (grades 7-12) is available in Integrated Language Arts (English major), Integrated Social Studies (history major), Integrated Mathematics (mathematics major), Life Sciences (biology major), and Physical Sciences (chemistry or physics major). Multi-age licensure is available in French, Latin, and Spanish. The program requires 35 credit hours in professional education: 12 taken at Case Western Reserve University and 23 taken at John Carroll University. For program details, see section on Education in this Bulletin and in the Handbook for Undergraduate Students.

The undergraduate/graduate programs in art education and music education meet the requirements for teacher licensure, grades pre-K-12. For further information, see departmental information in this bulletin for art history and art, music, and communication sciences.

Reserve Officer Training Corps (ROTC)

Reserve Officer Training Corps (ROTC) programs are available to Case Western Reserve University students through cooperative arrangements with Kent State University for Air Force ROTC and with John Carroll University for Army ROTC. Each of these universities offers military studies, leadership and training courses. Participating students may seek transfer credit at Case Western Reserve for these courses, and may be exempted from the undergraduate physical education requirement. Students who are not recipients of ROTC scholarships may enroll in the first and second year ROTC courses without incurring any military obligation. University students enrolling in ROTC programs are eligible to compete for ROTC scholarships awarded by the Air Force or the Army. See section on Financial Aid for scholarship information.

Air Force ROTC

The Air Force Reserve Officer Training Corps (AFROTC) program provided by Kent State University prepares students for service as officers in the United States Air Force. Through courses in history, management, and leadership, and through practical training, students acquire leadership and management skills, and learn about Air Force career opportunities, the role of the military in American society, the history of air power, and national defense policy.

An agreement between Case Western Reserve University and Kent State University allows full-time Case Western Reserve students to complete aerospace studies courses. The courses are held at Kent State University, which is approximately 35 miles from Case Western Reserve, and are usually scheduled on one or two afternoons during the week. This arrangement allows Case Western Reserve students to participate in either the four- or two-year AFROTC program. Students wanting to enter the two-year program in the junior year must contact the professor of aerospace studies before March of the year before their planned entry.

Air Force ROTC scholarships are available on a competitive basis. Information about courses, registration, and scholarships may be obtained from the Air Force ROTC DET 630, 104 Terrace Hall Annex, Kent State University, Kent, Ohio 44242; telephone: 330-672-2181.

Army ROTC

The Army ROTC program is designed to prepare young college men and women for service as a commissioned Army officer in either the
active duty U.S. Army or the reserve components of the Army Reserve or National Guard. Classes and practical training focus on military skills, officer professionalism, leadership training, and the development of military-related officer and management techniques and procedures.

Students may enroll in Army ROTC classes through cross-registration in the Department of Military Science at John Carroll University, which is approximately five miles from Case Western Reserve. Military science classes are taught at John Carroll University, with some activities also taking place at Cleveland State University or at Case Western Reserve. Army ROTC scholarships are available on a competitive basis. Information about courses, registration, and scholarships may be obtained from the Department of Military Science (ARMY-ROTC), John Carroll University, University Heights, OH 44118-4581; telephone: 216-397-4421

ACADEMIC ADVISING

Academic advising is an important component of the educational program at Case Western Reserve University. Academic advisors assist students in the exploration of academic opportunities at the university and in the selection of courses. Advisors may refer students to other sources of information and assistance at Case Western Reserve. Students are expected to initiate and maintain regular contact with their advisors to address the student’s curricular and career concerns, and to review progress towards graduation. Students are expected to meet with advisors when declaring a major or minor, before registering for classes, and when making corrections to their academic requirements reports.

First Year Advisors

During a student's first year at Case Western Reserve University, the faculty member instructing the student’s SAGES First Seminar serves as the student’s academic advisor. Students and their advisors are expected to explore the student’s academic interests or concerns, as well as educational and career goals, and to seek expert information and advice about academic policies and procedures and about specific academic programs from the Handbook for Undergraduate Students, from newsletters and websites, from the academic department representatives designated as first year resources, and from other sources of advice and counseling on campus. Staff in the Office of Undergraduate Studies, the University Career Center, Educational Services for Students, the Office of Multicultural Affairs, the University Counseling Service, and in specialized programs such as Co-op (cooperative education), SOURCE (research and creative projects), and the Center for Civic Engagement and Learning (community service) are available to support first year students and their advisors with publications, workshops, websites, experiential learning opportunities, and individual communications.

Selection of Majors and Minors; Departmental Advisors

Although some first year undergraduates enter with definite goals, they are not assigned to departmental advisors until they have declared their major. Opportunities for exploration of majors and minors during the first and second semesters include a Choices Fair, departmental information sessions, and individual conversations with faculty and academic advisors. First year students who are ready to declare a major in their first year may do so beginning in November.

Students engaging in further exploration of majors are expected to declare a major no later than the end of the second year. When a student selects a specific major or minor, the department representative assigns a faculty advisor. A choice or change of major or minor is not recorded for any student until the major or minor declaration form, bearing the signature of the student, the name of the advisor, and the signature of the department representative, has been completed and returned to the Office of Undergraduate Studies, 357 Sears Bldg.

After the first year, students who have not declared a major should consult their assigned advisor (noted in their online student information) or the academic representative of an academic department of interest for advice and schedule approval.

Advising in the Office of Undergraduate Studies

The deans and advisors in the Office of Undergraduate Studies are available to answer student and faculty questions about university rules, practices, programs, and resources and to meet with students who are interested in study abroad, accelerated undergraduate to graduate and professional school programs, academic awards, and fellowship and scholarship opportunities. All students who have not declared a major should consult with their first year advisor or with one of the advisors in the Office of Undergraduate Studies for advising and schedule approval. Students with interests in health professions and/or law school are encouraged to seek advice from the pre-health professions advisors and the pre-law advisor in the Office of Undergraduate Studies.

ACADEMIC REGULATIONS

All academic regulations governing undergraduates are administered by the Office of Undergraduate Studies. Academic regulations are subject to change by action of the Faculty Senate Committee on Undergraduate Education and the various committees responsible for the oversight of curriculum and academic standing. For the latest information consult the Handbook for Undergraduate Students.

When circumstances so warrant, a student may submit to the Office of Undergraduate Studies a petition requesting an exception a specific regulation.

ACADEMIC INTEGRITY POLICY

Students, faculty, and administrators share responsibility for the determination and preservation of standards of academic integrity. They must not only adhere to their own personal codes of integrity but also be prepared to educate others about the importance of academic integrity, to take reasonable precaution to discourage violations of academic integrity, and to adjudicate violations.

For students, education about the importance of academic integrity begins during the admissions process. The centrality of integrity to the academic enterprise is reinforced during new student orientation when students engage in discussion about academic integrity. Specific mention of academic integrity and course-specific guidelines should be presented in all classes. Programs and instruction about academic integrity guidelines are offered throughout the students’ undergraduate career.

Faculty and students are expected to uphold standards of academic integrity by taking reasonable precaution in the academic arena. Reasonable precaution involves implementing measures that reduce the opportunities for academic misconduct but do not inhibit inquiry, create disruption or distraction in the testing environment, or create an atmosphere of mistrust.

The vitality of academic integrity is dependent
upon the willingness of community members to confront instances of suspected wrongdoing. Faculty have specific responsibility to address suspected or reported violations as indicated below. All other members of the academic community are expected to report directly and confidentially their suspicion of violation to a faculty member or a dean or to approach suspected violators and to remind them of their obligation to uphold standards of academic integrity.

Definition of Violations
All forms of academic dishonesty including cheating, plagiarism, misrepresentation, and obstruction are violations of academic integrity standards. Cheating includes copying from another’s work, falsifying problem solutions or laboratory reports, or using unauthorized sources, notes or computer programs. Plagiarism includes the presentation, without proper attribution, of another’s words or ideas from printed or electronic sources. It is also plagiarism to submit, without the instructor’s consent, an assignment in one class previously submitted in another. Misrepresentation includes forgery of official academic documents, the presentation of altered or falsified documents or testimony to a university office or official, taking an exam for another student, or lying about personal circumstances to postpone tests or assignments. Obstruction occurs when a student engages in unreasonable conduct that interferes with another’s ability to conduct scholarly activity. Destroying a student’s computer file, stealing a student’s notebook, and stealing a book on reserve in the library are examples of obstruction.

Discussing, Reporting, and Adjudicating Violations
If a faculty member suspects that an undergraduate student has violated academic integrity standards, the faculty member shall advise the student and the department chair and consult with an Undergraduate Studies dean about the appropriate course of action. Before speaking with the student, the faculty member also may choose to consult with the chair or dean about academic integrity standards. If the faculty member, in consultation with the dean, determines that the evidence is not adequate to charge the student with a violation, the matter will be dropped. Otherwise, the following procedures will be followed:

First Violations
If the faculty member and the student agree that a violation has occurred and the violation is determined to be a first violation (the university has no record of previous violations by the student of the university’s Standards of Conduct), the faculty member shall choose either to sanction the student or to refer the case to the academic integrity board. If the faculty member chooses to sanction the student, the minimum sanction is failure in the work in question and the maximum sanction is failure in the course. The faculty member will be provided with a standard reporting form to be signed by both the student and faculty member.

However, the case will be referred to the director of judicial affairs for integrity board action if:
1. the student claims not to have violated academic integrity standards or the student disagrees with the sanction imposed by the professor; and
2. the faculty member feels that the seriousness of the first offense warrants presentation to the academic integrity board; or the faculty member, after consultation with the dean, prefers to have the academic integrity board investigate or adjudicate the alleged violation, or prefers that the board sanction the student.

The signed report form from a faculty member or the finding of responsibility by the academic integrity board will become part of the student’s university judicial file. Students found responsible for a first violation will be required, in addition to any other sanctions imposed, to attend an ethics education program or to complete an ethics exercise as assigned by the dean of undergraduate studies or the director of judicial affairs.

Subsequent Violations
If the university judicial file indicates that the student suspected of a violation has been responsible for one or more previous violations of the university’s Standards of Conduct, the case will be referred to the director of judicial affairs for Academic Integrity Board Action.

Misrepresentation and Obstruction
Reports of suspected academic misrepresentation or obstruction occurring in settings other than the classroom will be referred to the director of judicial affairs for Academic Integrity Board Action.

Academic Integrity Board

If a suspected or known violation of academic integrity standards warrants consideration by the Academic Integrity Board, the director of judicial affairs will convene the board. The board will be composed of three students (voting members) appointed by the Undergraduate Student Government, two faculty (voting members) appointed from a list of faculty members annually identified by the Office of Student Affairs as willing to serve and approved by the Executive Committee of the Faculty Senate and two administrators (non-voting members). One administrator will be a dean from the Office of Undergraduate Studies. The other administrator, the associate vice president from the Office of Student Affairs or his or her designee, will chair the board. All members of the board may question witnesses. Academic Integrity Board Procedure, the vote required for the determination of responsibility, and the evidence standard will be the same as those for the University Judicial Board.

Should the board find the student not responsible for a suspected violation, the faculty member and the student will be so informed. The faculty member will be asked to evaluate the student’s performance in the assignment in question and to issue a grade based on his or her normal grading practices.

If the board finds a student responsible for a violation of academic integrity standards, the board will notify the student and the faculty member. The board can sanction violations by issuing failure in the work in question, failure in the course, university disciplinary warning, university disciplinary probation, university disciplinary suspension, or expulsion.

In cases in which the Academic Integrity Board finds a student responsible for a second or subsequent violation, the minimum sanction will be failure in the course; the maximum penalty will be expulsion.

If the Academic Integrity Board finds a student responsible for misrepresentation or obstruction, the minimum sanction will be university disciplinary probation; the maximum penalty will be expulsion.

Violations Reported after Voluntary Withdrawal or Academic Separation
Suspected violations of academic integrity standards reported after a student voluntarily withdraws or is academically separated will be investigated and adjudicated. A student who withdraws or is academically separated during
the investigation and adjudication of a suspected violation may be asked to appear at a hearing or, if the student fails to appear, have his or her case heard in absentia. If the student is found responsible for a violation, sanctions can be imposed.

Violations Reported after Graduation
In the event that a suspected violation of academic integrity standards is reported after graduation, the director of judicial affairs will make a determination as to the feasibility of investigation and adjudication. Graduation will not preempt investigation or adjudication of a suspected violation when those processes are feasible. If a student is found responsible for a violation and the sanction imposed makes the student ineligible to earn his or her degree, the degree may be revoked.

Maintenance of Records
Violations of academic integrity standards are considered violations of the university’s Standards of Conduct and will be recorded in the student’s judicial record. University judicial files are maintained by the director of judicial affairs in the Office of Student Affairs.

APPLICATION FOR GRADUATION
A student who has completed all graduation requirements in fewer than four years has the choice of graduating early or deferring graduation in order to graduate with his or her class. A student who completes all graduation requirements in four years or more must graduate at that time.

In addition, the student must file an on-line application for the degree through the Student Information System by October 15 for January graduation, by January 15 for May graduation, and by June 15 for August graduation; and the student must have discharged all financial obligations to Case Western Reserve University.

ATTENDANCE
Students are expected to attend classes regularly. Each instructor is free to determine the extent to which absences affect the final grades of students but should make the policy regarding attendance known at the start of the course. Instructors should report excessive absences to the Office of Undergraduate Studies. Instructors who judge a student’s absences to class to be excessive may drop the student from the course with a grade of F. Instructors taking such action must notify the student’s dean in writing.

Mathematics courses which duplicate work taken earlier in high school or in another institution. First year undergraduates who have questions regarding their eligibility to receive credit for foreign language or mathematics courses should see the assistant dean for first year students in the Office of Undergraduate Studies.

COURSE REPETITION
Students have the opportunity to retake a course in which they have received an evaluative grade (A, B, C, D, or F) in order to improve their performance. When a course is repeated, the first grade will remain visible on the transcript, but will be removed from the calculation of the cumulative grade point average and the grade point average for the semester in which the course was first taken. The new grade will then be used for calculation of the cumulative grade point average and the grade point average for the semester in which it was earned, regardless of whether the new grade is higher or lower than the first grade. The student’s transcript will show the comment “GRADE NOT COUNTED. COURSE REPEATED” directly below the original grade. However, if the first attempt of the course resulted in a passing grade, but the second attempt results in a failing grade, then the original grade will remain, both grades will be included in the grade point average calculation, and the student will continue to earn credit for the first attempt. Similarly, if a student withdraws from a course that is being repeated, the original grade will stand. Course repetition may be exercised according to the following conditions:

1. A student may not use the Pass/No Pass Option on a course that is being repeated.
2. An academic action that occurred under the earlier grade is neither reversed nor removed from the record as a result of a change in the semester or cumulative averages that results from the repetition of one or more courses.
3. All grades earned at Case Western Reserve University, including those grades removed as a result of the application of the course repeat policy, will be applied to the Scholarship GPA that is reviewed in order to determine Case Western Reserve University merit-based scholarship retention.
4. The course repeat option may not be exercised after a degree has been awarded.

CAUTION: Students who are the recipients of any form of federal financial aid (grants,
loans, work study, etc.) and repeat a course that previously earned a passing grade must enroll for a minimum of 12 credits for which credit had not been earned previously.

CREDIT BY EXAMINATION

Advanced Placement/International Baccalaureate Examinations

Students may earn degree credit on the basis of advanced examinations taken while in secondary school. Examinations eligible for credit and/or advanced placement include, but are not limited to College Board Advanced Placement Examinations and International Baccalaureate Higher Level Examinations. Determination of the criteria for granting credit and/or placement is made by the appropriate department. In assigning credit or granting advanced placement for credentials from outside the United States, the university is guided by the placement recommendations and grade equivalencies approved by the National Council on the Evaluation of Foreign Educational Credentials.

Proficiency Examinations

Departments within each academic unit offering undergraduate programs may choose to offer students the opportunity to earn course credit in specific courses by proficiency examination. To qualify for proficiency examination credit for a course, the student’s examination performance must demonstrate knowledge and skills at a level no lower than that of an average student who successfully completes the course. Upon notification from the academic department, the Office of Undergraduate Studies will direct the Office of the Registrar to post credit for the course on the transcript. The grade will be recorded as PR, and will not be included in a student’s grade point average.

NOTE: Any student who receives proficiency credit for a course through a proficiency examination administered during a semester when the student is not registered for a full-time schedule (12 or more semester hours) at Case Western Reserve University is charged a fee equal to one-third of the present tuition charge for the course. No fee is charged if the student does not receive credit from the examination.

FINAL EXAMINATIONS

Final examinations normally are required in all courses and must be given during the final examination period at the time assigned by the Registrar; they may not be given during the final week of classes or on Reading Days. Any exception must be approved by the dean of undergraduate studies.

No student will be required to take more than two final examinations on a single day. A student who has three final examinations scheduled for a single day should go to the Office of Undergraduate Studies and obtain the assistance of the dean in arranging to take one of those examinations on an alternative day during the final examination period. Similarly, a student with conflicting examinations should seek the assistance of the dean of undergraduate studies in arranging to have the time of one examination changed.

A student must explain immediately and in writing to the dean of undergraduate studies an absence from a final examination. If the explanation is acceptable, the dean will authorize the assignment of the grade Incomplete and the administration of a make-up examination by the instructor. In the event of an unexcused absence from a final examination, the instructor should assign the student a final grade that assumes a grade of zero on the final examination and is consistent with the grading policy established for the course.

GRADING SYSTEM

See section on Registration.

ASSIGNMENT OF THE INCOMPLETE GRADE

The Incomplete grade (I) is assigned by and at the discretion of the instructor when: a) there are extenuating circumstances, explained to the instructor before the assignment of the grade, which clearly justify an extension of time beyond the requirements established for and met by other students in the class, and b) the student has been passing the course and only a small segment of the course, such as a term paper, remains to be completed. It is the student’s responsibility to notify the instructor of the circumstances preventing completion of all assigned work. In the absence of notification or adequate justification the instructor has the authority to assign the student a final grade that assumes a failing grade for the missing work. An Incomplete grade should not be assigned when: a) a student has been absent for much of the semester and/or has done little of the work required for a course, or b) because a student is absent from a final examination, unless the dean of undergradu-
ing and who are currently enrolled in 12 or more hours.
3. The Pass/No Pass Option can be exercised for only one course during any semester.
4. The Pass/No Pass Option cannot be used for courses being taken for satisfaction of Engineering Core or General Education Requirements.
5. The Pass/No Pass Option cannot be used for courses taken for the satisfaction of requirements of a major or minor concentration.
6. The Pass/No Pass Option cannot be used for courses that are being repeated.
7. Courses which are graded on a Pass/No Pass basis (e.g. PHED 055A) do not preclude the student's use of the Pass/No Pass Option in another course taken that same term.
8. Instructors are not notified of a student's use of this option. They are required to submit evaluative grades for all students and these are converted to Pass/No Pass in the Registrar's Office. The meaning of the P and NP will be noted on the transcript.
9. Once a course is completed under the Pass/No Pass Option, the student CANNOT reverse the Pass/No Pass grade in order to reveal and have posted the actual letter grade earned, or use the course for a purpose for which the use of a Pass/No Pass is prohibited.

NOTE: Students majoring in any Weatherhead School of Management major may not use the P/NP option for any Weatherhead School of Management courses, either required or elective. (ACCT, BAFI, BLAW, ENPT, LHRP, MGMT, MIDS, MKMR, OPMT, ORBH, OPRE, PLCY).

PETITIONS

Students may request exceptions to university rules and curricular requirements by petition to the Office of Undergraduate Studies. Please be reminded that a lack of knowledge of regulations that are published in the University General Bulletin, the Schedule of Courses, or the Handbook for Undergraduate Studies is not justification for an exception. Petition forms are available in the Office of Undergraduate Studies, 357 Sears Bldg. Petitions are referred to the the appropriate committee of the Faculty Senate Committee on Undergraduate Education.

PROFICIENCY EXAMINATIONS

See Credit by Examination, above.

PROMOTION

The standards for promotion are:
- To the sophomore class, 27 hours completed
- To the junior class, 60 hours completed
- To the senior class, 90 hours completed

READING DAYS

Prior to and/or during the final examination period two weekdays are set aside as Reading Days to be used by students for completing assignments and preparing for final examinations. In the fall semester there will be one reading day on Monday of the first exam week and one reading day on Friday of the first exam week. In the spring semester, the two days prior to the beginning of the final exam period are set aside as reading days. These days are not to be used by faculty for scheduling examinations or other course activities that require the attendance of students. They may be used by faculty to schedule review sessions for which attendance is optional.

READMISSION AFTER SEPARATION

See section on Academic Standing

RE-ENROLLMENT AFTER VOLUNTARY WITHDRAWAL

Students who have voluntarily withdrawn from the university and have not taken courses elsewhere following their withdrawal may re-enroll in any semester. Students who have taken courses elsewhere following withdrawal must provide official transcripts of their work with their request for re-enrollment. Upon re-enrollment following a voluntary withdrawal, students retain the hours earned and quality points for courses completed prior to withdrawal. In the first semester of re-enrollment, their academic status is the status in effect at the time of withdrawal, unless that status is changed by action of the Committee on Academic Standing.

TRANSFER CREDIT

Students may receive credit by transfer from another accredited college, university, or technological institute in the United States or from institutions of higher education outside the United States.

At the time of admission to Case Western Reserve University and upon presentation of an official transcript from each institution previously attended, credit will be awarded for courses equivalent or comparable to those offered by the university and completed with a grade of C or better. Any such courses taken prior to the student’s graduation from high school must be listed in the college's catalog among courses offered for degree credit to the college's undergraduates, taken in the company of matriculated college students, and organized and taught by college faculty. In addition, to be considered for transfer credit, such courses must not have been used to fulfill high school graduation requirements. The allocation of transfer credit is determined by the Office of Undergraduate Studies in consultation with the appropriate department.

After matriculation in the university, undergraduates are permitted to earn a maximum of 15 semester hours as transient students at other accredited institutions during the summer. Advance approval from the Office of Undergraduate Studies is required. Credit earned elsewhere after matriculation is not applied toward the 60 hour minimum required in residence.

Credit is not awarded for work done at an unaccredited institution in the United States except by proficiency examination in those departments of Case Western Reserve University offering that opportunity. The award of transfer credit for work done at institutions outside the United States is subject to departmental evaluation and to the recommendations of the National Council on the Evaluation of Foreign Credentials.

A student dismissed for poor scholarship from any institution cannot receive credit for courses taken in the first two sessions after dismissal without permission of the dean of undergraduate studies.

Grades for courses taken at other institutions will not be entered on the student's record nor will they be computed in the student's grade point average.

WITHDRAWAL FROM A COURSE

The First Undergraduate Year:

For the first two semesters of enrollment and after consultation with a dean in the Office of Undergraduate Studies, matriculated students who are beginning their college studies may withdraw from a course at any time during the semester, but no later than the last day of classes. Any course for which a grade of W is assigned will not be posted on the official transcript. This policy is not available for
A student is eligible for separation without a period of separation if they have earned a semester grade point average of 2.000 or higher and have attained the incomplete courses with grades that justify their retention before they will be allowed to continue in the colleges.

Ineligible to Register
Students will be declared “ineligible to register” when they have Incomplete grades which if averaged as F make them eligible for separation. Such students will be required to finish the incomplete courses with grades that justify their retention before they will be allowed to continue in the colleges.

Restoration To Good Standing
Students will be restored to Good Standing at the end of their semester of academic probation if they have earned a semester grade point average of 2.000 or higher and have attained the 2000 cumulative grade point average and cumulative hours that are required for good standing (see above).

Readmission
Students separated for reasons of scholarship may petition for readmission after two regular sessions have elapsed. In determining the period of separation, summer session is considered a regular session. Students readmitted
after being separated for reasons of academic performance will retain earned credit only for those courses passed with a grade of C or better. Readmitted students do not retain quality points earned before separation, and the cumulative grade point average subsequent to readmission will be computed solely on the basis of work completed following readmission. Students readmitted after being separated must thereafter maintain good academic standing. A readmitted student who performs below the level required for good standing will be eligible for permanent separation from the university. Students separated for reasons of academic performance may not offer for transfer credit work taken elsewhere during the two sessions after their dismissal unless such work has been specifically approved in advance by the Office of Undergraduate Studies.

**PROGRAMS ALLOWING ACCELERATION TOWARD PROFESSIONAL DEGREES**

**Senior Year in Professional Studies at Case Western Reserve University**

Students of outstanding ability and attainment who are candidates for the B.A. and who are admitted to professional studies in Case Western Reserve University by the end of the junior year are offered an opportunity to shorten their entire course of studies by one year through the Senior Year in Professional Studies privilege. Application should be made during the second semester of the junior year through the dean of undergraduate studies. This privilege is extended to qualified students who are candidates for the B.A. and who attend the School of Dental Medicine, the School of Medicine, the Frances Payne Bolton School of Nursing, or the Mandel School of Applied Social Sciences of Case Western Reserve University.

A student granted the senior year in professional studies privilege is permitted to substitute the work of the first year in a professional school for that required during the last year in the undergraduate college. Upon the satisfactory completion of the first year’s work in the professional school, the student will be granted the bachelor’s degree from the College of Arts and Sciences. To be eligible for the senior year in professional studies privilege, a student must:

1. Be accepted for admission to professional studies in Case Western Reserve University by the end of the junior year.

2. Meet the following degree requirements:
   a. Completion of the SAGES General Education Requirements of the College of Arts and Sciences and two semesters of physical education, unless excused from the latter.
   b. Completion of three-fourths of the courses required for the major, including three-fourths of the courses required in the major department.
   c. Completion of 84 hours of arts and sciences courses. These credits may be drawn from those offered by the College of Arts and Sciences as well as those in economics, biochemistry, nutrition, or computer science.
   d. Completion of at least 90 semester hours of academic credit, of which the final 60 hours must have been in residence. A student may include in that final 60 hours no more than six semester hours earned in courses completed in other institutions, either by cross registration in regular sessions or by approved transient registration in summer sessions. (Note: Students applying for the Senior Year in Professional Studies in the School of Medicine will generally be expected to have completed at least 117 hours towards the B.A. degree.)

Upon admission to the program, students register in the professional school to which they have been admitted and are subject to the policies, rules and regulations of the professional school. They may, however, continue to receive merit-based undergraduate scholarships and may continue to reside in undergraduate housing during what would normally be their senior year of undergraduate work.

For information, contact the Office of Undergraduate Studies, 357 Sears Bldg., 216-368-2928, e-mail: ugstudies@case.edu.

**Senior Year in Absentia Privilege for Students of Medicine and Dentistry**

Students of outstanding ability and attainment who are candidates for the B.A. and who are offered admission to a medical or dental school other than those at Case Western Reserve University at the end of the junior year are eligible for an opportunity to shorten their entire course of studies by one year through the Senior Year in absentia privilege. Application for this privilege should be made during the second semester of the junior year through the dean of undergraduate studies.

A student granted the Senior Year in absentia privilege is permitted to substitute the work of the first year in a professional school for that required during the last year in the undergraduate college. Upon the satisfactory completion of the first year’s work in the professional school, the student will be granted the B.A. and B.S. from the College of Arts and Sciences. The privilege is extended to qualified students who attend medical schools in the United States or Canada approved by the Association of American Medical Colleges or dental schools in the United States approved by the American Association of Dental Schools.

To be eligible for the Senior Year in absentia privilege, a student must:

1. Attain a cumulative grade point average of at least 3.200 in all courses attempted from the date of admission as an undergraduate.

2. Meet the following degree requirements:
   a. Completion of the Arts and Sciences SAGES General Education Requirements and two semesters of physical education, unless excused from the latter.
   b. Completion of three-fourths of the required courses for the major, including three-fourths of the courses required in the major department.
   c. Completion of 84 hours of arts and sciences courses. These credits may be drawn from those offered by the College of Arts and Sciences as well as those in economics, biochemistry, nutrition, or computer science.
   d. Completion of at least 90 semester hours of academic credit, of which the final 60 hours must have been in residence. A student may include in that final 60 hours no more than six semester hours earned in courses completed in other institutions, either by cross registration in regular sessions or by approved transient registration in summer sessions.

For information, contact the Office of Undergraduate Studies, 357 Sears Bldg., 216-368-2928, e-mail: ugstudies@case.edu.

**For Candidates for the B.S. in Accounting**

There are two programs that integrate graduate and undergraduate work in accounting. These programs are strongly recommended...
for those individuals planning to become certified accounting professionals, particularly as CPAs (Certified Public Accountants).

**Joint B.S. in Accounting/Master of Accountancy (M.Acc.)**

Students who are candidates for the B.S. in accountancy and who wish to earn a master’s degree in accountancy may apply to the B.S./M.Acc. program. Students in the program enroll during the senior year in six hours of M.Acc. courses that will serve toward satisfaction of both the B.S. and M.Acc. degree requirements. Before taking graduate course work, the student must have completed all prerequisites for the course on the undergraduate level and have a “B” average in those prerequisites. Following completion of the B.S., students in the program will enroll in the Weatherhead School of Management to complete an additional 30 hours of courses to satisfy M.Acc. degree requirements. For information, see Professor Larry Parker, 459 Peter B. Lewis Building, 216-368-2065, e-mail: larry.parker@case.edu.

**Accelerated B.S. in Accounting/ Master of Accountancy (M.Acc.) Program**

This program allows motivated students to accelerate their pursuit of both the B.S. and M.Acc. degrees. In addition to applying six credit hours of Weatherhead graduate course work towards their undergraduate degree program, students in this program may begin taking more graduate course work before completing all of their undergraduate degree requirements. To enroll in this program, students must have:

1. Completed 90 hours of undergraduate course work
2. Completed all of the undergraduate Weatherhead SAGES General Education Requirements
3. Completed 36 hours of the Weatherhead Management requirements (including 18 hours of the required Accountancy coursework)
4. Achieved at least a 3.000 overall grade point average. Students in this program will receive both the B.S. and the master’s degree at the end of the program. For the first eight semesters of study, the student will register as an undergraduate in Case Western Reserve University; thereafter, students will register in the graduate professional degree program in the Weatherhead School of Management. For information, see Professor Larry Parker, 459 Peter B. Lewis Building, 216-368-2065, e-mail: larry.parker@case.edu.

**PROGRAMS ALLOWING ACCELERATION TOWARD GRADUATE STUDY**

**Integrated Graduate Studies Program**

The Integrated Graduate Studies Program (IGS) is intended for highly motivated undergraduate students who are candidates for the B.A. and whose objective is a degree at the master’s or doctoral level. Qualified students may be admitted to graduate study for their senior year and pursue the simultaneous completion of requirements for both the master’s and bachelor’s degrees. The baccalaureate will normally be awarded upon completion of the requirements for both degrees, unless a student satisfies all B.A. requirements prior to completing the master’s degree requirements. Students in the IGS Program are exempted from the 42-hour restriction imposed on B.A. candidates for work above the 100-level in a single department. However, the exemption is granted only upon completion of the master’s degree requirements.

Eligibility requirements for participation in the Integrated Graduate Studies Program are:

1. 90 semester hours earned of which the last 60 hours must have been in residence at Case Western Reserve University
2. Completion of the SAGES General Education Requirements of the College of Arts and Sciences and two semesters of physical education; students who have fulfilled all SAGES General Education Requirements except the Senior Capstone will be required to complete the capstone during their first year in the IGS program
3. Completion of three quarters of the requirements for the major concentration, including three quarters of the courses required in the major department
4. Admission to a master’s or doctoral program offered through the School of Graduate Studies

Upon admission to the program, IGS students register as students in the School of Graduate Studies and are subject to the policies, rules and regulations of the School of Graduate Studies. They may, however, continue to receive merit-based undergraduate scholarships and may continue to reside in undergraduate housing during what would normally be their senior year of undergraduate work.

**For Candidates for the B.S. in Nutrition**

Integrated B.S./M.S. in Nutrition

Admission to the Integrated B.S./M.S. in Nutrition program is subject to the same process and requirements as admission to the Integrated Graduate Studies Program described above. Upon successful completion of the program, students earn the B.S. in Nutrition and the M.S. in Nutrition.

**For Candidates for the B.S. in Engineering, Computer Science, Mathematics, Natural Sciences and Statistics**

B.S./M.S. Program

The Integrated B.S./M.S. Program is intended for highly motivated candidates for the B.S. in engineering, computer science, mathematics, natural sciences, or statistics who wish to pursue an advanced degree. Application to the B.S./M.S. program must be made after completion of 75 semester hours of course work and prior to attaining senior status (completion of 90 semester hours). Generally, this means that a student will submit the application during his/her sixth semester of undergraduate course enrollment and will have no fewer than two semesters of remaining B.S. requirements to complete. Applicants in engineering or computer science should consult their departmental B.S./M.S. advisor in the Case School of Engineering. Applicants in mathematics, natural sciences, and statistics should consult the dean of undergraduate studies.

A student admitted to the program may, in the senior year, take up to nine hours of graduate courses (400 level and above) that will count towards both B.S. and M.S. requirements. The courses to be doubled-counted must be specified at the time of application. Any undergraduate course work that is to be applied to the M.S. must be beyond that used to satisfy B.S. degree requirements and must conform to university, school, and department. Students may petition to transfer graduate course work taken prior to application to the B.S./M.S. Program subject to the rules of the Graduate School.

Students for whom the master’s project or thesis is a continuation and development of the senior project should register for Exxx 651 Thesis (or the appropriate project course) during the senior year and are expected to complete all other courses for the B.S. before enrolling in further M.S. course work and thesis (con-
Dentistry. This program requires eight years:
in the Pre-Professional Scholars Program in
pursue careers in dentistry are offered places
well-qualified high school seniors who plan to
Pre-Professional Scholars Program in
368-2928, e-mail: prelaw@case.edu.
Jackson, pre-law advisor, 357 Sears Bldg., 216-
dividually with the pre-law advisor. For addi-
commitment will be honored upon suc-
ment of admission to the Case School of Law.
per year will be granted a conditional commit-
Admission Test (LSAT). Up to four students
Law is open to outstanding students who have
Th e Early Admission Decision Program in
undergraduates the opportunity to accelerate
successful completion of a program planned in-
blanced and committed entering fi rst year un-
The fi rst two years of the program are spent in
Six-Year Dental Program

The Pre-Professional Scholars Programs in medicine, dentistry, law, and social work grant
to a few outstanding, entering fi rst year un-
dergraduates conditional commitments of ad-
mission to the appropriate professional school at Case Western Reserve University. These
commitments are honored upon successful
completion of the requirements established
by each professional school. Students admitted
to these programs are relieved of much of the
anxiety and uncertainty associated with pre-
professional studies. Consequently, they
feel free to undertake challenging courses of
study and pursue a variety of interests as they
prepare for professional studies. Pre-Pro-
fessional Scholars are free to choose any of
the bachelor's degrees available in the university.
Participants who wish to change their career
goals or apply for admission to other profes-
sional schools are free to do so.

The Six-Year Dental Program gives exceptionally
able and committed entering fi rst year undergraduates the opportunity to accelerate
their undergraduate and professional studies.

The Early Admission Decision Program in Law is open to outstanding students who have
completed two years of undergraduate study in
the colleges and have taken the Law School
Admission Test (LSAT). Up to four students
per year will be granted a conditional commit-
ment of admission to the Case School of Law.
The commitment will be honored upon suc-
cessful completion of a program planned indi-
vidually with the pre-law advisor. For addi-
tional information, contact Professor JoAnne
Jackson, pre-law advisor, 357 Sears Bldg., 216-
368-2928, e-mail: prelaw@case.edu.

Pre-Professional Scholars Program in Dentistry
Each year, approximately 10 exceptionally
well-qualified high school seniors who plan to pursue careers in dentistry are offered places
in the Pre-Professional Scholars Program in
Dentistry. This program requires eight years:

four years of successful undergraduate study
and four years at the School of Dentistry.

Pre-Professional Scholars in Dentistry are free
to choose a major in an area of interest, but
must take the following courses to fulfill ad-
mission requirements of the School of Den-
tistry:

1. Chemistry: CHEM 105, 106, Principles of
Chemistry I, II; CHEM 113, Principles of
Chemistry Laboratory; CHEM 223, 224,
Introductory Organic Chemistry I, II; and
CHEM 233, 234, Introductory Organic
Chemistry Laboratory I, II

2. Biology: BIOL 214, Genes and Evolution;
BIOL 215, Cells and Proteins; and BIOL
216, Organisms and Ecosystems; and the
associated laboratory courses

3. Mathematics: MATH 125, Calculus I
Physics I, II

They are required to take the Dental Admis-
sion Test in the junior year and achieve an
acceptable level of performance on the test.

Successful progress through the program and
admission to dental studies will be based on
the pre-professional scholar's continuing to
fulfill expectations for outstanding personal
and academic development and on the schol-
ar's achievement of cumulative grade point
average of 3.250 or higher for his or her work
overall, as well as for his or her work in the
required sciences. Successful progress in the
program will be determined individually and
reviewed at regular intervals during the stu-
dent's undergraduate career.

Pre-Professional Scholars in Dentistry who
wish to accelerate their program may apply for
the senior year in professional studies privi-
lege.

Six-Year Dental Program
Each year a few exceptionally well-qualified
high school seniors who plan to pursue careers
in dentistry are offered places in the Six-Year
Dental Program.

The fi rst two years of the program are spent in
undergraduate studies. Students are required
to earn a minimum of 60 semester hours.
They are required to take all of the science
and mathematics courses listed above for the
Pre-Professional Scholars Program in Den-
tistry. If Advanced Placement credit is used to
satisfy some of these science requirements, a
minimum of 30 semester hours in biology,
chemistry, physics, and mathematics must be
taken during the two years of undergraduate
study. Additionally, to meet general education
requirements, students must take one year of
physical education, First Seminar, two Uni-
versity Seminars, one course in the area of
Arts and Humanities, one course in the area of
Social Sciences, and a course in Global and
Cultural Diversity. To qualify for the place re-
served in the School of Dentistry, a student in
the program must achieve the following:

1. A cumulative grade point average of 3.250
or higher for all course work completed.
2. Grades of B or higher in the required cours-
es in biology, chemistry, physics, and math-
ematics.
3. An average score of 18 or higher on both
the academic and PAT portions of the Den-
tal Admission Test of the American Dental
Association. The test must be taken no later
than April of the second year.

Pre-Professional Scholars Program in Law
Each year, approximately twelve exceptionally
well-qualified high school seniors who plan to
pursue careers in law will be offered places in

Pre-Professional Scholars Program in Law at Case Western Reserve University. Pre-Pro-
essional Scholars receive a conditional com-
mmitment of admission to the Case Western
Reserve School of Law, to be honored upon
completion of the bachelor's degree at the
University.

The Pre-Professional Scholars in Law are en-
couraged to gain a wide cultural experience in
their undergraduate studies, to major in the
area that most interests them and to choose
courses in which they will learn habits of rigor
and logical analysis. The law school encourag-
es applications from all majors, including en-
gineering and the sciences. The School of Law
recommends that Pre-Professional Scholars in
Law take courses in accounting, economics,
history, and philosophy and that they gain as
much writing experience as possible, because
the ability to write effectively is critical to suc-
cess in law school and legal practice.

Students admitted to the Pre-Professional
Scholars Program in Law will be guaranteed
a seat in the School of Law upon graduation
from Case Western Reserve University if they
satisfy the following requirements:

1. Graduation from Case Western Reserve
University with rank in the top quarter of
the class.
2. Demonstration of good moral character
sufficient for admission to the bar of the State of Ohio.
3. Participation in the Law School Data Assembly Service and an LSAT score at or above the 65th percentile.

Pre-Professional Scholars Program in Medicine
Each year, approximately 25 exceptionally well-qualified high school seniors who plan to pursue careers in medicine are offered places in the Pre-Professional Scholars Program in Medicine. Pre-Professional Scholars receive a conditional commitment of admission to the University Program of the Case Western Reserve University School of Medicine to be honored upon successful progress toward and completion of the bachelor’s degree. The Pre-Professional Scholars Program in Medicine requires eight years: four years of successful undergraduate study leading to the bachelor’s degree followed by four years in the University Program of the School of Medicine.

Pre-Professional Scholars in Medicine are free to choose from among all of the degree and major programs offered in the university, but must take the following courses to fulfill admission requirements of the School of Medicine:

2. Biology: BIOL 214, Genes and Evolution; BIOL 215, Cells and Proteins; and BIOL 216, Organisms and Ecosystems; and the associated laboratory courses

*PPSP Medical students seeking admission at other medical schools are advised to take MATH 121/125 Calculus I and MATH 122/126 Calculus II as these courses are required by many medical schools.

Pre-Professional Scholars in Medicine are not required to take the Medical College Admission Test (MCAT) for the program. However, if they do take the MCAT, they are expected to earn a score of 32 or higher on the exam. Program participants who have an interest in applying to any other medical schools, or who wish to be considered for a dean’s merit scholarship at the Case Western Reserve School of Medicine, should plan on taking this test.

Pre-Professional Scholars are expected to demonstrate successful progress by meeting the following levels of performance:

1. By the end of the sixth semester, Pre-Professional Scholars in Medicine are expected to attain a cumulative overall grade point average of 3.600, and to maintain that average for the rest of their undergraduate studies.
2. Pre-Professional Scholars in Medicine are expected to earn grades of B or higher in all courses in chemistry, biology and physics. By the end of the sixth semester, they should maintain this average for the rest of their undergraduate studies.
3. Pre-Professional Scholars in Medicine are expected to continue to fulfill expectations for outstanding personal development, including, but not limited to, maintaining academic integrity and adhering to the university’s standards of conduct. (All academic integrity and judicial offenses will be reported to the Case School of Medicine.)

Progress is reviewed with each student at regular intervals in the program. At the end of the third year, Pre-Professional Scholars in Medicine who have met the required levels of performance go through the normal admission procedures for the University Program of the School of Medicine, including submitting an application through the American Medical College Application Service (AMCAS) and an interview. Participants who do not meet the required levels of performance may still be admitted into the University Program of the School of Medicine, but such admission will be subject to review and approval by the School of Medicine’s Admissions Committee.

Successful completion of the Pre-Professional Scholars Program in Medicine guarantees admission only to the University Program of the School of Medicine. Students seeking admission to the Cleveland Clinic Lerner College of Medicine of the Case Western Reserve University School of Medicine must complete a separate application and will be considered in competition with all applicants for that program.

Pre-Professional Scholars Program in Social Work
Each year, as many as ten high school seniors who plan to pursue careers in social work are offered places in the Pre-Professional Scholars Program in Social Work. The program gives a conditional commitment of admission to the Case Western Reserve University Mandel School of Applied Social Sciences to be honored upon successful completion of the bachelor’s degree.

Admission to the master’s degree program in social work at MSASS is dependent upon the following requirements:

1. Graduation from the university with a cumulative grade point average of 3.000 in the junior and senior years.
2. Completion of a minimum of 24 semester hours in the social and behavioral sciences.
3. Continued evidence of a combination of personal qualities which are considered essential for the professional practice of social work.

Pre-Professional Scholars in Social Work who wish to accelerate their program may apply for the senior year in professional studies privilege.

Application Procedures for Pre-Professional Scholars and Six-Year Dental Programs
Prospective students who wish to apply to any of the Pre-Professional Scholars Programs or to the Six-Year Dental Program should apply for admission through the Office of Undergraduate Admission of Case Western Reserve University. All forms are included within the application materials.

The application for admission, supporting test scores and high school transcript, must be submitted to the Office of Undergraduate Admission as early as possible, but no later than December 1.

Students who are admitted to the university and are also deemed eligible for consideration for one of the Pre-Professional Scholars Programs or the Six-Year Dental Program will be notified by March 1 and will be invited for interviews at the appropriate professional schools. The basis for selection for these programs will be dedication to the pursuit of the particular profession, a distinguished high school record, high scores on the college entrance examinations (ACT or SAT), a record of personal accomplishments that attests to a student’s maturity, leadership, and interpersonal skills, and an interview with an admissions officer from the appropriate professional school. Decisions on admission to the programs will be communicated on or about April 15.
Students who are not admitted to these special programs are encouraged to pursue their undergraduate studies and to apply in the normal course to the professional school of their choice, including the professional schools of Case Western Reserve University.

NON-DEGREE STUDENTS

Transient (Visiting) Students

A transient student is one who has begun his or her education at another college or university and intends to return there. The university permits full- or part-time study as a transient student in the summer as well as during the fall and spring semesters. Enrollment must be for credit-bearing courses. Before enrollment, the transient student must present a statement of good standing from the registrar of his or her home college.

Enrollment is limited to 30 semester hours and is subject to the regulations of the student’s college. Transient students must meet all requirements for prerequisites before being admitted to specific courses.

Transient students are not eligible to receive financial aid from Case Western Reserve University. If the student’s home institution has entered into a consortium agreement with Case Western Reserve University, the student should inquire of the home institution regarding eligibility to receive aid through the home institution.

Applications for enrollment as a transient student may be obtained from the Office of Undergraduate Studies, 357 Sears Building.

Pre-College Scholars

The Pre-College Scholars Program at Case Western Reserve University is designed to give highly motivated and able secondary school students the opportunity to enroll in challenging college courses prior to graduation from high school, either in the summer or during the academic year. Admission to the Pre-College Scholars Program is selective and competitive. Case has limited seats available for this program and preference is given to qualified juniors and seniors who have exhausted academic options at their high schools and who are looking for unique educational opportunities. Students must have pursued a rigorous curriculum and achieved academic excellence in all course work. Additional factors considered in admission are the applicant’s standardized test scores (ACT, PSAT, SAT, or other tests of aptitude and/or academic achievement), and the applicant’s academic goals and level of maturity. Pre-College Scholars attend regularly scheduled classes with undergraduate students at Case Western Reserve, and must be able to work well independently at the college level. Questions about the program should be directed to the Office of Undergraduate Studies at 216-368-2928.

Non-Degree Students

Adults who do not already hold a bachelor’s degree may apply through the Office of Undergraduate Studies to enroll for credit in courses for which their education or experience has qualified them, even though they are not pursuing a baccalaureate degree. These non-degree students may study full- or part-time and enroll in the same classes as degree students. They are required to perform up to the same academic standards as degree students.

Non-degree students may be eligible for admission to candidacy for an undergraduate degree program if they meet the requirements for admission to the university. Courses taken for credit as a non-degree student may be applied toward the degree upon acceptance as a degree candidate. A non-degree student who wishes to become a degree candidate must apply through the Office of Undergraduate Admission.

Persons who already hold degrees and wish to continue their studies without actively pursuing an additional degree are welcome to apply to the School of Graduate Studies.

Continuing Education

The university provides academic, non-credit courses for those who seek self-enrichment and professional advancement. Courses are presented both on and off campus. Special workshops and seminars are designed and presented by faculty and in cooperation with various community groups throughout the academic year. Examples of three such programs follow. Participants in these programs are considered students at the university and may obtain student ID cards which entitle them to use the University Libraries, receive a student discount at the bookstore, and take advantage of student rates at campus events. Part-time parking privileges in university assigned parking lots are also available.

Senior Scholars

This program is designed for men and women 50 years of age and older who seek non-credit, university-level courses and the intellectual stimulation provided by being on a college campus.

Three seminars are presented each semester. The majority are taught by university faculty and meet once a week for 11 consecutive weeks. Senior Scholars pay a single fee at the beginning of the academic year which entitles them to two semesters of specially designed seminars and forums. They may participate in all or any parts of the program they choose.

Registration for this program is handled by the Office of Continuing Education, 341 Sears Building, 216-368-2090.

SPECIAL AUDIT

The Special Audit Program provides the adult student with the opportunity to attend a regular university course as a serious but informal observer at half the regular tuition. This program is available only to those not enrolled in a degree program at Case Western Reserve University. Special audit students receive no grades and no academic credit for the courses attended. No transcripts will be issued, but a certificate of attendance will be provided if requested.

Registration for this program is handled by the Office of Undergraduate Studies. No transcripts are necessary to register.

ALUMNI/SENIOR AUDIT

The Alumni/Senior Audit is a program sponsored by the College of Arts and Sciences that enables Case Western Reserve University alumni of all ages and members of the community age sixty-five and older to audit regular College of Arts and Sciences classes for 10 percent of regular tuition. Audit enrollment is limited to ten percent of Case Western Reserve student enrollment and is subject to approval by the specific faculty teaching the course. Auditors do not receive a grade or credit. Courses taken through the audit do not appear on existing transcripts, nor do they generate transcripts for students new to the university. Complete information is available on the Alumni/Senior Audit website at: www.case.edu/artsci/audit/.

HONORS, PRIZES, AND AWARDS

Dean’s Honor Lists

The Dean’s Honor Lists consist of the names of those undergraduate students who have
distinguished themselves by achieving during the previous semester the grade point average required with a minimum of 12 hours earned and who have no Fs or NP's, during the same period. Students with a grade point average of 3.750 or higher will be placed on the Dean's High Honors List. Students with a grade point average of at least 3.500 but less than 3.750 will be placed on the Dean's Honors List. Students whose records include Incompletes become eligible for the Dean’s Honor Lists once all Incompletes have been converted to final grades.

Commencement Honors
Commencement Honors are awarded to the top 35 percent of the graduating class.

- Top 10 percent: summa cum laude
- Next 10 percent: magna cum laude
- Next 15 percent: cum laude

To be eligible for commencement honors, candidates must have:
1. Earned a minimum of 54 hours for evaluative grades (A, B, C, D) in residence at the university.
2. Attained the required percentile ranking on the basis of all work for which grades are averaged at the university.

Honors in the Major
Students who participate in departmental honors programs and satisfy the requirements for such a distinction, as specified by the department, may qualify to receive the degree "with departmental honors."

Phi Beta Kappa
Phi Beta Kappa, a national honor society, recognizes outstanding scholarship in the arts and sciences. The Alpha Chapter of Ohio, one of the first ten established nationally, was established in Western Reserve College in 1847. Students may qualify for election to membership in the second semester of the senior year. A few outstanding students may be elected to membership as juniors.

Tau Beta Pi
Tau Beta Pi is a national honor society which recognizes full-time engineering students for outstanding scholarship, leadership, and service.

Mortar Board
Mortar Board is a national honor society which recognizes full-time senior students for outstanding scholarship, leadership, and service.

Departmental and Collegiate Awards
At honors assemblies at the end of each spring semester, the university presents awards recognizing the outstanding achievement of individual students. The departmental awards are based on achievement in specific academic disciplines. Some of the departmental and collegiate awards are based on a combination of leadership, scholarship, and service. The collegiate awards for students with the best academic records take into account credit load, grades, and the proportion of courses taken for evaluative grades (i.e., not taken Pass/No Pass).

ACCOUNTANCY
- The Apple Growth Partners Scholarship Award
- The Beta Alpha Psi Award for excellence in accounting
- The Beta Alpha Psi Scholars Recognition Award for outstanding scholarship among members of the Pi Chapter
- The Andrew D. Braden Award for Excellence in Auditing and Financial Reporting
- The Cashy Family Scholarship Award
- The Cohen & Co./Beta Alpha Psi Leadership Award
- The Dean's Award for excellence and leadership in accountancy
- The Deloitte and Touche Award to an outstanding junior majoring in Accounting
- The Thomas Dickerson Award for Excellence in Professional Accountancy Studies
- The Ernst and Young Accounting Achievement Award
- The KPMG Peat Marwick Scholarship Award
- The Louis E. Levy Scholars in Accountancy
- The Ohio Society Cleveland Endowment Scholarship
- The PriceWaterhouseCoopers Scholarship Award
- The Skoda, Minotti & Company Award for an outstanding underclassman
- The Wallach-Lee Families Scholarship Award

ANTHROPOLOGY
- The Callender Memorial Award for outstanding achievement in anthropology
- The James Dysart Magee Award for the senior year to an outstanding student in social and behavioral sciences who is also enrolled in the Integrated Graduate Studies Program
- The Ruth and Newbell Niles Puckett Award to a graduating senior for outstanding achievement in anthropology

ART HISTORY
- The Muriel S. Butkin Art History Prize for overall best performance and highest grade point average by an undergraduate art history major
- The Noah L. Butkin Award for the best term paper on an art history topic written by an undergraduate

ART STUDIO
- The Charles E. Clemens Prize for outstanding talent and accomplishment in art
- The William Grauer Award for excellence in art studio courses
- The Doris Young Hartsock Prize for excellence in art education
- The Hazel Gibbs Herbrick Prize for excellence in art education
- The Kennedy Prize for creative work in art
- The Arnold Philip Award for excellence in art

ASTRONOMY
- The Jason J. Nassau Prize was established by the Cleveland Astronomical Society in 1965 in memory of Professor Emeritus Nassau, former head of the Department of Astronomy, who was a member of the faculty for 41 years. It is awarded annually to a senior student in astronomy selected by the faculty of the department.

BIOCHEMISTRY
- The Merton F. Utter Prize to a candidate for the B.A. majoring in biochemistry for outstanding achievement
- The Harland G. Wood Prize for outstanding performance by a graduating senior majoring in biochemistry who is a candidate for the B.S. in Biochemistry

BIOLOGY
- The Daniel Burke Prize for excellence in both biology and chemistry
- The Francis Hobart Herrick Prize for outstanding biological research and academic excellence in biology
- The Russell M. Lawall Prize in Biological Sciences for excellence in both academics and research in biology
- The Flora Stone Mather Alumnae Award for outstanding performance in biology
- The Merton F. Utter Prize to a candidate for the B.A. majoring in biochemistry for outstanding achievement
- The Harold G. Wood Prize for outstanding performance by a graduating senior majoring in biochemistry who is a candidate for the B.S. in Biochemistry

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- The Ralph A. Spengler, Jr. Award for excellence in plant science

- The J. Paul Visscher Memorial Award of the Cleveland Audubon Society to the senior or graduate student who demonstrates outstanding ability and promise in the field of ecology or environmental science

### BIOMEDICAL ENGINEERING

- The Jose Ricardo Alcala Memorial Award for biomedical engineering research

- The Mark Bernstein Memorial Award to a senior biomedical engineering major for outstanding achievement in academics and leadership, contributions to research, and service to the university, department or community

- The Biomedical Engineering Chair’s Award for outstanding academic achievement and service to the biomedical engineering community

- The Biomedical Engineering Faculty Award for outstanding academic achievement, achievement in sports, and service to the biomedical engineering community

- The Biomedical Engineering Research Award for outstanding performance in biomedical engineering research combined with outstanding academic achievement and outstanding achievement in sports

- The Biomedical Engineering Scholarship Award

- The Cristina A. Camardo Award to a biomedical engineering student in recognition of his or her leadership and service within the university community

- The Department of Biomedical Engineering Award for outstanding senior project presentation

- The J. Thomas Mortimer Cooperative Education Award

- Outstanding Industrial Experience Award

### CHEMICAL ENGINEERING

- The Monroe J. Bahnsen Award was established by contributions of friends and associates in memory of Dr. M. J. Bahnsen, Case School of Applied Science ‘29. It is awarded annually to a senior for achievement in chemical engineering whose work in design and research projects has been outstanding.

- The Connie Ilcin Award to the student who exhibits outstanding performance in chemical engineering

- The Carl F. Prutton Chemical Engineering Award was established by Kent H. Smith, ’17, Kelvin Smith, ’22, and Vincent K. Smith in honor of Carl F. Prutton, ’20, for many years head of the Department of Chemistry and Chemical Engineering and a consultant to the Lubrizol Corporation. The prize is awarded to the senior whose academic performance merits his or her selection as outstanding.

- The William H. Schuette Memorial Award is given to a senior whose major field is chemical engineering and whose academic performance, character, and qualities of leadership merit election as outstanding. The award was established by friends and co-workers in memory of Mr. Schuette, ’33, vice president and general manager of Dow Chemical Company.

- The A. W. Smith Prize is presented to the senior in engineering whose major field is chemical engineering, and who has earned the highest record in the junior and senior years in chemical engineering courses. The prize was established by Dr. Carl F. Prutton, ’20, former head of the Department of Chemistry and Chemical Engineering, in memory of Dr. Albert W. Smith, who graduated from Case School of Applied Science in 1887 and was a member of the faculty for 40 years.

### CHEMISTRY

- The Analytical Chemistry Award

- The Hippolyte Gruener Award to a student for merit in chemistry

- The Hypercube Scholar Award

- The Iota Sigma Pi/Frank Hovorka Prize to the woman chemistry major with the highest grade average after three semesters

- The Eli Lilly Award to a sophomore or junior chemistry major pursuing the B.S. degree

- The Charles F. Mabery Prize is awarded to the undergraduate or graduate student presenting the best thesis on a subject connected with research in the Department of Chemistry. The prize was established in 1928 by Professor Charles F. Mabery, former head of the Department of Chemistry.

### COMMUNICATION SCIENCES

- The Crawford Summer Scholarship to the American School of Classical Studies in Athens

- The Abraham Lincoln Fuller Prizes for excellence in the study of Greek or Latin

- The Emma Maud Perkins Prize for excellence in classical studies

### COGNITIVE SCIENCE

- The Cognitive Science Award to the graduating senior for outstanding academic achievement in cognitive science

### COMMUNICATION SCIENCES

- The National Student Speech-Language-Hearing Association Award for outstanding leadership and achievement in communication sciences

- The Outstanding Undergraduate in Communication Studies Award

### ECONOMICS

- The Robert N. Baird Award for academic excellence and leadership in extracurricular activities

- The Marvin J. Barloona Book Award for outstanding performance in economics

- The Dean’s Achievement Award for scholarship and leadership in economics

- The Gardiner Scholarship to a student ma-
The H. W. Kniesner Prize to an outstanding senior in economics
- The James Dysart Magee Award to an outstanding student in economics for the senior year
- The Howard T. McMyler Award to an outstanding student majoring in economics

**ELECTRICAL ENGINEERING AND COMPUTER SCIENCE**
- The ACM Award to the senior judged by the student chapter of the Association for Computing Machinery most likely to have an outstanding professional career
- The Chair’s Award to a student in the Department of Electrical Engineering and Computer Science who shows exceptional academic or leadership potential
- The Donald P. Eckman Award was established by the American Automatic Control Council in memory of Dr. Donald P. Eckman, professor of mechanical engineering and first director of the Systems Research Center. It is given to the senior majoring in systems and control engineering with the best overall achievement in his or her undergraduate program.
- The Electrical Engineering and Computer Science Award for the best senior project
- The Electrical Engineering Service Award is given to the senior performing outstanding service to his or her class.
- The Eta Kappa Nu-I.E.E.E. Award was established by I.E.E.E. and Eta Kappa Nu honorary fraternity. This award is given to the senior student judged by his or her fellow students to possess the qualities necessary for an outstanding professional career in a general field of electrical engineering.
- The National Electrical Engineering Consortium William L. Everit Award to a student who has excelled academically in communications or computers
- The Andrew R. Jennings Award to a senior for excellence in Computer Engineering and Sciences
- The Carolyn J. and John A. Massie ’66 Prize for Computer Engineering and Science awarded to the outstanding junior in computer engineering and science with exceptional research and leadership potential
- The Carolyn J. and John A. Massie ’66 Prize for Computer Engineering and Science awarded to the outstanding sophomore in computer engineering and science with exceptional research and leadership potential
- The W. Bruce Johnson Award was established in 1969 in memory of Dr. W. Bruce Johnson, professor of engineering and head of the Division of Electrical Sciences and Applied Physics. This award is given to a senior for an outstanding project in the area of electrical sciences and applied physics.
- The EECS Research Award to the senior demonstrating exceptional research potential
- The Undergraduate Alumni Capital Award in Systems and Control Engineering to a senior for academic excellence and professional promise

**ENGLISH**
- The Charles E. Clemens Award for talent and accomplishment in writing
- The Finley Foster/Emily M. Hills Poetry Prize for the best poem or group of poems
- The Emily M. Hills Award for the best poem or essay written by a woman in the College of Arts and Sciences
- The Holden Prize for the best English paper written by an upperclass student
- The Kennedy Prize for creative work in English
- The Edith Garber Krotinger Prize for excellence in creative writing
- The Karl Lemmerman Award for formal poetry submitted by undergraduate students

**GEOLOGICAL SCIENCES**
- The Charles S. Bacon Award for outstanding contributions to the Department of Geological Sciences
- The Philip O. Banks Award for outstanding academic achievement in geological sciences
- The Carol W. Walker Award for an outstanding senior project in the Department of Geological Sciences

**HISTORY**
- The Donald Grove Barnes Award to a senior for excellence in history
- The Clarence H. Cramer Award for excellence in research and writing of history
- The Annie Spencer Cutter Prize to a senior for outstanding achievement in history
- The History Department Award for outstanding achievement in history

**MACROMOLECULAR SCIENCE AND ENGINEERING**
- The Hal Loranger Award for Polymer Science was established in 1974 by friends as a memorial to Hal Loranger. This award is given to the outstanding senior in polymer science.
- The Samuel Maron Memorial Award is given to an undergraduate for excellence in polymer research.

**MANAGEMENT**
- The Robert O. Berger Jr. Award to a junior who demonstrates overall achievement in scholarship, as well as notable community participation and leadership
- The Nellie Chittenden Carlton Prize is awarded to a senior in management whose outstanding work in the general field of economics shows the greater promise of leadership. This prize was established by Professor Frank Tracy Carlton, Case Western Reserve University ’95, and his wife, Mrs. Nellie Chittenden Carlton.
- The Dean’s Achievement Award for excellence in scholarship and leadership in management
- The Financial Executive’s Institute Award
- The Roulston Performance Award for outstanding performance in management
- The Kevin J. Semelsberger Prize for excellence in management
- The Iris Wolstein Award for Excellence in Business Venture History to a student whose work on projects and/or course work related to the study of Cleveland business venture history is determined to have made a significant contribution to the understanding of the business development in Northeast Ohio and related environs
- The Wolstein Family Award for Excellence in Business Venture Plan Development to a student enrolled in a major or minor in Weatherhead undergraduate programs whose business venture development plan is considered to have the highest promise to be
UNDERGRADUATE STUDIES

succeedfully initiated

MATERIALS SCIENCE AND ENGINEERING
- The Wesley P. Sykes Prize was established in 1961 by Dr. Wesley Pope Sykes, Case School of Applied Science '16. This prize is awarded to a senior majoring in materials science and engineering who shows outstanding ability in scientific research, especially as evidenced by the quality of his or her senior project.
- The Professor Jack F. Wallace Award to the materials science and engineering student who embodies the dedication and spirit of Professor Wallace

MATHEMATICS
- The Case Alumni Award to an outstanding senior mathematics major
- The Chair's Award to a student contributing to the intellectual life of the majors program
- The Max Morris Prize was established in 1964 by family, friends, and former students in memory of Professor Max Morris to honor his contribution to the teaching of mathematics. This prize is presented to an outstanding undergraduate student in mathematics who is pursuing the B.S. degree.
- The Webster Godman Simon Mathematics Award to a sophomore or junior pursuing a B.A. degree, for excellence in mathematics

MECHANICAL AND AEROSPACE ENGINEERING
- The Robert and Leona Garwin Prize was established in 1977 by Richard L. Garwin, Case Institute of Technology '47. It is given to a student who has demonstrated theoretical scientific ability with experimental competence and inventive talent.
- The Gustav Kuerti Award is given to the senior in mechanical and aerospace engineering who has demonstrated the highest level of scholarship.
- The Anish Shah '91 Award to an outstanding senior in mechanical and aerospace engineering based on academic achievement, extra-curricular activities, and community service
- The Fred Hale Vose Prize was established by Elmer L. Lindseth, Case School of Applied Science '25, to honor Professor Emeritus Fred Hale Vose, former head of the Department of Mechanical Engineering. It is presented to the senior in mechanical engineering who has demonstrated the greatest promise for professional leadership.

MODERN LANGUAGES
- The Arabic Undergraduate Book Prize for high achievement in Arabic
- The Louise Burke French Prize to an outstanding French student
- The Chinese Undergraduate Book Prize for high achievement in Chinese
- The Susie Scott Christopher Prize for excellent contributions to the French program
- The Department of Modern Languages and Literatures Award for outstanding achievement
- The Emile B. deSauze Award for attaining the highest honors in modern languages and literatures
- The Folberth German Prize for excellence in German language and literature
- The French Undergraduate Book Prize for high achievement in French
- The German Undergraduate Book Prize for high achievement in German
- The Hebrew Undergraduate Book Prize for high achievement in Hebrew
- The Italian Undergraduate Book Prize for high achievement in Italian
- The Japanese Undergraduate Book Prize high achievement in Japanese
- The Max Kade Excellence in German Award
- The Florence Keuerleber Prize to an undergraduate student who has seriously pursued and excelled in the study of a modern language while majoring in another area
- The Russian Undergraduate Book Prize for high achievement in Russian
- The Spanish Undergraduate Book Prize for high achievement in Spanish

MUSIC
- The Arthur H. Benade Prize to a senior with a major other than music who has made a notable contribution to music on campus during his or her undergraduate years
- The Charles E. Clemens Prize for talent and accomplishment in music
- The Doris Young Hartsock Prize for outstanding performance in music education
- The Kennedy Prize for creative work in music
- The Lyman Piano Award
- The Joan Terr Ronis Recital Prize to an outstanding undergraduate majoring in music who has made an exceptional contribution to the musical life of the University

NURSING
- The Bolton Scholar Award for Excellence in Acute Care Nursing
- The Bolton Scholar Award for Excellence in Community Health Nursing
- The Bolton Scholar Award for Excellence in Critical Care Nursing
- The Bolton Scholar Award for Excellence in Gerontology
- The Bolton Scholar Award for Excellence in Maternal-Child Nursing
- The Bolton Scholar Award for Excellence in Nursing Informatics
- The Bolton Scholar Award for Excellence in Nursing Research
- The Bolton Scholar Award for Excellence in Pediatric Nursing
- The Bolton Scholar Award for Excellence in Psychiatric/Mental Health Nursing
- The Dean's Award for Outstanding Capstone
- The Director's Award for Outstanding B.S.N. Graduate

NUTRITION
- The Mary Eliza Parker Award for excellence in nutrition and dietetics

PHILOSOPHY
- The Truman P. Handy Philosophical Prizes to outstanding juniors or seniors for excellence in philosophy

PHYSICAL EDUCATION
- The Emily Russell Andrews Award to the senior woman who makes the greatest contribution to the physical education department through scholarship, leadership, participation, and service
- The Philip K. "Nip" Heim Award to the senior man who makes the most outstanding contribution to Case Western Reserve University through the athletic program
- The Dorothy L. Hoza Award to the outstanding freshman, sophomore or junior who has made a strong contribution to the women’s intercollegiate sports program, maintained a high level of academic achievement, shown leadership in the team, and contributed service to the department and university
- The Patricia B. Kilpatrick Award to the outstanding freshman, sophomore or junior who has made a strong contribution to the women’s intercollegiate sports program, maintained a high level of academic achievement, shown leadership in the team, and contributed service to the department and university
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• The Krumhansl Family Prize to an outstanding undergraduate woman for her academic accomplishments in the sciences
• The Dayton C. Miller Award was established by the late Herbert A. Erf, Case School of Applied Science ’26, honoring this internationally renowned physicist who served as professor of physics for 50 years. It is given to an outstanding senior in physics for the best thesis.
• The Outstanding Senior in Engineering Physics Award
• The Elmer C. Stewart Memorial Award to an outstanding senior in Physics who has demonstrated achievement in the applications of physics
• The Senior Award for service and scholarship in physics

POLITICAL SCIENCE
• The James Dysart Magee Award for the senior year, to an outstanding student in social and behavioral sciences enrolled in the Integrated Graduate Studies Program
• The Flora Stone Mather Alumnae Award for outstanding academic performance in political science

PSYCHOLOGY
• The Stephen Bednarik Memorial Award to an outstanding senior majoring in psychology
• The James Dysart Magee Award for the senior year, to an outstanding student in social and behavioral sciences enrolled in the Integrated Graduate Studies Program
• The Flora Stone Mather Alumnae Award for outstanding academic performance in psychology

RELIGIOUS STUDIES
• The Ranner Family Prize to a graduating senior for the highest academic achievement in the study of religion

SOCIOLOGY
• The Stella Berkeley-Friedman Award to a graduating senior for the highest academic achievement in the study of sociology
• The Robert C. Davis Award for demonstrated commitment to sociological studies
• The Mark Lefton Award for excellence in sociological studies
• The James Dysart Magee Award for the senior year, to an outstanding student in social and behavioral sciences enrolled in the Integrated Graduate Studies Program
• The Schermerhorn Award for an outstanding student in sociology

THEATER ARTS
• The Dionysus Award for an outstanding contribution to theater or dance for a student not majoring in theater arts
• The Lily Dreyfuss Memorial Award for excellence in dance
• The Barclay Leathem/Nadine Miles Award for creativity and general excellence in theater

WOMEN’S AND GENDER STUDIES
• The George Sand Award in Women’s and Gender Studies to a graduating senior majoring or minoring in the field for excellence in academic performance
• The Sojourner Truth Award to an outstanding student who combines academic excellence in Women’s and Gender Studies with commitment to community service, advocacy of women’s and gender-related issues, and activism
• The Mary Wollstonecraft Award to a continuing undergraduate student for excellence in Women’s and Gender Studies courses

AWARDS FOR STUDY ABROAD
• The Brookes Friebolin Award to an outstanding student for study in France
• The Eva L. Pancoast Memorial Fellowship for graduating senior women in the College of Arts and Sciences or women students in the School of Graduate Studies enrolled in the Cooperative Education Student of the Year Program based on industry evaluations, written reports and student initiative
• The Case Alumni Association Prize for Achievement to the senior with the best academic record in the Case School of Engineering
• The Case Western Reserve University Women’s Club Award for exemplary intellectual contributions in First Seminar
• The Case Western Reserve University Women’s Club Prize for a student completing an outstanding Capstone Project
• The Edward J. “Ted” Corcoran Award to a senior for outstanding leadership, character and service
• The Rachelle L. Grier Award to a Case Western Reserve University staff member who is enrolled as a non-degree or as a degree-seeking undergraduate at the University
• The Russell A. Griffin Award to a senior in the College of Arts and Sciences who has made the most significant contribution to campus life
• The George T. Hunt Awards to a junior and a senior outstanding in leadership, scholarship, and service
• The Junior Award of the College of Arts and Sciences to juniors with the best academic records at the end of five semesters
• The Matthew Leskiewicz Award to a senior in the Weatherhead School of Management for outstanding leadership and service
• The Louis K. Levy Prize for an outstanding junior in the College of Arts and Sciences
• The P. G. “Jerry” Lind Award for a graduating senior in engineering or science who has made a significant contribution to campus life
• The Flora Stone Mather Alumnae Award for outstanding academic performance in the humanities
• The Outstanding Junior Awards of the College of Engineering to juniors with the best academic records at the end of five semesters in the Case School of Engineering
• The Outstanding Sophomore Awards of the Case School of Engineering to sophomores with the best academic record at the end of three semesters in the Case School of Engineering
• The Phi Beta Kappa Prize to sophomores with the best academic records in a liberal arts curriculum after three semesters
• The Harriet Levion Pullman Award to a senior outstanding in leadership, character and service
• The John Schoff Millis Award to the senior with the best academic record in the College of Arts and Sciences
UNDERGRADUATE STUDIES

- The Sylvia Green Rosenberg Award to a part-time or full-time non-traditional student
- The Robert and Joyce Shafer Prize to a student from the Case School of Engineering who has made a major contribution to campus publications
- The Robert L. Shurter Prize to a senior for leadership in extracurricular activities in the 2009-2010al Award to an outstanding pre-medical student for the senior year
- The Kent H. Smith Award was established in 1961 by Case Institute of Technology students and presented by the Case Student Senate to honor Kent H. Smith, Case School of Applied Sciences ’17, for his service as a member of the Board of Trustees and as acting president from 1958 to 1961. The award is presented to an outstanding senior displaying extraordinary leadership, character, and scholarship in the Case School of Engineering
- The Weatherhead School of Management Award to a senior, for outstanding achievement in the Weatherhead School of Management
- The Stanley E. Wertheim Prize for an outstanding junior in the Case School of Engineering who has demonstrated leadership skills through involvement in campus or coop activities
- The Peter Witt Scholarship to a deserving student who demonstrates a vital and active interest in the improvement of life in Cleveland

2009-2010 MAJORS AND MINORS FOR CASE UNDERGRADUATE DEGREES

**Major**
A program of ten or more courses (required)
Major* - available only as 2nd major for a B.A.; may be sole major for a B.A. student who also completes a B.S.

**Minor**
A program of 15-18 hours (optional)

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<tr>
<th>Department Code</th>
<th>Subject</th>
<th>Degree</th>
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<td>WSOM – SAGES</td>
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<td>Major</td>
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<td>POL</td>
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<td>Major or Minor</td>
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<td>Major or Minor</td>
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The School of Graduate Studies (SGS) is the unit through which Case Western Reserve University offers graduate programs in the humanities and social sciences, biological and natural sciences, engineering, and selected disciplines related to professional fields. These programs lead to the degrees of Master of Arts, Master of Fine Arts (theater and dance), Master of Science, Master of Public Health, Master of Engineering and Management, Master of Engineering, Doctor of Musical Arts, and Doctor of Philosophy. Several programs offered jointly with the professional schools and local affiliated institutions lead to dual degrees such as M.A./J.D., M.A./Ph.D., M.A./M.D., M.A./M.S., M.S./M.D., M.S.S.A./Ph.D., Ph.D./M.P.H., J.D./M.P.H., M.S.N./M.P.H., M.B.A./M.P.H., M.D./M.P.H., M.P.H./M.A., and M.D./Ph.D. There are also two combined undergraduate and graduate programs, IGS (Integrated Graduate Studies) and, B.S./M.S., which allows undergraduate students to enter graduate study before they complete their undergraduate programs. The School of Graduate Studies, overseeing university-wide standards of quality in admission and performance, presently awards graduate degrees in seventy basic disciplines with Ph.D. programs and fifteen others in which the highest degree is the M.A., M.F.A., or M.S. Enrollment in the School of Graduate Studies for fall 2008, excluding non-degree registrants, totaled 1939, of which 52% were men, 48% were women, and 31% were international. During the academic year 2007-2008, the school awarded 334 master’s degrees and 204 doctorates.

The Office of Postdoctoral Affairs located within the School of Graduate Studies is responsible for the appointment of postdoctoral scholars and fellows, as well as the development, implementation and monitoring of all university policies applicable to these positions. The Office of Postdoctoral Affairs works closely with the Postdoctoral Researchers Association to provide a liaison between postdoctoral scholars and fellows and the administration and faculty of Case Western Reserve University. Handbooks for both post-doctoral scholars and fellows are available at the SGS and on the website: http://www.case.edu/provost/graduatesudies/postdoc.html/

APPLICATION TO GRADUATE STUDY

1. Completed application forms, part A and B, with the nonrefundable application fee.
2. Statement of Objectives
3. Official transcripts of all previous undergraduate and graduate courses taken for credit.
4. Graduate and/or undergraduate degree verification, which can be posted on the academic transcript or certified by the academic institution where the degree(s) has been awarded.
5. Three letters of recommendation from former professors or other persons familiar with the applicant’s ability and probable performance as a graduate student.
6. For departments and programs which require standardized tests, the results of the Graduate Record Examination, the Miller Analogies Test, Medical College Admissions Test, or the Graduate Management Admission Test. (Contact the department for the tests that are required for the degree programs in that department.)
7. Certain programs require submission of writing samples, portfolios, scheduling of auditions and personal interviews. (Refer to departmental materials for details.)
Admission of International Students

The admissions criteria for international students are the same as U.S. residents except for the following:

1. International students whose first language is not English must be able to speak, read, write and comprehend English. English proficiency must be demonstrated by taking the Test of English as a Foreign Language (TOEFL). A score of at least 550 (paper-based), 213 (computer-based), 79 (IBT—internet based TOEFL) or completion of ELS Language Center, Level 112 with a grade of B at Case Western Reserve University is a mandatory requirement for admission. The IELTS (International English Language Testing System) is also accepted. The required minimum score is 6.5. Scores must be on file before registration will be permitted. Some departments may require higher scores.

To register to take the TOEFL exam at testing centers world-wide go to website: http://www.toefl.org/.

Applicants are exempt from the TOEFL requirements if they (1) speak English as their native language; (2) have completed a bachelor’s degree or higher at a foreign university where the instruction was in English; (3) have completed six semester hours of sophomore level English literature in a U.S. college or university; or (4) have a earned a bachelor’s degree or higher in a U.S. college or university with instruction in the English language.

If a student does not have an acceptable TOEFL score, he or she must contact ELS Language Center at Case Western Reserve University. They are authorized to enroll foreign students. Admission to their courses is open to persons who can devote full time to an intensive language-learning program. Only persons who can give evidence of suitable academic background, adequate financial resources to cover living and school expenses, and seriousness of purpose will be approved for admission.

2. To obtain a student visa, international students must demonstrate financial sufficiency by submitting bank statements and other financial documents indicating sufficient funds to support the tuition and living expenses for one academic year.

3. For those students who are to receive financial aid from the department, the amount of funds required will depend on the amount of the aid award. In some cases it will be living expenses, and in others more funds will be required.

When a letter of acceptance for an international student has been issued, a copy is sent to the International Student’s Office where the I-20 is processed and sent to the student who must then obtain a student visa in order to begin study in the U.S. More detailed information can be obtained from the International Students’ Office and from the “Student Affairs” section of this Bulletin.

Admission Status

FULL STANDING

To be admitted to full standing the applicant must meet all the admissions criteria without conditions or academic provisions. Applicants must have a good academic record, e.g., a B average or rank in the upper third of his or her graduating class at an institution whose status and programs are readily assessed. The applicant will be expected to meet essentially all of the undergraduate prerequisites for the proposed field of graduate study. In addition to evidence of admissibility from transcripts, grade records, letters of recommendation and TOEFL test (English proficiency test for international students only), certain departments require that the applicant submit satisfactory scores on the Graduate Record Examination, the Miller Analogies Test, or the Graduate Management Admission Test.

Ordinarily a bachelor’s degree is required for unconditional admission to the graduate school. Under some circumstances, an admissions committee may recommend admission to the School of Graduate Studies on the basis of an equivalent experience. In this case, final approval for admission by the dean of graduate studies is required.

PROVISIONAL STANDING

Applicants who have academic deficiencies and do not qualify for admission with full standing are occasionally admitted provisionally. A student may give evidence of ability in his or her chosen field that is sufficiently convincing to warrant provisional admission, but the quantity or quality of the student’s preparation may be difficult to determine with sufficient certainty for admission in full standing. The provisions will be specified by the department to which the student is admitted, and stated in the official letter of admission from the dean of graduate studies. A provisional graduate student is expected to complete appropriate course work and to meet the performance standards of the School of Graduate Studies within the first academic year of study. Although the provisional student’s records will be reviewed each semester, the student’s status will be reconsidered by the department no later than at the end of two semesters of study. At that time, if the student has satisfied the provisions associated with his or her admission in the judgment of the department and the dean of graduate studies, the student will be given full standing; otherwise, he or she will be separated from further graduate study in that department.

CONDITIONAL STANDING

Applicants who have missing documentation in their admissions file (such as an official academic transcript with degree posted or official test score reports, may be admitted conditionally. The condition (s) specified in the letter of acceptance must be satisfied prior to matriculation in the School of Graduate Studies.

POSTPONEMENT OF MATRICULATION

Applicants are guaranteed admission only for the term specified in the letter of admission. An applicant who is unable to enroll in the semester for which he or she was initially admitted may request to postpone matriculation up to two regular academic semesters. In such cases, the department to which the applicant has applied may accept or reject the applicant’s request, and the terms of readmission may differ from the original offer. If a delay of more than two semesters is requested, the applicant’s file must be reviewed and reevaluated by the department. If more than two years elapse since acceptance, the applicant must reapply in the same manner as a new applicant. Because applicant files are only kept for a maximum of two years, all documentation will have to be resubmitted.

NON-DEGREE STUDENTS

Individuals with earned bachelor’s degrees who want to enroll in classes for personal enrichment or to satisfy prerequisite course requirements for later admission to graduate programs may enroll as non-degree students through the School of Graduate Studies. A student who wishes to register as a non-degree student should request the appropriate application form from the School of Graduate Studies and submit evidence that a bachelor’s degree has been earned. Students may enroll in undergraduate and graduate level courses. Continuation in non-degree status is at the discretion of the dean of graduate studies.
Graduate study presupposes a considerable maturity on the part of the student in planning and reaching his or her educational objectives. The effectiveness of the graduate program lies jointly with the individual student and the faculty advisor or advisory committee through early, substantive planning discussions. The formal requirements set forth in these regulations are intended to aid in the maintenance of uniform minimum standards of performance, to form a basis for planning programs of graduate study, and to provide for efficient management and coordination.

For each graduate student, an official planned program of study consisting of the courses and other requirements for the M.A., M.F.A., M.S., M.E., M.P.H., D.M.A., or Ph.D. degrees should be established in consultation with the major faculty advisor or advisory committee. After consultation with the major faculty advisor, the student should submit their Planned Program of Study via the Student Information System where it will be routed for appropriate approvals. Students must submit an approved program of study by the end of the second semester. A revised program of study must be submitted via the Student Information System when any change in the original plan occurs. For graduate engineering students, additional details regarding degree program requirements are given in the Engineering section of this Bulletin. The various departments and schools may make such additional regulations concerning programs of study as may be necessary to reach particular academic goals. These regulations must be in writing, with a copy filed in the School of Graduate Studies.

THE ACADEMIC ADVISOR

Each graduate student will have a faculty advisor or advisory committee assigned by the department or professional school to assist the student in planning the program of study best designed to enable the student to reach appropriate educational objectives.

ACADEMIC REQUIREMENTS FOR MASTER'S DEGREES

In recognition that the objectives of master’s degrees differ for various departments and for individual students, especially in the importance given to research, two general plans for master’s degrees may be followed:

Plan A

M.A. or M.S. with a thesis based on individual research and a final oral examination.

Plan B

M.A., M.F.A., M.P.H., or M.S. without a thesis but requiring a comprehensive examination and/or a major project to be administered by the academic unit.

The Master’s Thesis (Plan A)

The minimum requirements for the master’s degree under Plan A are 18 semester hours of course work plus a thesis equivalent to at least 9 semester hours of registration, or 21 semester hours of course work plus a thesis equivalent to at least 6 semester hours of registration. Once registered for thesis credit (Course 651), a student must continue 651 registration each succeeding regular semester until graduation.

However, if a student is registered for course work or research toward the doctorate in the semester in which the thesis examination is expected to occur, concurrent registration for 651 is not required. At least 18 semester hours of course work, in addition to thesis hours, must be at the 400-level or higher.

Each student must prepare an individual thesis. Joint theses are not permitted. The written thesis must conform to regulations concerning format, quality, and time of submission as established by the dean of graduate studies. Detailed instructions can be obtained from the School of Graduate Studies and can be found at the following website: http://www.case.edu/provost/gradstudies/index.htm

For completion of master’s degrees under Plan A, an oral examination (defense) of the master’s thesis is required. This examination is conducted by a committee of at least three members of the university faculty. The candidate’s thesis advisor customarily serves as the chair of the examining committee. The other members of the committee are appointed by the chair of the department or curricular program faculty supervising the candidate’s course of study. The examining committee must agree unanimously that the candidate has passed the thesis examination. Because theses are made public immediately upon acceptance, they should not contain proprietary or classified material. When the research relates to proprietary material, the student and advisor are responsible for making preliminary disclosures to the sponsor sufficiently in advance to permit timely release of the thesis, and these plans should be disclosed when the thesis is submitted to the School of Graduate Studies.

The Master’s Comprehensive (Plan B)

The minimum requirements for the master’s degree under Plan B are 27 semester hours of course work, a comprehensive examination, and in some fields, an approved project. At least 18 semester hours of course work must be at the 400 level or higher.

Each candidate for the master’s degree under Plan B must pass satisfactorily a comprehensive examination to be administered by the department or curricular program committee. The examination may be written or oral or both. A student must be registered during the semester in which any part of the comprehensive examination is taken. If not registered for other courses, the student will be required to register for one semester hour of EXAM 600,
Comprehensive Examination, before taking the examination.

Engineering students are required to complete 3 to 6 semester hours of Special Problems (Project) course work, which must consist of an engineering project approved by the chair of the department offering the degree program, and may be carried out at the student’s place of employment with nominal supervision by a faculty advisor or in the departmental laboratories under direct supervision. The project must culminate in a written report and examination by at least three professors including approval by the chair of the department.

Performance evaluation for course 601 (Independent study/Research) is limited to P/NP grading.

Theater students in the M.F.A. program are required to register for six semester hours of Thesis Production (creative project), followed by an oral and written defense.

**ACADEMIC REQUIREMENTS FOR DOCTORAL DEGREES**

The degree of Doctor of Philosophy is awarded in recognition of in-depth knowledge in a major field and comprehensive understanding of related subjects together with a demonstration of ability to perform independent investigation and to communicate the results of such investigation in an acceptable dissertation.

**Curricular Requirements**

Within the framework of these general regulations, it is expected that a relevant program of study will be planned for each candidate for the doctorate by the student and the faculty advisor or advisory committee. Such a program should include appropriate courses, together with work on the doctoral dissertation, and may also include, where relevant, such experiences as field work or practicum.

Although specific requirements vary among departments, students entering with a bachelor’s degree will satisfactorily complete a minimum of 36 semester hours of courses (which may include independent study/research, course 601), tutorials, and seminars. For students entering with an approved master’s degree, completion of at least 18 semester hours of course work is required. A minimum of 18 semester hours of dissertation research (Course 701) is required for all doctoral students.

**Examination Requirements**

In order to meet the requirements for the doctorate, a student must pass satisfactorily a general examination (or a series of examinations covering different fields) specified and administered by the student’s department or supervising committee. The examination generally precedes advancement to candidacy. A student must be registered during the semester in which any part of the general or qualifying examination is taken. If not registered for other courses, the student will be required to register for one semester hour of EXAM 700, General/Qualifying Examination, before taking the examination. A student who fails the examination on the first attempt may be permitted to take the examination a second time within one year at the discretion of the department. Except in unusual circumstances, a student who fails the examination a second time will be separated from further graduate study within the same department or program.

**Advancement to Candidacy**

The formal acceptance of a student as a candidate for the doctoral degree is the responsibility of the student’s department or the committee supervising the doctoral program in accordance with the written procedures of the academic unit. At its discretion the supervising unit may require a student to pass qualifying examinations before candidacy is granted. Generally, advancement to candidacy allows the student to enter the dissertation research phase of the degree program, and occurs after all course work and exam requirements are satisfied. Students are expected to make regular and continuous progress toward the degree. Advancement to candidacy in a Ph.D. program should occur within a maximum of 6 years post-matriculation with a bachelor’s degree (no later than at the completion of 36 semester hours of graduate study) and 4 years post-matriculation with a master’s degree (no later than at the completion of 18 semester hours of graduate study). Students may continue in pre-candidacy status beyond this time by means of a petition to the School of Graduate Studies by a program director, based on evidence of student progress toward the degree. Individual programs can require advancement to candidacy before the time limit set in this policy.

The dean of graduate studies must promptly be notified in writing of the decision concerning a student’s advancement to candidacy, and a copy of the notification must be sent to the student concerned. A student who is refused candidacy status may not undertake further study for credit toward the doctoral degree within the same department or supervising unit. With the approval of both the department concerned and the dean of graduate studies, such a student may:

1. Take additional courses, if required, in order to complete an approved master’s degree in that department.
2. Seek admission to the graduate program of another department.

**Course 701 Requirements**

**Pre- and Post-Candidacy Dissertation Research**

When a student has been advanced to candidacy, he or she may begin dissertation research by formally registering for course 701 credits.

In certain cases, students who have not advanced to candidacy may begin registering for up to 6 credit hours of course 701 per semester at the discretion of the department and upon written notification to the dean of graduate studies. Pre-Candidacy 701 hour(s) may be taken concurrently with course work. Once a student begins registration of 701 hours, he or she must register for at least one credit hour of 701 each semester until graduation. Once 701 registration begins doctoral students have five consecutive calendar years from the semester of the first credited 701 registration, including leaves of absence, to complete all requirements for the doctorate.

**Foreign Language Requirements**

Although there is no general foreign language requirement for the doctorate, each department or supervising committee may set such requirements as are appropriate to the student’s program of study. It is the student’s responsibility to ascertain the foreign language requirements approved by the supervising unit. Each department must notify the dean of graduate studies in writing of the specific language(s) required and the date of examination determining the student’s proficiency in the required language(s).

**Dissertation Requirements**
All candidates for the Ph.D. degree must electronically submit a dissertation as evidence of their ability to conduct independent research at an advanced level. The dissertation must represent a significant contribution to existing knowledge in the student’s field, and at least a portion of the content must be suitable for publication in a reputable professional journal or as a book or monograph. Students must prepare their own dissertations. Joint dissertations are not permitted. The dissertation must conform to regulations concerning format, quality, and time of submission as established by the dean of graduate studies. Detailed instructions can be obtained from the School of Graduate Studies and are posted on the following website: http://www.case.edu/provost/gradstudies/index.htm

Research work connected with a dissertation is to be carried out under the direct supervision of a member of the university faculty selected by the student in consultation with departmental faculty and approved by the chair of the department.

Two copies of each completed and accepted dissertation will be deposited in the university library by the School of Graduate Studies. In addition, the student must guarantee the reproduction of the dissertation through University Microfilms, Ann Arbor, Michigan, before certification for the doctorate. Because dissertations are made public immediately upon acceptance, they should not contain proprietary or classified material. When the research relates to proprietary material, the student and advisor are responsible for making preliminary disclosures to the sponsor in advance to permit timely release of the dissertation. These arrangements must be disclosed when the thesis is submitted to the School of Graduate Studies. (Most forms may be found at the following website: http://www.case.edu/provost/gradstudies/forms.htm.)

Dissertation Advisory Committee

Each doctoral student is responsible for becoming sufficiently familiar with the research interests of the department or program faculty to choose in a timely manner a faculty member who will serve as the student’s research advisor. The research advisor is expected to provide mentorship in research conception, methods, performance, and ethics, as well as focus on development of the student’s professional communication skills, building professional contacts in the field, and fostering the professional behavior standard of the field and research in general. The research advisor also assists with the selection of at least two other faculty to serve as members of the dissertation advisory committee.

The dissertation defense committee must consist of a minimum of four members of the university faculty, including at least one whose primary appointment is outside the student’s program, department or school. The committee is appointed by the dean of graduate studies upon recommendation of the Chair of the department, division, or curricular program committee.

The student’s dissertation advisor must be a member of the dissertation advisory committee and may serve as chair. The chair of the committee must be a Case Western Reserve University tenured or tenure-track faculty member in the student’s program. Any tenured or tenure-track Case Western Reserve faculty member, and any full time faculty member whose primary duties include research who is authorized to serve on a Ph.D. dissertation committee by the school or college through which they are affiliated with the university, may serve on a Ph.D. dissertation committee. Any appropriate outside researcher may serve on a Ph.D. committee upon approval by the dean of graduate studies of a request by the program or department. A petition with the rationale for the request must be presented to the dean along with the proposed member’s curriculum vitae. Under special conditions, a former faculty member whose time of leaving the university has not exceeded 18 months may be approved as a voting university member by the dean of graduate studies.

Throughout the development and completion of the dissertation, members of the dissertation defense committee are expected to provide constructive criticism and helpful ideas generated by the research problem from the viewpoint of their particular expertise. Each member will make an assessment of the originality of the dissertation, its value, the contribution it makes, and the clarity, with which concepts are communicated, especially to a person outside the field. The doctoral student is expected to arrange meetings and maintain periodic contact with each committee member. A meeting of the full committee for the purpose of assessing the student’s progress should occur at least once a year until the completion of the dissertation.

Final Oral Examination (Defense of Dissertation)

Each doctoral candidate is required to pass a final oral examination in defense of the dissertation. The examination may also include an inquiry into the candidate’s competence in the major and related fields.

The defense must be scheduled with the School of Graduate Studies no later than three weeks before the date of the examination. The chair of the examining committee should give approval to schedule the defense when the written dissertation is ready for public scrutiny. The candidate must provide to each member of the committee a copy of the completed dissertation at least ten days before the examination so that the committee members have an opportunity to read and discuss it in advance.

Scheduled defenses are made known through on-campus publication, and any member of the university may be present at that portion of the examination pre-designated as public by the chair of the dissertation defense committee. Others may be present at the formal defense only by invitation of that chair.

It is expected that all members of the dissertation defense committee be present at the defense. Exceptions to this rule: a) must be approved by petition to the dean of graduate studies and only under extraordinary circumstances, b) no more than one voting member can ever be absent, c) the absent member must participate through real-time video conferencing at the department’s expense; however, if such video conferencing is not available, the absent member may participate through telephone conferencing; and d) the student must always be physically present.

The dissertation defense committee is responsible for certifying that the quality and suitability of the material presented in the dissertation meet acceptable scholarly standards. A student will be certified as passing the final oral examination if no more than one of the voting members of the committee dissents.

Institutional Review Board (IRB)

The promotion of scholarship and the discovery of new knowledge through research are among the major functions of Case Western Reserve University. If this research is to be meaningful and beneficial to humanity, involvement of human subjects as experimental participants is necessary. It is imperative that investigators in all disciplines strive to protect human subjects. University policy and federal regulations demand compliance. Per federal
SCHOOL OF GRADUATE STUDIES regulations (45 CFR 46), all research involving human subjects requires submission of an IRB application prior to initiation of research to the Case Western Reserve IRB.

Each IRB application must have a faculty member noted as the Responsible Investigator. Applications that are not fully completed as instructed will not be accepted. See university policy on the involvement of human participants in research for guidelines under which investigations involving human subjects may be pursued.

COURSE DESIGNATIONS Courses numbered 100 to 399 are undergraduate-level courses. Courses numbered 400 and higher are graduate-level courses.

GRADING SYSTEM See the “University” section of this Bulletin for a list of valid grades for the School of Graduate Studies and their appropriate use in assigning to graduate students. The only grades that can be changed after they have been assigned by the instructor are Incompletes (I). All others will remain permanently on the student’s academic record. Additional work cannot be done to change an existing grade to a higher grade.

There are some grading schemes in the School of Graduate Studies that have important policy implications. They are:

INCOMPLETE (I) Grades of I should only be assigned for letter-graded and Pass/No Pass courses for extenuating circumstances, and only when a student fails to complete a small segment of the course. Students may not sit in the same course in a later term. When an I grade is assigned by the instructor, he or she must also submit to the School of Graduate Studies the completed “Arrangement to Resolve a Grade of Incomplete” form (website: http://www.cwru.edu/provost/gradstudies/index.htm) indicating the date that the I grade will be resolved. If the student cannot complete the work for the Incomplete by the specified deadline, he or she must petition for an extension which must be endorsed by the instructor, and explain the reasons why the work has not been completed, and include a new date for completion. Students will be allowed only one extension of no more than one additional semester to complete the work for an I grade.

PASS/NO PASS (P/NP) Some graduate courses are graded on a pass or no pass basis, and students need to be aware of the regulations governing letter graded and pass/no pass credits. Of the minimum credit hours required beyond the bachelor’s degree to complete course work requirements, at least 12 credits must be letter graded for the master’s degree, and at least 24 credits must be letter graded for the Ph.D. degree. For students with approved master’s degrees who are admitted to Ph.D. programs, at least 12 credits of the required minimum of 18 credits of course work must be letter graded. Letter graded courses should be the courses most central to the student’s plan of study. Additional credit hours of letter graded course work may be specified by departmental policy. Performance evaluation for course 601 (Independent study/Research) is limited to P/NP grading.

SATISFACTORY/UNSATISFACTORY (S/U) Grades of Satisfactory (S) and Unsatisfactory (U) are to be used exclusively for two courses: 651 thesis research and 701, dissertation research. “Satisfactory” indicates an acceptable level of progress towards completion of the research required for the degree, and Unsatisfactory indicates an unacceptable level of progress towards completion of the research for the degree. Any student who receives a grade of U will automatically be put on academic probation, and if a second U is received, the student will be separated from further study in his or her degree program.

ACADEMIC POLICIES Fellowship Tuition Policy for Graduate Students The purpose of this policy is to allow students pursuing graduate degrees to take courses beyond their degree requirements without additional financial burden to the student and little or no cost to the university. Such courses, referred to as “fellowship” courses, can broaden the educational experience of graduate students by allowing them to pursue studies according to their own intellectual needs. 1) a student pursuing a graduate degree shall be charged tuition at the standard hourly rate for all of the credit hours which are intended to count toward the degree. In any semester for which students are registered for a minimum number (as determined by the school) of credits that will be applied toward the degree, fellowship courses will not incur a tuition charge. 2) In order to enroll in a fellowship course, the student must be in good standing, meet course prerequisites, and obtain consent of instructor. In addition, the student must obtain permission from his/her advisor and the School of Graduate Studies. Up to eight fellowship courses may be permitted in aggregate. 3) Thesis research (651 and 701) and similar courses cannot be taken as fellowship courses and prior rules for 701 and 703 (dissertation fellowship) are not changed by this policy. 4) Fellowship courses can not be audited. The grade that a student receives in the course will count in the cumulative GPA, but will not count towards the degree program GPA. 5) Fellowship courses can not be used toward a degree program at Case Western Reserve University. 6) Notwithstanding any of the foregoing provisions and policies, the rules, regulations, and terms of tuition and credit enrollments for each school shall remain in full force and effect.

Guidelines for Multidisciplinary Graduate and Graduate Professional Studies I. Purposes Multidisciplinary studies have as their goal the education of individuals who can make contributions to academic disciplines or professional endeavors that would be less likely to be accomplished by individuals with a background in a single discipline. Departments or faculty members may design a joint degree program, which will generally result in two degrees, or a multidisciplinary degree, which will generally result in a single degree which has a broader perspective than similar existing degrees. Such programs should meet challenges of new interdisciplinary knowledge and/or developments requiring new combinations of talent. In addition, such programs or degrees
should enhance and not duplicate existing programs in the university. Individual students with specific multidisciplinary interests that desire to pursue them at Case Western Reserve University and faculty members who wish to run pilots for joint degree programs or multidisciplinary degrees are encouraged to do so, even if no official joint or multidisciplinary degree program currently exists by organizing an individual joint degree or an individual multidisciplinary degree. Such degrees require faculty and departmental support. Guidance for the design and approval of both such programs and such individual degrees can be found at this website: http://www.case.edu/provost/gradstudies/faculty.html

Graduate Student Rights and Responsibilities

It is the responsibility of the student to become familiar with the general rules and regulations of the university not just those of the School of Graduate Studies. A member of the University community who is accused of violating any of these rules and regulations is subject to university disciplinary action. Due process procedures of adequate notice of all charges and a fair hearing will apply. Case Western Reserve University has established a mechanism whereby students may express a grievance against the actions of other students or members of the faculty and staff. A statement of the policies and procedures to be followed in the case of academic infractions by graduate students may be obtained through the School of Graduate Studies. The policies and procedures governing all other infractions are detailed in the university's annual Student Services Guide and in the "Student Affairs" section of this Bulletin. The University Office of Student Affairs should be consulted for non-academic infractions.

It is also the responsibility of the student to become acquainted with the general regulations and administrative procedures governing graduate study, together with the departmental or school regulations which apply to the student's course of study, and, in consultation with the faculty advisor or advisory committee of the supervising unit, to plan the program and carry out the work in accordance with these regulations and procedures.

DEPARTMENTAL RESPONSIBILITY FOR REQUIREMENTS

Requirements for master's and doctoral degrees beyond those set forth in these regulations may be established by departments or curricular program committees with the approval of the dean of graduate studies. Individual students may be required to take courses beyond the published requirements in order to successfully complete their degree programs. In such instances the student must be notified in writing upon matriculation by the chair of the department or curricular program, with a copy to be filed in the School of Graduate Studies.

MAINTENANCE OF GOOD STANDING

A student maintains good standing in the School of Graduate Studies by registering each fall and spring semester unless on an official leave of absence which has been approved by the School of Graduate Studies. A student is in good standing who meets the standards set by the academic department and the School of Graduate Studies to ensure normal progress toward the fulfillment of the stated requirements at levels of quality without warning or probation or extension of the allowable time limit for degree completion. Students whose quality point averages fall below minimum standards (3.00 for doctoral students; 2.75 for master's) will automatically be placed on probation until the minimum standards are achieved. In addition, a student will be subject to separation from the university for any of the following reasons:

1. Failure to achieve a quality-point average of 2.50 or higher at the completion of 12 semester hours or 2 semesters of graduate study.
2. Failure to achieve a quality-point average of 2.75 or higher at the completion of 21 semester hours or 4 semesters of graduate study.
3. Failure to receive a grade of S in the thesis research 651 or dissertation research 701/703. A student who receives a grade of U in thesis (Course 651) or dissertation research (Courses 701/703) will be placed on probation and be subject to separation. The probationary status will be recorded on the student's transcript. The student must be removed from probation by the end of the semester immediately following receipt of the grade of U by repeating the course for the same number of credit hours, and achieving a grade of S. Although removal from probation restores the student's good standing, the grade of U received will not be canceled or substituted by the grade of S subsequently received. Separation will occur if the student placed on probation receives another grade of U in the following semester; or, if the dean of graduate studies, in consultation with the academic unit, determines that the student is unlikely to be successful in working independently and productively toward the completion of the thesis or dissertation research.
4. Failure of a conditionally or provisionally admitted student to satisfy the conditions or provisions stated in the letter of acceptance by the end of the first academic year (2 semesters) or after 18 credits of course work.
5. Failure to make progress towards degree completion. If the student is not making progress towards degree completion, and it has been judged that the student is unlikely to be successful in working independently and productively toward the completion of clinical requirements, thesis or dissertation research the department and/or the dean of graduate studies (in consultation with the department) can recommend academic separation.

6. In addition to disciplinary actions based on academic standards, on recommendation of the student's department or school, the dean of graduate studies can suspend or separate a student from the university for failure to maintain appropriate standards of conduct and integrity. Such a suspension or separation will be implemented only for serious breaches of conduct that threaten to compromise the standards of a department or create concern for the safety and welfare of others. In the event of such suspension or separation, the student will be entitled to an appeal through the grievance procedure of the Graduate School.

MAINTENANCE OF QUALITY-POINT AVERAGE

In calculating the quality-point average, courses taken as a student in the School of Graduate Studies at the 400 level or above, as well as any courses accepted toward fulfillment of degree requirements for which quality points are given, will be counted, including courses which may need to be repeated. Unless otherwise stated by the department a minimum cumulative quality-point average of 2.75 is required for the award of the master's degree, and a minimum cumulative quality-point average of 3.00 is required for award of the doctoral degree. Any department, school, or curricular program committee may choose to establish quality standards higher than those stated above if such additional requirements are made known in writing to the students upon matriculation, and are recorded with the
The doctoral residency requirement is intended to insure a period of intensive academic interaction with faculty and peers and of sustained independent research. Graduate students are considered to be in residence when they are fully engaged in academic work. As resident students they may teach at the university, take graduate courses, assist in course development, and engage in research or in other scholarly activities at the university. Regardless of the nature of the work, the student's regular presence at the university is expected during fulfillment of the residency requirement.

The formal fulfillment of residency requires continuous registration in at least six consecutive academic terms (fall, spring and/or summer) from matriculation to a period not exceeding five years after the first credited hour(s) of dissertation research (701). The period while students are on a leave of absence do not count towards fulfilling the residency requirement. Within the context of continuity of registration, departments may enact other restrictions. In such instances, the departmental requirements take precedence and must formally be disclosed to the student at matriculation. This is meant to be a reflection of the appropriate reality that departments and fields have different norms and traditions of graduate study. For example, to fulfill the residency requirement, some departments may require the doctoral student to be registered for 9 or more semester hours of graduate credit in each of two consecutive semesters. Fulfillment of residency by all engineering Ph.D. candidates will be certified by their research advisors and department chairs based on an assessment of active, concentrated involvement for a period of two consecutive semesters during their pursuit of the doctorate.

**TIME LIMITATION**

All the requirements for the master's degree must be completed within five consecutive calendar years after matriculation as a graduate student, including any leaves of absence. Doctoral students have five consecutive calendar years from the semester of the first credited 701 registration, including leaves of absence, to complete all requirements for the doctorate. Any graduate student who fails to complete the requirements within the five year limit for his or her degree program will be subject to separation from further study unless granted an extension by the dean of graduate studies with the recommendation of the faculty advisor or advisory committee and approval by the department chair. An extension may be granted if the student and his or her advisor work out a plan of action for degree completion within a specified time frame which must be endorsed by the department chair. Students will be expected to meet all the specified deadlines outlined in the plan of action. The minimum acceptable registration during this extended period for each semester until graduation is three credit hours of 651 or 701, or, for Plan B master's students, an appropriate course.

**LEAVE OF ABSENCE FROM GRADUATE STUDY**

Students undertaking graduate work are expected to pursue their studies according to a systematic plan each year whether registered for full or part-time study. Occasionally a student finds it necessary to interrupt his or her studies before completion of the graduate program. A leave of absence is not to be requested unless the circumstances are such that the student cannot continue graduate study. Under such circumstances the student must request in writing a leave of absence for a period not to exceed two consecutive regular academic semesters. Forms can be found at this website: http://www.case.edu/provost/grad-studies/index.htm. In exceptional circumstances, the leave can be extended for another two semesters. However, the maximum amount of leave permitted per graduate program is four semesters. The reason for the leave must be stated clearly, and the request must be submitted to the dean of graduate studies with the written endorsement of the student's academic department. During a leave of absence the student must not seek aid from faculty members or use of the facilities of the university. This means that students may not take exams or defend theses and dissertations while on a leave. A leave of absence does not extend the maximum time permitted for the completion of degree requirements, and a leave cannot be taken while students are on extension of the five-year limit. At the expiration of the leave the student must resume registration unless formally granted an extension of the leave. Retroactive leaves are not permitted. A student who fails to obtain a leave of absence, or who fails to register following an official leave, must petition the dean of graduate studies for reinstatement in order to resume work as a student in good standing at the university.

A student who is granted a maternity or paternity leave of absence related to infant care, as well as those who must fulfill military duty obligations can petition to extend the five-year time limit associated with completion of the degree. The length of the extension may not exceed two years. International students must check with the Office of International Student Services before petitioning for a leave of absence, as such a leave can affect their visa status.

**WITHDRAWAL, RESIGNATION AND REINSTATEMENT**

Students must maintain continuous registration throughout their degree programs unless granted an official leave of absence. Students who fail to register for any academic term will be automatically withdrawn from their programs. Students who are withdrawn from their programs must petition for reinstatement in order to continue graduate study. The petition must be approved by both the student's department and the dean of graduate studies before the student may register for further course work as a student in full standing. In each case of readmission with full standing, the official letter will state the terms of readmission, including future time limits for the degree program, and the past course work that will be credited toward the degree. If more than 24 months have elapsed since the last registration, students may have to resubmit file materials if requested by the School of Graduate Studies.

**TRANSFER OF CREDIT**

Transfer of credit from another university toward master's and doctoral degree requirements is awarded for appropriate course work (not applied to another degree program) taken prior to admission. Transfer of credit must be requested in the student's first academic year, and must be appropriate for the student's planned program of study. For master's candidates, transferred credit is limited to six semester hours of graduate-level courses, and no credit for master's thesis may be transferred from another university. No transfer of credit will be awarded towards the Ph.D. degree except by petition, and no credit for the doctoral dissertation may be transferred from another university.
Students who wish to receive credit for courses taken outside the university once they are enrolled must petition for approval. All transfer of credit requires approval from the student’s advisor, the departmental chair or graduate committee, and the dean of graduate studies. Such courses must have been taken within five years of first matriculation at Case Western Reserve University and passed with grades of B or better. Forms can be found at this website: http://www.case.edu/provost/gradstudies/index.htm/.

INTERNAL TRANSFER OF CREDIT
Students of exceptional ability in the undergraduate programs of Case Western Reserve University who have the approval of the dean of undergraduate studies and the dean of graduate studies may apply to receive credit for graduate courses completed in excess of the undergraduate degree requirements.

CHANGES IN REGISTRATION
To add or withdraw from courses or to change registration from credit to audit or the reverse, a student must obtain the appropriate official form to submit to the University Registrar in accordance with the dates published each academic term for such actions to be taken. Students must make appropriate changes to their schedules by the end of the first week of classes in order to avoid paying full tuition for courses withdrawn after the final drop/add date. Only complete withdrawal for the semester entitles a student to a percentage refund of the withdrawn courses after the first week of classes. (See the “Financial Information” section of this Bulletin under Refunds). Failure to attend class or merely giving notice to the instructor will not be regarded as official notice of withdrawal or change. When making changes in registration, the international student must be aware of maintaining full-time status. Full-time status requires registration for a minimum of 9 semester hours per semester. Students financed by federal loans must remain registered for at least 6 semester hours (defined as half-time) each semester to maintain continued eligibility for that funding or to initiate such a loan.

GRADUATION
A candidate for a degree awarded by the School of Graduate Studies must make application for the degree to the School of Graduate Studies by the deadline established for that semester, which is approximately twelve weeks before the commencement date for which the degree is expected to be awarded. Students are encouraged to contact the School of Graduate Studies at the beginning of the semester in which they intend to graduate to obtain a packet of graduation materials. The candidate must meet all the deadlines for completion of degree requirements set forth in the calendar. All candidates must be registered for credit and in good standing during the semester in which the degree is awarded. Payment of tuition, fees, and fines is a prerequisite to the award of a degree.

DELAYED GRADUATION
It is a requirement of the School of Graduate Studies that a student be registered for credit in the semester in which he or she completes all the requirements to graduate in accordance with established deadlines for that semester. For a student engaged in thesis or dissertation research the completion of all requirements to graduate is not easily predicted, making it difficult to adhere to scheduled deadlines. If a student will not be able to meet the degree requirements to graduate in one semester, but will finish before the next semester begins, he or she can petition for a waiver of the requirement to be registered in the semester of graduation. To be granted a waiver of registration students must be registered for the appropriate thesis or dissertation credit hours in the semester (or summer session) immediately preceding the semester of graduation, complete all degree requirements including a current application to graduate, and submit all required materials to the School of Graduate Studies by the last day scheduled for the Drop/Add period of the next semester.

A student who qualifies for the waiver will be awarded the degree at the next graduation without the need to be registered or to pay a special fee. If a student fails to meet the waiver deadline, he or she will be required to register for the appropriate thesis or dissertation credit hours in the next semester, and to reapply for graduation in that semester.

EXCEPTIONS TO REGULATIONS
Students have the right to petition for exceptions to these regulations. Such a petition should be addressed to the dean of graduate studies. In most cases the student’s department or program committee must endorse the petition.

GRADUATE STUDENT GRIEVANCE PROCEDURE
It is the responsibility of the School of Graduate studies to assure that all students enrolled

SCHOOL OF GRADUATE STUDIES

GRADUATE STUDENT GRIEVANCE PROCEDURE

1. Students with complaints should first discuss their grievances with the person against whom the complaint is directed.
2. In those instances in which this discussion does not resolve a grievance to the student’s satisfaction, a complaint should be presented in writing to the department chairperson.
3. In the event that a decision still appears unfair to the student, the student may bring the matter to the attention of the dean of graduate studies. The dean may ask the student to put the complaint in writing. The dean will then discuss the case with the student and the department chair to evaluate the particulars and to make a ruling on it. As the situation warrants, the dean may appoint a Grievance Committee to recommend what action should be taken. In this event the Committee will be composed of two faculty members selected from the Committee on Graduate Studies of the Faculty Senate and two graduate students selected either from the Executive Committee of the Graduate Student Senate or from the student members of the Committee on Graduate Studies.

The dean of graduate studies has the responsibility for the final decision, and the ruling from the Graduate Studies Office will be considered final and binding on the persons involved in the grievance. Additional information about the grievance procedure can be obtained from the School of Graduate Studies.

It should be understood that this grievance procedure relates solely to graduate student complaints concerning academic issues. The procedure for handling complaints about other matters is detailed in the Graduate Student Handbook.

PROCEDURES AND SANCTIONS FOR GRADUATE STUDENT ACADEMIC INFRACTIONS

Graduate students accused of violating the university’s standards of conduct, which are detailed in this Academic Integrity Policy. The policy can be found at this website:
http://www.case.edu/provost/gradstudies/current.htm/. are entitled to adequate notice of all charges and to a fair hearing and may subsequently be subject to disciplinary action. The process that is outlined in the Academic Integrity Policy will apply to academic infractions, e.g., cheating on examinations, plagiarism, and other forms of dishonesty in academic activities. Additional information is available from the School of Graduate Studies.
Engineering seeks to create new processes, products, methods, materials, or systems that impact and are beneficial to our society. To enable its graduates to lead the advancement of technology, the Case School of Engineering offers thirteen degree programs at the undergraduate level (twelve engineering degrees, plus the B.S. in computer science). At the post-graduate level, the School of Engineering offers Master of Science programs and the Doctor of Philosophy for advanced, research-based study in engineering. Case School of Engineering also offers two specialized degrees at the master’s level: a Master of Engineering specifically for practicing engineers, and an integrated Master of Science programs and the Doctor of Philosophy for advanced, research-based study in engineering. Case School of Engineering also offers a Master of Science and the Doctor of Philosophy for advanced, research-based study in engineering. Case School of Engineering also offers two specialized degree programs in engineering.

The Case School of Engineering combines advanced classroom study with a rigorous independent research experience leading to significant results appropriate for publication in archival journals and/or presentation at leading technical conferences. Scientific integrity, engineering ethics, and communication skills are emphasized throughout the program.

The undergraduate program aims to create lifelong learners by emphasizing engineering fundamentals based on mathematics, physical and natural sciences. Curricular programs are infused with engineering creativity, professionalism (including engineering ethics and the role of engineering in society), professional communications, and multi-disciplinary experiences to encourage and develop leadership skills. To encourage societal awareness, students are exposed to and have the opportunity for in-depth study in the humanities, social sciences, and business aspects of engineering. Undergraduate students are encouraged to develop as professionals. Opportunities include the Cooperative Education Program, on-campus research activities, and participation in the student chapters of professional societies. Graduates are prepared to enter the workforce and be strong contributors as practicing engineers, or continue for advanced study in engineering.

At the graduate level, the Case School of Engineering combines advanced classroom study with a rigorous independent research experience leading to significant results appropriate for publication in archival journals and/or presentation at leading technical conferences. Scientific integrity, engineering ethics, and communication skills are emphasized throughout the program.

The Case School of Engineering continues the tradition of rigorous programs based on fundamental principles of mathematics, science and engineering that have been the hallmark of its two predecessors, the Case School of Applied Science (1880) and the Case Institute of Technology (1947). The formation of the Case School of Engineering is a re-commitment to the obligations of the gift of Leonard Case Jr., to serve the citizens of Northern Ohio. The School of Engineering has been a leader in many educational programs, being the first engineering school to offer undergraduate programs in computer engineering, biomedical engineering, polymer engineering and systems and control engineering.

ADMINISTRATION

Norman Tien, Ph.D.
(University of California, San Diego)
Dean of the Case School of Engineering and Nord Professor of Engineering

Patrick E. Crago, Ph.D.
(Case Western Reserve University)
Associate Dean of Engineering

Ica Manas-Zloczower, D.Sc.
(Technion-Israel Institute of Technology)
Associate Dean of Faculty Development

Robert A. Knight, M.B.A.
(Case Western Reserve University)
Associate Dean of Finance and Administration

Deborah J. Fatica, M.A.
(Bowling Green State University)
Assistant Dean, Engineering Student Programs

Marc R. Buchner, Ph.D.
(Michigan State University)
Faculty Director of Program Evaluation & Assessment

Kenneth A. Loparo, Ph.D.
(Case Western Reserve University)
Faculty Director of Continuing Education

Joseph M. Prahl, Ph.D.
(Harvard University)
Faculty Director of Undergraduate Recruiting and Student Life

J.T. Garabrant, CFRE
(John Carroll University)
Associate Dean of External Affairs

ENGINEERING DEGREES GRANTED

1. Bachelor of Science in Engineering degree with major designations as follows:
   - Aerospace Engineering
   - Biomedical Engineering
   - Chemical Engineering
   - Civil Engineering
   - Computer Engineering
   - Electrical Engineering
   - Engineering Physics
   - Materials Science and Engineering
UNDERGRADUATE DEGREE PROGRAMS

In addition to the major department requirements, each engineering undergraduate degree program includes the Engineering Core, which provides a foundation in mathematics and sciences as well as aspects of engineering fundamentals for programs in engineering. The Engineering Core also is designed to develop communication skills and to provide a body of work in the humanities and social sciences. Requirements of the Engineering Core can be found in the Undergraduate Studies section of this bulletin.

Details of the specific curricular requirements for the undergraduate majors are described in the respective departmental descriptions.

UNDERGRADUATE CORE COURSES (ENGR)

ENGR 101. Freshman Engineering Service Project (2)
This course is intended to provide engineering freshmen with an initial exposure to engineering problem solving and engineering design in a given technical field or project-driven environment. Small groups of students will be attached to a particular service project, with the assignment of working out and implementing an engineering solution. Collaboration with the Case Engineering Service Group, as well as off-campus service organizations, will provide a source of real world problems, addressing needs within the greater community for students to work on. Final engineering reports/presentations, as well as actual prototype solutions (possibly either hardware or software), are expected of each group.

ENGR 131. Elementary Computer Programming (3)
Students will develop an understanding of, and an appreciation for, the use of algorithms to solve problems, as well as the ability to translate them into good computer programs. The problems dealt with in this course will be chosen to illustrate the fundamentals of computer programming. Java is the programming language used in this course, and students create and debug Java programs as an important part of learning the fundamentals of computer programming.

ENGR 145. Chemistry of Materials (4)
Application of fundamental chemistry principles to materials. Emphasis is on bonding and how this relates to the structure and properties in metals, ceramics, polymers and electronic materials. Application of chemistry principles to develop an understanding of how to synthesize materials. Prereq: CHEM 111 or equivalent.

ENGR 200. Statics and Strength of Materials (3)
An introduction to the analysis, behavior and design of mechanical/structural systems. Course topics include: concepts of equilibrium; geometric properties and distributed forces; stress, strain and mechanical properties of materials; and, linear elastic behavior of elements. Prereq: PHYS 121.

ENGR 210. Introduction to Circuits and Instrumentation (4)
Modeling and circuit analysis of analog and digital circuits. Fundamental concepts in circuit analysis: voltage and current sources; Kirchhoff’s Laws; Thevenin and Norton equivalent circuits, inductors, capacitors, and transformers; modeling sensors and amplifiers and measuring DC device characteristics; characterization and measurement of time dependent waveforms; transient behavior of circuits; frequency dependent behavior of devices and amplifiers; frequency measurements; AC power and power measurements; noise in real electronic systems; electronic devices as switches; digital logic circuits; introduction to computer interfaces; and analog/digital systems for measurement and control. Prereq: MATH 122. Prereq or Coreq: PHYS 122.

ENGR 225. Thermodynamics, Fluid Dynamics, Heat and Mass Transfer (4)

ENGR 398. Professional Communication for Engineers (1)

Students will attend lectures on global, economic, environmental, and societal issues in engineering, which will be the basis for class discussions, written assignments and oral presentations in ENGL 398. Recommended preparation: ENGL 150 or FSCC 100 or equivalent and concurrent enrollment in ENGL 398 (ENGL 398 and ENGR 398 together form an approved SAGES departmental seminar). SAGES Dept Seminar

ADVANCED DEGREE PROGRAMS

Graduate Course

ENGR 400C. Graduate Cooperative Education (0 - 3)
An academic opportunity designed for graduate students to enhance their classroom, laboratory, and research learning through participation and experience in various organizational/industrial environments where theory is applied to practice. Graduate Cooperative Education experiences may be integrated with the student’s thesis or research project areas, or be solely for the purpose of gaining professional experience related to the student’s major field of study. Registration in this course will serve to maintain full-time student status for the period of time that the student is on a co-op assignment.

Master of Engineering Program

The Master of Engineering Program is a graduate degree program that targets currently employed engineers. The objective of this program is to provide engineers in industry with technical as well as business, management, and teamwork skills. The program differs from a traditional Master of Science degree in engineering by combining core courses that focus on the engineering-business environment and technical elective courses that concentrate on contemporary industrial practice rather than research.

The Master of Engineering Program prepares students to enhance their role as corporate leaders and provides an environment in which practicing engineering professionals can address the increasingly wide range of technical, management, financial and interpersonal skills demanded by an ever-expanding and diverse global industry base.

The Master of Engineering Program requires 30 credit hours of course work that include 18 credit hours of core courses and 12 credit hours of technical electives that are chosen from focus areas (see below). It is possible to complete the Master of Engineering degree program within a two-year (six semester), part-time, program of study, although most students choose to complete the program over a seven-nine semester period. The core courses are aimed at equipping participants with
The Program
The program consists of a set of six core courses and a four course technical elective sequence (a total of 30 credit hours are required). The core courses provide a common base of study and experience with problems, issues, and challenges in the engineering business environment. The technical course sequence provides an opportunity to update disciplinary engineering skills and to broaden interdisciplinary skills. Up to six transfer credits may be approved for graduate-level courses taken at Case Western Reserve or another accredited university.

Core Courses
- Team Leadership, Presentation Skills and Professional Assessment and Development (EPOM 400 A, B & C)
- Introduction to Business for Engineers (EPOM 401)
- Product/Process Design and Implementation (EPOM 403)
- Applied Engineering Statistics (EPOM 405)
- Engineering Economics/Financial Analysis (EPOM 407)
- Master of Engineering Capstone Project (EPOM 409)

Technical Electives
Four courses are chosen from the technical concentration areas below. For detailed course offerings in these areas, please refer to the Master of Engineering program information at www.engineering.case.edu/meng/.

- Biomedical Engineering
- Chemical Engineering
- Computer Engineering
- Infrastructure Engineering
- Macromolecular Science and Engineering
- Materials Processing and Synthesis
- Mechanical Engineering
- Robotics and Control
- Software Engineering
- Signal Processing and Communications

Master of Engineering Program
Course Descriptions
EPOM 400A. Engineering Professionalism: Team Leadership in Effective Groups (1)
This course is designed as an experience-based process to increase understanding of teams and group processes especially as they relate to leadership and project management. Students will examine human behavior in groups for the purpose of developing competence in group process management. Groups will become the essential unit for teaching and learning with the instructor serving as the facilitator. Students will be encouraged to examine group process from the perspective of the member, leader, and change agent. In addition, they will develop skills to facilitate and intervene in group processes to assure the achievement of desired group goals and outcomes.

EPOM 400B. Engineering Professionalism: Presentation Skills for Effective Leaders (1)
This course uses a combination of lecture and workshop formats to prepare students to make convincing presentations and hold effective meetings in a business setting. It will address the following: organizing materials, building persuasive content, developing effective vocal and physical presentation skills that will engage the audience, and develop meeting facilitation skills. Criteria for good presentation and facilitation skills will be standardized in all Master of Engineering core courses. Based on these criteria, standardized feedback can be established and given to reinforce effective performance as well as needed areas of improvement.

EPOM 400C. Engineering Professionalism: Professional Development (1)
The goals of the course are to help students learn methods for assessing their knowledge, abilities, and values relevant to their engineering careers, and for acquiring new professional knowledge and skills throughout their career. Students will initially assess their own values, personality style, and organizational competencies. After learning about emotional intelligence at work, each student will solicit and receive feedback from people at different levels in their organization about their work effectiveness.

EPOM 401. Introduction to Business for Engineers (3)
This course provides an introduction to the business environment for practicing engineers. The course emphasizes the interaction between business and engineering in the context of the competitive marketplace (economics), how engineering proposals are evaluated (finance), the relationship between product and customer (marketing), making effective use of micro-disciplinary teams (organizational behavior), and the manufacturing and production process (operations).

EPOM 403. Product and Process Design and Implementation (3)
The course is taught through a series of lectures, class discussions, group projects and case studies. The course aim is to provide a solid understand-
one calendar year of additional study and may be entered following a student's Junior or Senior year. The program prepares engineers to work in different business environments. A rigorous curriculum prepares graduates to build synergy between the technical possibilities of engineering and the profit-loss responsibilities of management. This program evolved after years of research and interviews with over 110 professionals and twenty-eight corporations in the U.S.

The Program
The program includes 42 credit hours of graded course work. The ten-course core sequence makes up 30 of these hours. Students choose an area of concentration, either technology entrepreneurship or biomedical entrepreneurship, for the remaining 12 credits. The Program prepares participants to function as technical leaders with a unique blend of broadened engineering and management skills, which can have a strategic impact on the organization's bottom line. Graduates are uniquely positioned for rapid advancement in technology-based organizations.

TEN CORE COURSES
• Professional Development (IIME 400)
• Project Management (IIME 405)
• Accounting, Finance, and Engineering Economics (IIME 410)
• Materials and Manufacturing Processes (IIME 415)
• Product and Process Design, Development and Delivery I & II (IIME 430 A & B)
• Information Technology & Systems (IIME 420)
• Understanding People and Change in Organizations (IIME 425)
• Engineering Entrepreneurship I & II (IIME 450 A & B)

Technology Entrepreneurship Concentration
• Design for Manufacturing and Manufacturing Management I & II
• Engineering Statistics and Quality I & II
• Biomedical Entrepreneurship Concentration
• Engineering Statistics for Biomedical Applications
• Models for Health Care and Regulatory Affairs

Two courses from the following areas:
• Biomedical Imaging: EBME 410, EBME 431, EBME 400, EBME 461
• Biomaterials/Tissue Engineering: EBME 403, EBME 406, EBME 408, EBME 416
• Neuroprostheses: EBME 407, EBME 507, EBME 417
• Cardiac Bioelectricity: EBME 417, EBME 501, EBME 502
• Biomedical Instrumentation and Sensors: EBME 403, EBME 414, EBME 418

MASTER OF ENGINEERING AND MANAGEMENT PROGRAM

Course Descriptions
IIME 400. Professional Development (3)
The goal of the course is to help students learn methods for assessing their knowledge, abilities, and values relevant to engineering and management, and for the acquiring of new professional knowledge and skills throughout their career. Recommended preparation: Senior status in engineering.

IIME 405. Project Management (3)
Project Management is concerned with the management and control of a group of interrelated tasks required to be completed in an efficient and timely manner for the successful accomplishment of the objectives of the project. Since each project is usually unique in terms of task structure, risk characteristics and objectives, the management of projects is significantly different from the management of repetitive processes designed to produce a series of similar products or outputs. Large-scale projects are characterized by a significant commitment of organizational and economic resources coupled with a high degree of uncertainty. Thus, the objective of the course is to understand what are the main issues and problems in the management of projects and to have a thorough knowledge of the conceptual models and techniques available to deal with them. Recommended preparation: Senior status in engineering.

IIME 410. Accounting, Finance, and Engineering Economics (3)
This class uses a combination of class lecture and discussion, in combination with problem-type and case-type assignments, to introduce you to key concepts and tools of financial economics. You are expected to use the resources at your disposal, such as the textbook or the accounting dictionary, to help you understand any unfamiliar concepts. Normally, each class will be divided into two sections. The first part of each class session will be devoted to discussions of selected problems and cases, with focus on the specific topics being covered. The second part of each class will be devoted to prepare you for the following session class assignments. Recommended preparation: Senior status in engineering.

IIME 415. Materials and Manufacturing Processes (3)
A survey course on contemporary and modern materials and their processing, the course begins with a review of traditional materials, including metals, ceramics, plastics, and composites. The evolution of the materials will be traced from their beginnings as raw resources and precursors to finished products. Topics will emphasize modern manufacturing methods and materials. Traditional and modern tools for materials and process characterization will be an important part of the course. Special attention will be directed to examples of statistical methodology and information technology. Visits to local industries and presentations by participating companies will reinforce the information presented in the classroom. Recommended preparation: Senior status in engineering.

IIME 420. Information Technology and Systems (3)
This course is intended to provide students with a perspective of effective use and management of information technology. The primary thrust will be to explain the enabling role of information technology, and how this insight can provide a competitive advantage for industrial organizations in many application areas. In order to accomplish this, technologies such as telecommunications and networking, distributed systems, data management systems, software development, electronic commerce, and the use of multimedia, internet, and web-based systems will be investigated. The impact of these IT technologies for improved industrial productivity and competitiveness. Recommended preparation: accredited bachelor's degree in engineering.

IIME 425. People Issues and Change in Organizations (3)
This course is intended to help students assess events occurring in organizations from a behavioral and human resources perspective and to help them develop strategies for managing these events. The course applies knowledge from the fields of organizational behavior and human resource management to provide an understanding and the skills needed to be effective in organizations. The fields of Organizational Behavior and Human Resource Management are devoted to the study of how human beings act in organized settings and how organizations can affect human behavior through a variety of policies, practices, structures, and strategies. In today's environment, organizations are faced with high levels of international competition and an increasing pace of technological, market, and social changes. As an organizational member, you are expected to successfully operate within these increasingly complex demands as well as help create and guide change. The purpose of this course is to provide you with the framework and tools needed to analyze and operate in the changing organization. We will examine some of the features that characterize an emerging organizational form and contrast this to its traditional predecessor. The focus of the course will be on the skills you will need to operate in the "new" organization including skills for being a change agent working in entry level and early career managerial roles. Recommended preparation: accredited bachelor's degree in engineering plus summer job experience.

IIME 430A. Product and Process Design, Development, and Delivery I (3)
An integrated approach to the teaching of the complex relationship of customer to designer and to manufacturer, this course will be team taught by...
Faculty from Weatherhead School of Management and Case School of Engineering, with participation of corporate representatives sponsoring projects for the teams. The course will be built on a series of projects, each emphasizing different aspects of the product/process design experience, selected to provide exposure to a wide variety of entrepreneurial activities. The project activities are expected to promote the development of realistic activities of cross-functional teams. Recommended preparation: accredited bachelor’s degree in engineering plus summer job experience.

IIME 430B. Product and Process Design, Development, and Delivery (3)
An integrated approach to the teaching of the complex relationship of customer to designer and to manufacturer, this course will be team taught by faculty from Weatherhead School of Management and Case School of Engineering, with participation of corporate representatives sponsoring projects for the teams. The course will be built on a series of projects, each emphasizing different aspects of the product/process design experience, selected to provide exposure to a wide variety of entrepreneurial activities. The project activities are expected to promote the development of realistic activities of cross-functional teams. Recommended preparation: IIME 430A.

IIME 435. Design for Manufacturing and Manufacturing Management (3)
This course introduces concepts for helping make designs more manufacturable and for making the manufacturing process more successful through better planning and control. It is related to the product and process design course, in that it picks up where that course stops. We study how to plan and control the manufacturing process, given the design for manufacturing. The course will include quantitative analysis for cases that will be performed on microcomputer software.

IIME 440. Engineering Statistics and Quality (3)
This course provides an introduction to managing quality throughout the supply chain in both manufacturing and service organizations, utilizing the popular Six Sigma approach. The familiar DMAIC (define, measure, analyze, improve control) problem solving approach will be emphasized. Students will learn the basic tools of quality (such as cause-and-effect diagrams for brainstorming), quality processes (such as benchmarking), and quality management including quality planning, quality control, and quality improvement. The course will include the subject of statistical process control, an integral component of Six Sigma.

IIME 445. Engineering Statistics for Biosciences (3)
This course provides an introduction to biostatistics, emphasizing experimental design, analysis of data, and special emphasis on statistical and financial aspects of randomized clinical trials for biomedical applications. There will be a final project involving development of a clinical trial protocol including the experimental design, recruitment and retention strategy, analysis plan and budget. Offered as BIOS 448, HSMC 448, and IIME 445.

IIME 446. Models of Health Care Systems (1.5)
This course is for professionals who will pursue their careers in, or associated with, the health care industry; and therefore, need to understand the structure, operations and decision influences in the health care delivery system. The course is intended to develop competence and confidence in the participant’s ability to understand and operate in the industry, the largest and, perhaps, the most complex in the United States. It is applicable to the private and public, profit and not-for-profit sectors. In this course students are introduced to: the different systems of care delivery; their organization and operations; their markets and the nature of the demand for their services; and the dynamics of their interaction among themselves and with other entities in the industry (e.g., payors/insurers, regulators and accreditors, technology and pharmaceutical suppliers). Offered as HSMC 446 and IIME 446.

IIME 447. Regulatory Affairs for the Biosciences (1.5)
This mini-course introduces students to the Food and Drug Administration (FDA) and the laws and regulations it enforces. A scientific regulatory agency with far reaching enforcement authority, FDA is the most powerful consumer protection agency in the world. This course will familiarize students with FDA’s mission, philosophy and organizational structure, as well as policy and procedure it uses to ensure the safety and effectiveness of the food, drugs, biologics, cosmetics, medical devices and radiation-emitting products it regulates. Recommended preparation: Enrollment in the MEM Bio-medical Entrepreneurship Track. Offered as BIOS 447, HSMC 447, and IIME 447.

IIME 450A. Engineering Entrepreneurship I (3)
The nature and importance of entrepreneurship is an area of importance to business leaders, educators, politicians, and individual members of the society. It is a driver of economic development and wealth creation in organization units ranging in size from the individual company to entire nations. Technology-based entrepreneurship is particularly important to this economic development due to its impact on productivity and its potential for exponential growth. To create something new and of value to both the organization and the market requires a technical individual who is willing to assume the social, psychic, and financial risks involved and achieve the resulting rewards whether these be monetary, personal satisfaction, or independence. This can occur while starting an enterprise (i.e., entrepreneur) or while driving innovation in an existing organization (intrapreneurship). This course will also take students through a variety of issues related to enhancing innovation in the context of a technology-based organization. This is sometimes termed intrapreneurship and includes innovating new products and services within an organization. This is a very complex field and relatively young. Students will learn that there are not many “absolute truths,” but there are numerous best practices and benchmarks that can assist the intrapreneur. Recommended preparation: accredited bachelor’s degree in engineering plus summer job experience.

IIME 450B. Engineering Entrepreneurship II (3)
IIME 470. Independent Projects (3)
This course is designed for students wishing to expand experiential learning opportunities at the interface of engineering and management. Preferred focus areas in entrepreneurship and opportunity assessment, product design and development, and manufacturing planning and management. Project ideas along with milestone, deliverables, and potential corporate clients need to be arranged in advance.

MASTER OF SCIENCE DEGREE PROGRAMS

Recognizing the different needs and objectives of resident and non-resident graduate students pursuing the master’s degree, two different plans are offered. In both plans, transfer of credit from another university is limited to six hours of graduate-level courses, taken in excess of the requirements for an undergraduate degree, approved by the student’s advisor, the department chair, and the dean of graduate studies. All Master of Science degree programs require the submission of a Planned Program of Study which must be approved by the engineering department and the dean of graduate studies, and which must be submitted before registering for the last 9 course credits of the program.

Master’s Thesis Plan
Minimum requirements for the degree of Master of Science in a major field under this plan are:

1. Completion of 18 hours of graduate course work. The courses must be approved by the department offering the degree.
2. Completion of nine hours of thesis work culminating in a thesis examination given by at least three professors, plus approval by the chair of the department offering the degree. A student with research experience equivalent to a thesis may petition the Graduate Committee of the Case School of Engineering for substitution of nine hours of course work for the thesis requirement. In this case, the thesis examination above is replaced by a similar examination covering the submitted research work and publications.

At least 18 hours of total course work, including up to 9 hours of thesis research, must be at the 400 level or higher.
Master's Comprehensive Plan
Students may pursue either a project or non-project track under this option. Minimum requirements for the degree of Master of Science in a major field under this plan are

1. Project track: Completion of 27 hours of graduate course work including three to six hours of Special Problems. Special Problems course work must consist of an engineering project approved by the chair of the department offering the degree, and may be carried out at the student's place of employment with nominal supervision by a faculty advisor or in the division laboratories under direct supervision. The project must culminate in a written report and examination by at least three professors plus approval by the chair of the department offering the degree. The Special Problems course may be waived for students who have had industrial design or research experience and who submit sufficient evidence of this experience in the form of a publication or internal report. For these students, a minimum of 27 hours of course work and the final oral examination covering the submitted publications or reports as well as related course material will be required for the master's degree. At least 18 hours of course work including up to 6 hours of Special Problems must be at the 400 level or higher.

or

2. Non-project track: Students who register for 27 hours, not including Special Problems course work, must pass satisfactorily a comprehensive examination to be administered by the department or curricular program committee. The examination may be written or oral or both. A student must be registered during the semester in which any part of the comprehensive examination is taken. If not registered for other courses, the student will be required to register for one semester hour of EXAM 600, Comprehensive Examination, before taking the examination.

UNDESIGNATED MASTER OF SCIENCE DEGREE
A student working toward an undesignated Master of Science degree in engineering must select a department. The student is responsible for submitting a Planned Program of Study, which must have the approval of the engineering department and the dean of graduate studies, and which must contain a minimum of 9 semester hours of course work in the department approving the program. A minimum of 18 semester hours of course work for the degree must be at the 400 level or higher. The student must meet all the requirements of the designated Master of Science degree in engineering.

DOCTOR OF PHILOSOPHY DEGREE
The student's Ph.D. program should be designed to prepare him or her for a lifetime of creative activity in research and in professional engineering practice. This may be coupled with a teaching career. The mastery of a significant field of knowledge required to accomplish this purpose is demonstrated by an original contribution to knowledge embodied in a thesis and by satisfactory completion of a comprehensive course program which is intensive in a specific area of study and includes work in other areas related to, but not identical with, the major field. The necessity for breadth as well as depth in the student's education cannot be overemphasized. To this end, any engineering department may add additional requirements or constraints to ensure depth and breadth appropriate to its field.

No student may be admitted to candidacy for the Ph.D. degree before approval of his or her Planned Program of Study by the Advisory Committee and the engineering department. After this approval has been obtained, it is the responsibility of the student's department to notify the dean of graduate studies of his or her admission to candidacy after the student has fulfilled any additional department requirements. Minimal requirements in addition to the university requirements are

1. The minimum course requirement beyond the B.S. level is 36 credit hours of courses taken for credit, at least 18 hours of which must be taken at Case Western Reserve University. The following courses taken for credit will be acceptable for a Ph.D. program of study:
   a. All 400-, 500-, and 600-level courses,
   b. Those 300-level courses approved by the student's department up to a maximum of three beyond the B.S. or a maximum of one beyond the M.S., and
   c. Approved graduate-level courses taken at other institutions
2. A minimum depth in basic science equivalent to six semester hours (for credit) is required. This requirement is to be satisfied by courses that have been previously approved by the faculty of the department in which the student is enrolled.
3. The requirement for breadth is normally satisfied by a minimum of 12 semester hours of courses (for credit) outside the student's major area of concentration as defined by the student's department and does not include courses taken to fulfill the basic science requirement.
4. A minimum of three teaching experiences as defined by the student's department. All programs of study must include departmental 400T, 500T, and 600T courses to reflect this requirement. All students fulfilling teaching duties must complete UNIV 400.
5. The minimum requirement for research is satisfied by at least eighteen hours of thesis (701) credits.
6. A cumulative quality-point average of 3.0 or above in all courses taken for credit as a graduate student at Case Western Reserve University (excluding grades in thesis research and grades of R) is required for the award of the doctoral degree.

Qualifying Examination
The student must pass a qualifying examination relevant to his or her area of study as designated by the curricular department with which he or she is affiliated. For students who obtain the M.S. degree from Case Western Reserve University, the qualifying examination should be taken preferably before the end of the student's fourth semester of graduate study but no later than the end of the fifth semester at the university. For students entering with the master's degree the examination should be taken no later than the end of the third semester at the university.

Planned Program of Study
Each student is required to submit a Planned Program of Study, detailing his or her course work, thesis schedule, and qualifying examination schedule and indicating that all the minimum requirements of the university and the faculty of the Case School of Engineering are satisfied. This Planned Program of Study must be approved by the advisory committee and the engineering department before registering for the last 18 credits hours of the program.

If the student is pursuing the Ph.D. degree without acquiring the M.S. degree, a petition to waive the requirement of the M.S. degree should be approved by the departmental advi-
sor, the chair and submitted to the dean of graduate studies. All required courses taken at the university beyond the B.S. degree should be shown on the Planned Program of Study with the grade if completed. If the requirements are to be fulfilled in other than the standard ways described above, a memorandum requesting approval should be submitted to the dean of graduate studies.

The Planned Program of Study must be submitted within one semester after passing the qualifying examination.

INTERDISCIPLINARY RESEARCH CENTERS

Interdisciplinary research centers act as intensive incubators for students and faculty doing research and studying applications in specialized areas. Thirteen research centers and research programs at the Case School of Engineering have been organized to pursue cutting-edge research in collaboration with industrial and government partners. The transfer of technology to industry is emphasized in all the centers.

The educational programs of these centers encompass the training of graduate students in advanced methods and strategies, thus preparing them to become important contributors to industry after graduation; the involvement of undergraduates in research; the presentation of seminars that are open to interested members of the community; and outreach to public schools to keep teachers abreast of scientific advances and to kindle the interest of students in seeking careers in engineering.

Advanced Platform Technology (APT) Center
Louis Stokes Cleveland Veterans Affairs 10701 East Boulevard, Mail Stop 151 AW/APT Cleveland, Ohio 44106 www.aptcenter.research.va.gov Phone: 216-707-6421 Fax: 216-707-6420 Ronald J. Triolo, Executive Director e-mail: ronald.triolo@case.edu

The Advanced Platform Technology (APT) Center brings together top faculty and researchers from Case Western Reserve University and the Cleveland Veteran’s Affair Medical Center to capture the most recent developments in the fields of microelectronics and material science and focus them on the practical medical needs of individuals disabled by sensorimotor dysfunction or limb loss. The APT Center creates novel, cross-cutting technologies for the diagnosis, treatment or study of high priority clinical conditions within a structured framework that facilitates regulatory compliance, outsourcing by contract manufacturers, and dissemination within the rehabilitation community. Center projects to date have concentrated primarily on developing new materials and microsystems for interfacing with the nervous system, repairing orthopaedic trauma and accelerating wound healing, replacing or restoring natural limb, somatosensory and organ system function, and both monitoring and promoting neurological, genito-urinary and vascular health.

The APT Center was established as a VA R&D Center of Excellence in 2005 and is based at the Louis Stokes Cleveland VAMC (CVAMC). The Center is able to provide the following resources for developing, testing and implementing neural interfaces: 1) manufacture and supply of nerve- and muscle-based stimulating and recording electrodes 2) neural modeling and analysis of interface designs 3) polymer and bioactive material development 4) Microelectromechanical (MEMS) systems design and fabrication 5) rapid prototyping 6) pre-clinical in vitro and in vivo verification of electrode and neural interface performances 7) circuit and software design and 9) system validation and design control documentation.

Case Advanced Power Institute (CAPI)
124 A.W. Smith Building (7217) Phone: 216-368-2472 Fax: 216-368-0953 Thomas A. Zawodzinski, Director e-mail: taz5@case.edu

The Case Advanced Power Institute (CAPI) is a center for research, education, industry stimulation and outreach activities in energy efficient technologies. The current focus is on various fuel cell technologies. CAPI combines the strengths and legacy of fuel cell related research and development at Case Western Reserve University with new generation of leading scientists and engineers. Specifically CAPI R&D is focused on enabling the commercialization of fuel cells. CAPI activities range from studying the fundamentals of the phenomena taking place within the fuel cell to completing performance and system level studies and mathematical modeling. The CAPI Affiliates Program gives industry the opportunity to work directly with expert fuel cell researchers and state-of-the-art capabilities, at below standard rates. Affiliates are consulted on topic areas critical to CAPI research and have access to results from the research program.

Center for Cardiovascular Biomaterials (CCB)
202 Wickenden Building (7207) www.case.edu/affil/CCB/ccbhome.htm Phone: 216-368-3005 Fax: 216-368-4969 Roger E. Marchant, Director e-mail: rmx4@case.edu Anirban Sen Gupta, Associate Director Phone: 216-368-4564 Fax 216-368-4969 e-mail: anirban.sengupta@case.edu

The Center for Cardiovascular Biomaterials (CCB) carries out research and development projects to investigate new biomaterials, tissue engineered materials, and targeted drug delivery systems, for use in cardiovascular applications and implants. CCB also provides researchers access to shared use facilities, which includes high resolution microscopy such as AFM, molecular spectroscopies, surface analysis, and polymer and peptide synthesis capabilities. The chemical and mechanical interface between the biomaterial and the host tissue are the focus of major study, with the goals being to improve biologic function and biocompatibility in the response of the human body to implants. Current projects include investigation of thrombosis (blood clotting) and infection mechanisms due to cardiovascular prosthesis, biomimetic design of novel biomaterials for cardiovascular and neural implants; cardiovascular and neural tissue engineering based on biomimetic designs. Studies at the cell and molecular level assist our understanding of the underlying mechanisms, so that novel biomedical materials may be designed, prepared, and characterized.

Center for In Situ Cell and Tissue Imaging
Department of Biomedical Engineering Wickenden 307 http://bme.case.edu/mechbio/facilities.html Phone: 216-368-5884 Fax 216-368-4969 Melissa Knothe Tate, Director email: mkt4@case.edu

The Center for In Situ Cell and Tissue Imaging (CISCTI) is designed to offer state of the art and cutting edge imaging capabilities to the biomedical community at Case Western Reserve University. The center showcases a custom-configured instrument based on the Leica TCS SP2 AOBS Spectral confocal microscope system (Leica Microsystems, Mannheim, Germany). The tunable acousto-optical beam splitter (AOBS) provides selection and examination of any portion of the visible and near-IR emission wavelengths set.
for a given dye or chosen for unique research applications; it allows for spectroscopy at length scales from tissue to cellular to subcellular. The microscope is configured with software for fluorescence recovery after photobleaching (FRAP), which provide diffusion rates of fluorescence-marked macromolecules. The upright design of the microscope allows not only examination of slides and cell cultures, but also thicker, opaque objects. The removable stage allows use of large objects, with the confocal scanning feature still functional, because it is built into the motorized nosepiece and not into a motorized stage as in other confocal microscopes. For example, the system allows for live animal and/or cell imaging concomitant fluorescent spectroscopy, patch clamping, fluorescence recovery after photobleaching (FRAP), tracking of molecular transport (e.g. drug delivery), and digital video documentation. In order to assist in preparation of specimens for imaging, a state of the art histology core lab (part of CISCCTI) is set up to carry out fixation, embedding, and sectioning of soft and hard tissues. Through a Ohio Board of Regents BRTT grant (Clinical Tissue Engineering Center, CTEC), the CISCCTI has recently acquired a stereolithography rapid prototyping system (3D Systems Viper si2).

Center for Layered Polymeric Systems (CLiPS)
NSF Science and Technology Center 420 Kent Hale Smith Building 2100 Adelbert Road Cleveland, Ohio 44106-7202 http://clips.case.edu Phone: 216-368-4203 Fax: 216-368-6329 Eric Baer, Director email: exb6@case.edu Anne Hiltner, Co-Director email: pah6@case.edu

Exploration of multilayered polymeric systems at the micro- and nano-layer levels reveals unique properties and capabilities that are different, and often not predicted, from systems involving the same materials on a larger scale. Technology refined within CLiPS allows the production of films and membranes composed of hundreds or thousands of layers. These extremely thin layers promote interactions approaching the molecular level between the materials used in the process.

CLiPS research focus includes four major areas: the enabling technology which is the continuing refinement of and innovation in the multilayering process; exploration of membranes and transport phenomena for applications such as food and electronic packaging, drug delivery, and diagnostic devices; optoelectronic systems which involves applications in information, electronic and laser technologies; and science and technology initiatives which is directed toward innovation with multilayer technology to create new polymeric structures.

CLiPS was established in 2006 with funding by the National Science Foundation as a Science and Technology Center. It is the first NSF STC ever to be established at Case Western Reserve University. CLiPS is a national center involving close partnership with the University of Texas, Fisk University, the University of Southern Mississippi, and the Naval Research Laboratory, and an important educational partnership with the Cleveland Metropolitan School District.

CLiPS researchers and educators work together to accomplish the Center’s mission of advancing the nation’s science and technology agenda through development of new materials and materials systems and for educating a diverse American workforce through interdisciplinary education programs.

Center for Modeling Integrated Metabolic Systems (MIMS) 410 Wickenden (7207) www.csuohio.edu/mims/ Phone: 216-368-4066 Fax:216-368-4969 Gerald M. Saidel, Director e-mail: gms3@case.edu

The thrust of the MIMS Center is mathematical modeling and simulation of metabolic systems in response to stresses associated with hypoxia, exercise, diet, and drug inputs. A general integrative whole-body model relates cellular to tissue metabolism with special emphasis on skeletal muscle, and heart. Biomedical research projects incorporate one or more of the metabolic stresses in which the modeling can help quantify mechanisms and predict responses that cannot be directly measured. These projects involve modeling of cell-tissue integration within an organ as well as modeling the integrated, whole-body effects of the combined tissue-organ systems. Critical experimental studies with each of the tissue-organ systems are conducted for model validation. A quantitative understanding of the complexity of cellular metabolism integrated with tissue, organ, and whole-body processes requires sophisticated mathematical models, computer simulations, and validation with experimental data. Physiologically based models incorporate cellular metabolic reactions and transport processes of a large number of chemical species. Such models allow quantitative evaluation of metabolic pathways and regulatory mechanisms under normal and abnormal conditions and associated with disease states. Consequently, these models can provide a basis for simulating the integrated effects of altering enzyme contents/activities or substrate concentrations with pharmacological agents.

Cleveland Functional Electrical Stimulation Center 11000 Cedar Avenue, Suite 230 Cleveland, Ohio 44106-3052 www.FEScenter.org Phone :216-231-3257 Fax: 216-231-3258 P. Hunter Peckham, Director e-mail: info@FEScenter.org

Functional electrical stimulation (FES) is the application of electrical currents to either generate or suppress activity in the nervous system. FES can produce and control the movement of otherwise paralyzed limbs, for standing and hand grasp; activate visceral bodily functions, such as micturition; create perceptions such as skin sensibility; arrest undesired activity, such as pain or spasm; and facilitate natural recovery and accelerate motor relearning. FES is particularly powerful and clinically relevant, since many people with neurological disabilities retain the capacity for neural conduction, and are thus amenable to this intervention.

The Center focuses its activities in four major areas: Fundamental studies to discover new knowledge; Enabling technologies for clinical application or the discovery of knowledge; Clinical research that applies this knowledge and technology to individuals with neurological dysfunction; Transfer of knowledge and technology to the clinical community and to industry.

The FES Center was established as a VA RR&D Center of Excellence in 1991 and is based at the Louis Stokes Cleveland VAMC (CVAMC). The Center is a consortium with three institutional partners: CVAMC, Case Western Reserve University (CWRU), and the MetroHealth Medical Center (MHMC). The Center fulfills its mission by integrating and facilitating the efforts of scientists, engineers, and clinicians through common goals and directions in the major clinical areas, and by providing mechanisms to accomplish these goals across the institutional partners.
The Electronics Design Center (EDC) is a multi-disciplinary educational and research Center focusing on the applications of microfabrication processing to the advancement of chemical and biological micro-systems. The Center has complete thick film and thin film processing facilities, including screen printing, ink jet printing and sputtering equipments. Other facilities supporting the microfabrication processing are also readily available.

Microfabrication Laboratory (MFL)
112 Bingham Building (7200)
http://mems.case.edu/
Phone: 216-368-2934 Fax: 216-368-8738
Chung-Chiun Liu, Director
e-mail: cxl9@case.edu

MFL houses a state-of-the-art facility that provides the latest in microfabrication and micromachining processes. The Institute focuses on the applications of microfabrication and micromachining technology to a wide range of sensors, actuators and other microelectromechanical (MEMS) systems. Application thrusts include: (i) healthcare; (ii) industrial control, automation and fault detection; (iii) portable power generation; and (iv) functional materials and structures. In addition to silicon based technology, the Institute has a unique strength in silicon carbide micromachining that is particularly valuable for applications in harsh environments. Undergraduate students, graduate students, and post-doctoral assistants use the Institute’s facilities to carry out their research or special projects. Recent developments by researchers in MFL include Schottky diode based hydrogen sensor, high temperature oxygen sensor, nano-structure tin oxide sensor, inertial sensors, micro-size pressure sensors, wireless telemetric Microsystems, miniature displays, micromechanical light modulators, microvalves, and micropumps.

MFL facilities support a state-wide network, Ohio MEMSNet, for MEMS research and development.

National Center for Space Exploration Research (NCSER)
305 Olin Building
http://mae1.cwru.edu/mae/
Phone: 216-368-0748 Fax: 216-368-0718
J. Ivan D. Alexander, Director
e-mail: ida2@case.edu

The National Center for Space Exploration Research (NCSER) is a collaborative effort between the Universities Space Research Association (USRA), Case Western Reserve University (CWRU), and NASA Glenn Research Center (GRC) that provides GRC with specialized research and technology development capabilities essential to sustaining its leadership role in NASA missions. Expertise resident at NCSER includes reduced gravity fluid mechanics, reduced gravity combustion processes, heat transfer, two-phase flow, micro-fluidics, and phase change processes, computational multiphase fluid dynamics, heat and mass transfer, computational simulation of physico-chemical fluid processes and human physiological systems. This expertise has been applied to:

- Cryogenic fluid management
- On orbit repair of electronics
- Spacecraft fire safety
- Exploration life support
- Energy storage
- Dust management
- Thermal management and control
- Environmental monitoring/control
- ISS experiment development
- Integrated system health monitoring
- Astronaut health
- Planetary Surface Mobility
- In situ resource utilization
- Materials synthesis
- Bio-fluid mechanics
- Biosystems modeling

Neural Engineering Center
112 Wickenden (7207)
http://nec.case.edu/
Phone: 216-368-3974 Fax: 216-368-4872
Dominique Durand, Director
e-mail: dxd6@case.edu

The research mission of the center is to bring to bear combined tools in physics, mathematics, chemistry, engineering and neuroscience to analyze the mechanisms underlying neuronal function and to solve the clinical problems associated with neuronal dysfunction. Research areas include: Neuromodulation, Neuroprostheses, Quantitative Neurophysiology, Neural Dynamics, Neuro-Mechanical Systems, Neural Regeneration, Neural Interfacing, Neural Imaging and Molecular Sensing, Neuro-Magnetism, and Systems Neuroscience. The education mission of the center is to provide engineers and scientists with an integrated knowledge of engineering and neuroscience capable of solving problems in neuroscience ranging from the molecules to the clinic. The center is also an outlet for technology transfer of new ideas to be commercialized by industrial partners. The center’s goals are accomplished by fostering interdisciplinary research between clinicians, scientists, students and local industry, educational experiences including didactic material, laboratory experience and clinical exposure, and close ties to industrial partners.

ThinkTank for Multiscale Computational Modeling of biomedical and Bio-inspired Systems
Department of Mechanical & Aerospace Engineering
10900 Euclid Avenue
Glennan 418
http://bme.case.edu/mechbio/facilities.html
Phone: 216-368-5884 Fax: 216-368-4969
Melissa Knothe Tate, Director
e-mail: mkt4@case.edu
Christopher Hernandez, Vice Director
e-mail: cjh29@case.edu

Typically, computational modelers share common approaches to diverse research and development problems. By providing a common space and infrastructure (software licenses and hardware) for computational modelers to work, we hope to promote exchange of modeling experience and expertise and to promote cross-departmental as well as cross-institutional collaborations. The ThinkTank provides a home for several international computational collaborations as well.

BIOMEDICAL ENGINEERING

The mission statement of the Case Western Reserve University Department of Biomedical Engineering (BME) is:
To promote human health through education and research that bridges the gap between medicine and engineering. Our faculty and students play leading roles ranging from basic science discovery to the creation, clinical evolution, and commercialization of new technologies, devices and therapies. In short, we are “Engineering Better Health.”

Graduates in biomedical engineering are employed in industry, hospitals, research centers, government, and universities. Biomedical en-
Biomedical engineering was established in 1968 at Case Western Reserve University. As one of the pioneer programs in the world, it has become a strong and well-established program in research and education with many unique features. It was founded on the premise that engineering principles provide an important basis for innovative and unique solutions to biomedical problems. This philosophy has been the guide for the successful development of the program, which has been emulated by many other institutions. Quantitative engineering for biomedical applications remains the cornerstone of the program and distinguishes it from biomedical science programs. In addition to dealing with biomedical problems at the tissue and organ-system level, the department’s educational programs have a growing emphasis on cellular and subcellular mechanisms for understanding of fundamental processes as well as for systems approaches to solving clinical problems. Current programs lead to the B.S., M.S., combined B.S./M.S., Ph.D., and M.D./Ph.D. in biomedical engineering. In all of the BME programs at Case, the goal is to educate engineers who can apply engineering methods to problems involving living systems. The Case School of Engineering and the School of Medicine are in close proximity on the same campus. The Biomedical Engineering faculty members carry joint appointments in the two schools and participate in the teaching, research, and decision-making committees of both schools. The department is close to several major medical centers (University Hospitals, Cleveland Clinic, VA Medical Center, and MetroHealth Medical Center). As a result, there is an unusually free flow of academic exchange and collaboration in research and education among the schools and institutions. All of Case’s BME programs take full advantage of faculty cooperation among university departments, which adds significant strength to the programs.

FACULTY

Primary Appointments

Jeffrey L. Duerk, Ph.D.
(Case Western Reserve University)
Associate Professor, Biomedical Engineering
Rapid MR imaging and Image guided procedures. New methods for MR acquisition and reconstruction with particular emphasis in cancer and cancer therapeutics

Eben Alsbarg, Ph.D.
(University of Michigan)
Assistant Professor
Biomimetic tissue engineering: innovative biomaterials and drug delivery vehicles for functional tissue regeneration and cancer therapy; control of stem cell fate decision; precise temporal and spatial presentation of signals to regulate cell behavior; mechanotransduction and the influence of mechanics on cell behavior and tissue formation; cell-cell interactions

James P. Basilion, Ph.D.
(The University of Texas)
Associate Professor (joint with Radiology)
High resolution imaging of endogenous gene expression; definition of “molecular signatures” for imaging and treatment of cancer and other diseases; generating and utilizing genomic data to define informative targets; strategies for applying non-invasive imaging to drug development; novel molecular imaging probes and paradigms

Patrick E. Crago, Ph.D.
(Case Western Reserve University)
Professor and Associate Dean of Engineering
Control of neuroprostheses for restoration of motor function; neuromechanics; modeling of neuromusculoskeletal systems

Dominique Durand, Ph.D.
(University of Toronto, Canada)
Elmer L. Lindseth Professor, Neural Engineering Center
Neural Engineering, neural interfacing, neural prostheses, computational neuroscience, neurophysiology and control of epilepsy

Steven J. Eppell, Ph.D.
(Case Western Reserve University)
Associate Professor
Biomaterials, instrumentation, synthesis of nanophase bone substitute, nanoscale structure-function analysis of orthopaedic biomaterials; scanning probe microscopy and spectroscopy of skeletal tissues

Miklos Gratzl, Ph.D.
(Technical University of Budapest, Hungary)
Associate Professor
Biomedical sensing and diagnostics in vitro and in vivo; electrochemical and optical techniques; BioMEMS for cellular transport; cancer multidrug resistance at the single cell level; sliver sensor for multianalyte patient monitoring

Kenneth Gustafson, Ph.D.
(Arizona State University)
Assistant Professor
Neural engineering; neural prostheses; neurophysiology and neural control of genitourinary function; devices to restore genitourinary function; functional neuromuscular stimulation

J. Lawrence Katz, Ph.D.
(Polytechnic Institute of Brooklyn)
Professor Emeritus
Structure-property relationships in bone and teeth, osteophilic biomaterials, ultrasonic studies of tissue anisotropy, scanning acoustic microscopy

Robert F. Kirsch, Ph.D.
(Northwestern University)
Professor
Restoration of movement using neuroprostheses; neuroprosthesis control system design; natural control of human movements; biomechanics of movement; computer-based modeling; system identification

Melissa Knothe Tate, Ph.D.
(Swiss Federal Institute of Technology ETH, Zurich, Switzerland)
Associate Professor (joint with Mechanical and Aerospace Engineering)
Cell and protein interactions with biomaterials; liposome drug delivery; bacterial adhesion; surface modification of cardiovascular devices; targeted liposome drug delivery; bacterial adhesion; cell and protein interactions with biomaterials using atomic force microscopy

Roger Marchant, Ph.D.
(Case Western Reserve University)
Professor, Director, Center for Cardiovascular Biomaterials
Self-assembling biomimetic materials; vascular tissue engineering, novel biomaterials for surface modification of cardiovascular devices and hydrogels for tissue engineering; targeted liposome drug delivery; bacterial adhesion; cell and protein interactions with biomaterials using atomic force microscopy

J. Thomas Mortimer, Ph.D.
(Case Western Reserve University)
Professor Emeritus
Neural prostheses; electrical activation of the nervous system; bowel and bladder assist device; respiratory assist device; selective stimulation and electrode development; electrochemical aspects of electrical stimulation

P. Hunter Peckham, Ph.D.
Tissue engineered epithelia; pre-vascularized polymer scaffolds for tissue engineering; directed stem cell differentiation; novel stimuli responsive biomaterials for gene and drug delivery; systems biology approaches to the identification of angiogenic factors

David L. Wilson, Ph.D.
(Rice University)
Professor
Biomedical image processing; digital processing and quantitative image quality of X-ray fluoroscopy images; interventional MRI

Xin Yu, Sc.D.
(Harvard-MIT)
Associate Professor
Cardiovascular physiology; magnetic resonance imaging and spectroscopy; characterization of the structure-function and energy-function relationships in normal and diseased hearts; small animal imaging and spectroscopy

Research Appointments

Niloy Bhadra, M.D., Ph.D.
(Case Western Reserve University)
Research Assistant Professor
High-frequency nerve block, functional electrical stimulation, neurowhires

Ann-Marie Broome, Ph.D.
(Case Western Reserve University)
Research Assistant Professor
Molecular Imaging of complex signatures in cancer, in vivo/in vitro imaging of cellular mechanisms In differentiation, inflammation, and carcinogenesis: signaling of chemotactic peptides In epithelia

Zhilin Hu, Ph.D.
(The Chinese Academy of Sciences)
Research Assistant Professor
Biophotonics and biomedical optics; optical coherence tomography (OCT) for microscoppic biomedical imaging in vivo; development of OCT imaging technology and quantitative image analysis for medical diagnostics, screening and guided therapy and for biomedical science

Junnin Zhu, Ph.D.
(Peking University)
Research Assistant Professor
Design and synthesis of nanobiomaterials, bioactive hydrogels, and self-assembly materials; biomimetic scaffolds for vascular and cartilage tissue engineering; nanocarrier systems for biomedical diagnostics and cancer therapeutics; anti-biofouling surface modification of medical devices

Secondary Appointments

Jay Alberts, Ph.D.
(Arizona State University)
Assistant Professor of Biomedical Engineering
(Cleveland Clinic)
Neural basis of upper extremity motor function and deep brain stimulation in Parkinson’s disease

James M. Anderson, Ph.D.
(Oregon State University),
M.D. (Case Western Reserve University)
Professor, Pathology, University Hospitals-Case Medical Center
Biocompatibility of implants

Harilah Baskaran, Ph.D.
(Pennsylvania State University)
Assistant Professor, (joint with Chemical Engineering)
Tissue Engineering, Cell/cellular transport processes in inflammation, wound healing, and cancer metastasis

Arnold Caplan, Ph.D.
(Johns Hopkins University)
Professor, Biology
Tissue engineering

Ronald L. Cechner, Clinical Ph.D. (Anesthesiology)
(Case Western Reserve University)
Assistant Professor, Anesthesiology and Associate Professor, Biomedical Engineering and Pathology, Technical Director, Anesthesia Simulation Laboratory, University Hospitals-Case Medical Center
Simulation in medical education

John Chae, M.D.
(New Jersey Medical School)
Associate Professor, Physical Medicine and Rehabilitation, MetroHealth Medical Center
Application of neuroprostheses in hemiplegia

Hillel J. Chiel, Ph.D.
(Massachusetts Institute of Technology)
Professor, Biology
Biomechanical and neural basis of feeding behavior in the marine mollusk Aplysia californica; neumechanical system modeling; analysis of neural network dynamics

Guy Chisolm, Ph.D.
(University of Virginia)
Professor, Cell Biology, Cleveland Clinic
Vascular biology; lipoprotein-cell interactions

Janis J. Daly, Ph.D.
(University of Akron)
Margot Damaser, Ph.D.
(University of California)
Assistant Professor, Biomedical Engineering, Cleveland Clinic
Biomechanics and neural control of the female pelvic floor and lower urinary tract in normal and dysfunctional cases

Brian Davis, Ph.D.
(Pennsylvania State University)
Assistant Professor, Molecular Medicine (Biomedical Engineering, Cleveland Clinic)
Human locomotion and biomechanics

David Dean, Ph.D.
(City University of New York)
Associate Professor, Neurological Surgery, Anatomy, Orthodontics, University Hospitals-Case Medical Center
Bone tissue engineering, photodynamic therapy, radiosurgery treatment planning

Louis F. Dell’Osso, Ph.D.
(University of Wyoming)
Professor, Neurology, VA Medical Center
Neurophysiological and ocular motor control systems

James Dennis, Ph.D.
(Case Western Reserve University)
Assistant Professor, Orthopaedics, University Hospitals-Case Medical Center
Engineering cartilage for orthopaedic and trachea reconstruction applications; developing reagents, termed “cell paints,” that can be used to direct repair cells to specific organs and tissues

Kathleen Derwin, Ph.D.
(University of Michigan)
Assistant Professor, Molecular Medicine (Biomedical Engineering, Cleveland Clinic)
Tendon mechanobiology and tissue engineering

Isabelle Deschenes, Ph.D.
(Laval University)
Assistant Professor, Cardiology, MetroHealth Medical Center
Molecular mechanisms of cardiac arrhythmias, ion channels structure-function

Pedro J. Diaz, Ph.D.
(Case Western Reserve University)
Assistant Professor, Radiology Physics, MetroHealth Medical Center
Magnetic resonance imaging; image processing

Agata Exner, Ph.D.
(Case Western Reserve University)
Assistant Professor, Radiology, University Hospitals-Case Medical Center
Development and imaging characterization of drug delivery for cancer chemotherapy; interventional radiology

Baowei Fei, Ph.D.
(Shanghai Jiao Tong University, Shanghai)
Assistant Professor, Radiology, University Hospitals-Case Medical Center
Image registration, image-guided intervention, prostate cancer, photodynamic therapy (PDT), cellular and molecular imaging (PET and MRI)

Elizabeth Fisher, Ph.D.
(Rutgers University)
Assistant Professor, Molecular Medicine (Biomedical Engineering, Cleveland Clinic)
Quantitative image analysis for application to multiple sclerosis and neurodegenerative diseases

Christopher Flask, Ph.D.
(Case Western Reserve University)
Assistant Professor, Radiology, University Hospitals-Case Medical Center
Development of Quantitative and Molecular MRI Imaging Methods, MRI Physics

Linda M. Graham, M.D.
(University of Michigan)
Professor, Surgery (Vascular Surgery and Biomedical Engineering), Cleveland Clinic
Cell movement and vascular healing, vascular tissue engineering

Marc Griswold, Ph.D.
(University of Wuerzburg, Germany)
Associate Professor, Radiology, University Hospitals-Case Medical Center
Rapid magnetic resonance imaging, image reconstruction and processing and MRI hardware/instrumentation

Christopher J. Hernandez, Ph.D.
(Stanford University)
Assistant Professor, Mechanical and Aerospace Engineering, Director, Musculoskeletal Mechanics and Materials Laboratories
Orthopaedic Biomechanics, Imaging related to Orthopaedics

Alex Y. Huang, Ph.D.
(Johns Hopkins University)
Assistant Professor, Pediatrics, Pathology, University Hospitals-Case Medical Center / Rainbow Babies & Children’s Hospital
Dynamic high-resolution 2-photon microscopy of immune cellular migration and interaction in vivo

Michael W. Keith, M.D.
(Ohio State University)
Professor, Orthopaedic Surgery, MetroHealth Medical Center
Restoration of motor function in hands

Kandice Kottke-Marchant, Ph.D., M.D.
(Case Western Reserve University)
Professor, Molecular Medicine (Hematology, Cleveland Clinic Foundation)
Interaction of blood and materials

Kenneth R. Laurita, Ph.D.
(Case Western Reserve University)
Associate Professor, Heart & Vascular Research Center, MetroHealth Medical Center
Cellular mechanisms of cardiac arrhythmias, cellular therapy for sudden cardiac death, fluorescent imaging of transmembrane potential and intracellular calcium, calcium mediated arrhythmogenesis, instrumentation and software for imaging cardiac electrical activity

Zhenghong Lee, Ph.D.
(Case Western Reserve University)
Assistant Professor, Radiology, Nuclear Medicine, University Hospitals-Case Medical Center
Quantitative PET and SPECT imaging, multimodal image registration, 3D visualization, molecular imaging and small animal imaging systems

R. John Leigh, M.D.
(University of Newcastle-Upon-Tyne, U.K.)
Professor, Neurology, VA Medical Center
Normal and abnormal motor control of the eye

Cameron McIntyre, Ph.D.
(Case Western Reserve University)
Assistant Professor, Molecular Medicine (Biomedical Engineering, Cleveland Clinic)
Theoretical modeling of the interaction between electric fields and the nervous system; deep brain stimulation

George F. Muschler, M.D.
(Northwestern University School of Medicine, Chicago, IL)
Professor, Molecular Medicine (Orthopaedic Surgery and Biomedical Engineering, Cleveland Clinic)
Musculoskeletal oncology, adult reconstruc-
tive orthopaedic surgery, fracture non-union, research in bone healing and bone grafting materials

Raymond F. Muzic Jr., Ph.D.
(Case Western Reserve University)
Associate Professor, Radiology, Biomedical Engineering, Oncology, Division of General Medical Sciences, University Hospitals-Case Medical Center
Experiment design and analysis for positron emission tomography

Sherif Nour, M.D.
(University of Cairo, School of Medicine, Egypt)
Assistant Professor, Radiology, University Hospitals-Case Medical Center
Development of new interventional MRI techniques and percutaneous thermal ablation therapies for cancer treatment, sleep apnea, and other biomedical applications

Marc Penn, M.D., Ph.D.
(Case Western Reserve University)
Assistant Professor, Molecular Medicine (Cardiology and Cell Biology, Cleveland Clinic)
Myocardial ischemia, vascular biology, cardiac critical care

Clare Rimnac, Ph.D.
(Lehigh University)
Wilbert J. Austin Professor of Engineering and Chair, Department of Mechanical and Aerospace Engineering
Orthopaedic implant performance and design, mechanical behavior of hard tissues

David S. Rosenbaum, M.D.
(University of Illinois, Chicago)
Professor, Director, Heart & Vascular Center, MetroHealth Medical Center
Mechanisms of cardiac arrhythmias; cardiac electrophysiology; characterization of genetically engineered mice; prediction and prevention of sudden cardiac death

Mark S. Rzeszotarski, Ph.D.
(Case Western Reserve University)
Professor, Radiology, MetroHealth Medical Center
Radiological imaging: computed tomography, medical education

Jean A. Tkach, Ph.D.
(Case Western Reserve University)
Assistant Professor, Radiology, University Hospitals-Case Medical Center
Functional MR imaging

Ronald J. Triolo, Ph.D.
(Drexel University)
Associate Professor, Orthopaedics, University Hospitals-Case Medical Center, VA Medical Center, MetroHealth Medical Center
Neural prostheses, rehabilitation engineering and restoration of lower extremity function, biomechanics of human movement quantitative analysis and control of gait, standing balance and seated posture

Antonie J. van den Bogert, Ph.D.
(University of Utrecht)
Assistant Professor, Molecular Medicine (Biomedical Engineering, Cleveland Clinic)
Biomechanics of human movement

Albert L. Waldo, M.D.
(State University of New York, Downstate)
Professor, Medicine/Cardiology, University Hospitals-Case Medical Center
Cardiac electrophysiology and cardiac excitation mapping

Barry Wessels, Ph.D.
(University of Notre Dame)
Professor, Biomedical Engineering and Radiation Oncology, Director, Division of Medical Physics and Dosimetry, University Hospitals-Case Medical Center
Radiolabeled antibody therapy (Dosimetry and clinical trials), image-guided radiotherapy, intensity modulated radiation therapy, image fusion of CT, MR, SPECT and PET for adaptive radiation therapy treatment planning

Guang Hui Yue, Ph.D.
(University of Iowa)
Associate Professor, Molecular Medicine, Biomedical Engineering, Cleveland Clinic
Neural control of movement

Maciej Zborowski, Ph.D.
(Polish Academy of Science)
Associate Professor, Molecular Medicine (Biomedical Engineering, Cleveland Clinic)
Membrane separation of blood proteins

Assem G. Ziady, Ph.D.
(Case Western Reserve University)
Assistant Professor, Pediatrics, University Hospitals-Case Medical Center
Proteomics, DNA nanoparticles, mass spectrometry, cystic fibrosis, inflammation, and redox signaling

Nicholas P. Ziai, Ph.D.
(Case Western Reserve University)
Associate Professor, Pathology, University Hospitals-Case Medical Center
Vascular grafts; vascular cells; blood vessels

Adjunct Appointments

Ravi V. Bellamkonda, Ph.D.
(Brown University)
Adjunct Associate Professor, Department of Biomedical Engineering, Neurological Biomaterials and Therapeutics, Georgia Tech/Emory University
Neural tissue engineering

Richard C. Burgess, M.D., Ph.D.
(Case Western Reserve University)
Adjunct Professor of Biomedical Engineering (Neurological Computing, Cleveland Clinic)
Magnetoecephalography; Electrophysiological monitoring; EEG processing; medical informatics

Jeffrey R. Capadona, Ph.D.
(Georgia Institute of Technology)
Adjunct Assistant Professor, Research Health Scientist, Louis Stokes Department of VA Medical Center
Surface modification of neural electrodes; mechanically dynamic stimuli responsive biomaterials; and tissue engineering strategies for intervertebral disc regeneration

Peter R. Cavanagh, Ph.D., D.Sc.
(University of London at Royal Free Medical School, London, England)
Adjunct Professor, Department of Orthopaedics and Sports Medicine, University of Washington, Seattle, WA
Foot complications of diabetes, bone biomechanics

Yuanna Cheng, Ph.D.
(Oita Medical University, Japan)
Adjunct Associate Professor (Cardiovascular Medicine, Cleveland Clinic)
Cardiac fluorescent imaging, mechanisms of arrhythmias, implantable defibrillators, cardiac remodeling, antiarrhythmic therapy

Cheri Deng, Ph.D.
(Yale University)
Adjunct Assistant Professor (Department of Biomedical Engineering, University of Michigan)
Ultrasound mediated drug and gene delivery; ultrasound imaging; ultrasound tissue characterization; ultrasound contrast agents; high intensity focused ultrasound ablation

Elizabeth C. Hardin, Ph.D.
(University of Massachusetts)
Adjunct Assistant Professor of Biomedical Engineering, (VA Medical Center)
Neural prostheses and gait mechanics; improving gait performance with neural prostheses using strategies developed in conjunction with forward dynamics musculoskeletal models

GENERAL BULLETIN 2009-2011

CASE SCHOOL OF ENGINEERING

111
Vincent J. Hetherington, D.P.M.  
Adjunct Assistant Professor of Podiatric Medicine  
(Pennsylvania College of Podiatric Medicine)  
Some B.S. graduates are employed in industries, devices and therapies. In short, we envision technologies, devices and therapies. In short, we envision contributions of knowledge in the emerging field of the medical arena and advance to positions of greater responsibility.

To achieve these post-graduation objectives, we have defined the following program outcomes. These are skills that graduates of our program are expected to be proficient in at the time of graduation:

(a) An ability to apply knowledge of mathematics, science, and engineering appropriate to the biomedical engineering
(b) An ability to design and conduct experiments, as well as to analyze and interpret data
(c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) An ability to function on multi-disciplinary teams

1. Our graduates will successfully enter and complete post baccalaureate advanced degree programs, including those in biomedical engineering

2. Our graduates will obtain jobs in the biomedical arena and advance to positions of greater responsibility.

The mission of the Biomedical Engineering department is:

To promote human health through education and research that bridges the gap between medicine and engineering. Our faculty and students play leading roles ranging from basic science discovery to the creation, clinical evolution, and commercialization of new technologies, devices and therapies. In short, we are "Engineering Better Health."

Some B.S. graduates are employed in industry and medical centers. Others continue studies in biomedical engineering and other fields. Students with engineering ability and an interest in medicine may consider the undergraduate biomedical engineering program as an exciting alternative to conventional pre-medical programs. The undergraduate program has three major components (1) Engineering Core, (2) BME Core, and (3) BME Specialty Sequence. The Engineering Core provides a foundational background in mathematics, sciences, and engineering. The BME Core integrates engineering with biomedical science to solve biomedical problems. Hands-on experience in BME is developed through undergraduate laboratory and project courses. In addition, by choosing a BME specialty sequence, the student can study a specific area in depth. This integrated program is designed to ensure that BME graduates are competent engineers. Students may select open electives for educational breadth or depth or to meet entrance requirements of medical school or other professional career choices. BME faculty serve as student advisors to guide students in choosing the program of study most appropriate for individual needs and interests.

At the undergraduate level, we direct our efforts toward two educational objectives that describe the performance of alumni 3-6 years after graduation:

The Case undergraduate program leading to the Bachelor of Science degree with a major in biomedical engineering was established in 1972. The degree of Bachelor of Science in Biomedical Engineering is accredited by the Engineering Accreditation Commission (EAC) of ABET, Inc. 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700.

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BME SPECIALTY SEQUENCE CLASSES
To ensure depth in a particular area, students take one of the eight specialty sequences listed below. Students should consult the Web site of the Department of Biomedical Engineering to learn more about the educational program and to determine the best order for taking courses in a particular sequence.

Biomechanics
EMAE 181, ECIV 310, EMAE 250, EMAE 271, EBME 307, and EMAE 372; and technical electives from EMAE 172, EMAE 370, EMAE 350, EMAE 415, EBME 402, ECIV 420

Bioelectric Engineering
EECS 245, EECS 309, EBME 317, EBME 327; and technical electives from EECS 281, ECE 311, EECS 321, EECS 322, EECS 344, EECS 382, EBME 418, EACS 333, EACS 304, EACS 324, EECS 337, EECS 338, EECS 340, EECS 351, EECS 354, EECS 355, EECS 346, EBME 378, EBME 401, EBME 407, EBME 408, EBME 320, EBME 350

Biomaterials (polymeric)
EMAC 270, CHEM 223, CHEM 323, EMAE 351, and EBME 303; and technical electives from EBME 316, EBME 315, EBME 325, EBME 350, EBME 405, EACS 377, ECIV 360, ECIV 376, EBME 406, EBME 408, EBME 425, EBME 276, EMAC 370, and EMAC 352.

Biomaterials (orthopaedic)
EMSE 201, ECIV 310, EMSE 303, and EMAC 270; and technical electives from EBME 405, EMSE 316, EBME 416, EMSE 202, EMAE 172, EMSE 270, EMSE 313, EMSE 411, EMAE 372, EMAC 276, EMAE 350, EBME 303, EMSE 307, EBME 406, EMSE 415, EMSE 301, EMSE 307, and EMSE 201.

Biomedical Computing and Imaging
EECS 233, EECS 337, and EMAC 320; and technical electives from EECS 231, EACS 431, EACS 375, EACS 398M, EECS 340, EECS 313, MIDS 329, EBME 461, EECS 375, EECS 341, EECS 338, EECS 391, and MATH 304

Biomedical Instrumentation (devices)
EECS 245, EBME 281, and EECS 344; and technical electives from EECS 382, EBME 309, EBME 403, EBME 320, EBME 321, EACS 311, EBME 418, PHYS 326, EBME 322, EECS 344, ECIV 370, ECIV 380, and ECIV 381.

Biomedical Systems and Control
EECS 304, EECS 313, EECS 322, and EMAE 181; and technical electives EECS 306, MATH 201, MATH 338, OPRE 345, EBME 402, EBME 407, EBME 320, EBME 461, EMSE 307, and EECS 346.

Notes: This gives 129 credits. Varies from sequence to sequence.

Tissue Engineering
CHEM 223, CHEM 323, BIOL 326, EMAE 325, EMSE 270, and; and technical electives from EBME 315, EBME 316, EMAE 405, EBME 416, EBME 425, EMAE 351, EMAC 377, EBME 406, EBME 408, ECIV 364, ECIV 360, ECIV 474, EMSE 376, EBME 303, and ECIV 340.

GRADUATE PROGRAMS
The objective of the graduate program in biomedical engineering is to educate biomedical engineers for careers in industry, academia, health care, and government and to advance research in biomedical engineering. The department provides a learning environment that encourages students to apply biomedical engineering methods to advance basic scientific discovery; integrate knowledge across the spectrum from basic cellular and molecular biology through tissue, organ, and whole-body physiology and pathophysiology; and to exploit this knowledge to design diagnostic and therapeutic technologies that improve human health. The unique and rich medical, science, and engineering environment at Case enables research projects ranging from basic science through engineering design and clinical application.

Numerous fellowships and research assistantships are available to support graduate students in their studies.

M.S. PROGRAMS
The M.S. program in biomedical engineering provides breadth in biomedical engineering and biomedical sciences with depth in an engineering specialty. In addition, students are expected to develop the ability to work independently on a biomedical research or design project. The M.S. requires a minimum of 30 credit hours. With an M.S. research thesis (Plan A), a minimum of 21 credits are needed in regular course work and 9 hours of thesis research (EBME 651). With an M.S. project (Plan B), a minimum of 27 credits is needed in regular course work, and three hours of project research (EBME 601).

MASTER OF ENGINEERING AND MANAGEMENT - BIOMEDICAL ENTREPRENEURSHIP
Biomedical engineering students may apply for the Biomedical Entrepreneurship concentration in the Master of Engineering (MEM) program. The MEM is a degree offered by The
Institute for Management and Engineering (TiME), a joint program between the Case School of Engineering and the Weatherhead School of Management. The objective of this program is to provide biomedical engineers with the business and management context required to enable them to drive innovation within biomedical companies while serving in a technical capacity.

Students can enter the program as undergraduates. The program does not interfere with undergraduate degree requirements. The curriculum includes courses integrating engineering and management, as well as industrial internships. By making use of summers for both course work and internships, the M.E.M. degree is completed in one additional year beyond the B.S., i.e., for a total of five years for the B.S. and M.E.M. degrees. Students should apply through TiME.

M.D./M.S. PROGRAM

Medicine is undergoing a transformation based on the rapid advances in science and technology that are combining to produce more accurate diagnoses, more effective treatments with fewer side effects, and improved ability to prevent disease. The goal of the M.D./M.S. in Engineering is to prepare medical graduates to be leaders in the development and clinical deployment of this technology and to partner with others in technology based translational research teams. Current Case medical students in either the University Program (UP) or the Cleveland Clinic Lerner College of Medicine (CCLCM) may apply to the M.D./M.S. in Engineering program.

Students must complete the normal requirements in their particular M.D. program. Portions of the medical school curriculum earn graded credit toward the M.D./M.S. degree. Specifically, six credit hours of the medical school curriculum can be applied to the M.S. component of the joint degree.

The balance of 12 credit hours (4 courses) must be graduate level engineering concentration courses that provide rigor and depth in a field of engineering relevant to the area of research.

A required thesis serves a key integration role for the joint degree, with both medical and engineering components. The thesis also fulfills the research requirement of the UP or CCLCM programs.

Students should apply through the BME department admissions office.

PH.D. PROGRAM IN BIOMEDICAL ENGINEERING

For those students with primary interest in research, the Ph.D. in biomedical engineering provides additional depth and breadth in engineering and the biomedical sciences. Under faculty guidance, students are expected to undertake original research motivated by a biomedical problem. Research possibilities include the development of new theory, devices, or methods for diagnostic or therapeutic applications, as well as for measurement and evaluation of basic biological mechanisms.

The Ph.D. program requires a minimum of 12 courses beyond the B.S. degree. There are four required core courses (EBME 403, 409, 451, 452). The balance of the courses can be chosen with significant flexibility to meet the career goals of the student, and to satisfy requirements of depth and breadth. Programs of study must include three graduate level courses in biomedical sciences and two courses whose content is primarily mathematical. Two semesters of departmental seminar attendance (EBME 611, 612) and three semesters of teaching experience (EBME 400T, 500T, 600T) are also required. Ph.D. programs of study are reviewed and must be accepted by the Graduate Education Committee and the department chair. Eighteen hours of EBME 701 registration are required.

Ph.D. candidacy requires passing certain milestones. A student is advanced to Ph.D. candidacy after: (1) passing the Ph.D. Qualifying Exam; (2) obtaining an M.S. degree (or equivalent); and (3) obtaining approval of the Ph.D. short proposal. The Ph.D. is completed when the dissertation has been written and defended, and when at least two manuscripts have been submitted for publication and at least one of the two is accepted.

M.D./PH.D. PROGRAMS

Students with outstanding qualifications may apply to either of two M.D./Ph.D. programs. Students interested in obtaining a combined M.D./Ph.D., with an emphasis on basic research in biomedical engineering, are strongly encouraged to explore the Medical Scientist Training Program (MSTP), administered by the School of Medicine. Alternatively, the Physician Engineer Training Program (PETP) was established to train future physicians who also possess expertise in state-of-the-art engineering medical technologies, with a research focus on applied biomedical engineering. It is expected that graduates of the PETP will have a strong interest in the biomedical industrial sector, clinical medicine, or in academic positions in biomedical engineering, rather than the traditional M.D./Ph.D. career pathway in academic medicine.

Both M.D./Ph.D. programs require approximately 7-8 years of intensive study after the B.S. Interested students should apply for either program through the MSTP office in the Medical School.

RESEARCH AREAS

Several research thrusts are available to accommodate various student backgrounds and interests. Strong research collaborations with clinical and basic science departments of the university and collaborating medical centers bring a broad range of opportunities, expertise, and perspective to student research projects.

BIOMATERIALS/TISSUE ENGINEERING/DRUG AND GENE DELIVERY

Fabrication and analysis of materials for implantation, including neural, orthopaedic, and cardiovascular tissue engineering, biomimetic materials, liposomal and other structures for controlled, targeted drug delivery, and bio-compatible polymer surface modifications. Analysis of synthetic and biologic polymers by AFM, nanoscale structure-function relationships of biomaterials. Applications in the nervous system, the cardiovascular system, the musculoskeletal system, and cancer.

BIOMEDICAL IMAGING

MRI, PET, SPECT, CT, ultrasound, acoustic elastography, optical coherence tomography, cardiac electrical potential mapping, human visual perception, image-guided intervention, contrast agents. In vivo microscopic and molecular imaging, and small animal imaging.

BIOMEDICAL SENSING

Optical sensing, electrochemical and chemical fiber-optic sensors, chemical measurements in cells and tissues, endoscopy.

NEURAL ENGINEERING AND NEURAL PROSTHESSES

Neuronal mechanisms; neural interfacing for electric and magnetic stimulation and recording; neural dynamics, ion channels, second messengers; neural prostheses for control of limb movement, bladder, bowel, and respiratory function; computational modeling of neural structures

TRANSPORT AND METABOLIC

CASE WESTERN RESERVE UNIVERSITY
SYSTEMS ENGINEERING
Modeling and analysis of tissue responses to heating (e.g., tumor ablation) and of cellular metabolism related to organ and whole-body function in health (exercise) and disease (cardiac).

BIOMECHANICAL SYSTEMS
Computational musculoskeletal modeling, bone biomechanics, soft tissue mechanics, control of neuroprostheses for motor function, neuromuscular control systems, human locomotion, cardiac mechanics.

CARDIOVASCULAR SYSTEMS
Normal cardiac physiology, pathogenesis of cardiac diseases, therapeutic technologies; electrophysiological techniques, imaging technologies, mathematical modeling, gene regulation, molecular biology techniques; cardiac bioelectricity and cardiac biomechanics.

FACILITIES
The home of the Department of Biomedical Engineering is the Wickenden Building, with offices for all primary faculty and most of the non-clinical research laboratories and centers. Major interdisciplinary centers include the Center for Cardiovascular Biomaterials (CCB), the Center for Biomolecular and Nanoscale Engineering for Targeted Therapeutics (BioNETT), the Neural Engineering Center (NEC), the Center for Modeling Integrated Metabolic Systems (MIMS), and the In-situ Imaging Center. The CCB includes laboratories for biomaterials microscopy, bio-polymer and biomaterial interfaces, and molecular simulation. The BioNETT Center develops technologies for physical and chemical targeting of therapeutics, and imaging their distribution within the body. The NEC is a major facility for basic research and animal experimentation, with a focus on recording and controlling neural activity to increase our understanding of the nervous system and to develop neural prostheses. The MIMS Center combines mathematical modeling, computer simulation, and in vivo experimentation to quantify relationships between cellular metabolism and physiological responses of tissue-organ systems and the whole body. The Biomedical Imaging Laboratories, housed in the Case Center for Imaging Research and the Radiology department at University Hospitals, image structure and function from the molecular level to the tissue-organ level, using many modalities, including ultrasound, MRI, CT, PET, SPECT, bioluminescence, and light. Biomedical Sensing Laboratories include facilities for electrochemical sensing, chemical measurements in individual cells, and minimally invasive physiological monitoring.

Primary BME faculty also have laboratories and Centers in other locations. The Endoscopy Research Laboratory in University Hospitals is the center for work on optical coherence tomography and biophotonics. The FES (Functional Electrical Stimulation) Center, with laboratories in three medical centers, develops techniques for restoration of movement in paralysis, control of the nervous system, and implantable technology. Also, it promotes technology transfer and disseminates information about functional electrical stimulation, and evaluates clinical functionality of neuroprostheses. The APT (Advanced Platform Technology) Center develops advanced technologies that serve the clinical needs of veterans and others with motor and sensory deficits and limb loss.

The Coulter-Case Translation and Innovation Partnership (CCTIP) is a department-based collaboration with the Wallace H. Coulter Foundation. The partnership’s mission is to accelerate the introduction of new technologies into patient care through translational research and commercialization.

The department faculty and students have access to the facilities and major laboratories of the Case School of Engineering and of the Cleveland Clinic Foundation. Faculty have numerous collaborations at University Hospitals, MetroHealth Medical Center, VA Medical Center, and the Cleveland Clinic Foundation. These provide extensive research resources in a clinical environment for both undergraduate and graduate students.

BIOMEDICAL ENGINEERING (EBME)

Course Descriptions
EBME 105. Introduction to Biomedical Engineering (3)
This course is intended to introduce Freshmen to a wide variety of biomedical engineering fields including: biomaterials, tissue engineering, drug delivery systems, biomedical imaging and processing, cardiac measurement and analysis, neural engineering, neuromuscular control, and systems biology. Topics span research, development, and design for diagnostic and therapeutic applications. Prereq: Freshmen standing.

EBME 201. Physiology-Biophysics I (3)
This course (1) teaches cell physiology from an engineering perspective - basics covered include cell structures and functions, genes and protein synthesis, diffusion fundamentals, electrical properties of neural and muscle cells, sensory transduction, and integration of function on the micro and macro scale; (2) teaches how to use engineering tools to model different cell functions and predict, measure, and control cell behavior; (3) introduces mathematical and graphical analysis of specific physiological systems emphasizing applied modeling and simulation.

EBME 202. Physiology-Biophysics II (3)
This course is an extension of EBME 201 that will extend the application of system modeling and simulation to complex physiological systems in a clinical environment. The course will cover models of biochemical systems with pathology, muscle, the cardiovascular system, respiratory system, renal and hepatic systems with pathology and clinical applications. Prereq: EBME 201 or consent of instructor.

EBME 300. Dynamics of Biological Systems: A Quantitative Introduction to Biology (3)
This course will introduce students to dynamic biological phenomena, from the molecular to the population level, and models of these dynamical phenomena. It will describe a biological system, discuss how to model its dynamics, and experimentally evaluate the resulting models. Topics will include molecular dynamics of biological molecules, kinetics of cell metabolism and the cell cycle, biophysics of excitability, scaling laws for biological systems, biomechanics, and population dynamics. Mathematical tools for the analysis of dynamic biological processes will also be presented. Students will manipulate and analyze simulations of biological processes, and learn to formulate and analyze their own models. This course satisfies a laboratory requirement for the biology major. Offered as BIOL 300 and EBME 300.

EBME 303. Structure of Biological Materials (3)
Structure of proteins, nucleic acids, connective tissue and bone from molecular to microscopic levels. Principles and applications of instruments for imaging, identification, and measurement of biological materials. Recommended preparation: EBME 202. Offered as EBME 303 and EMAC 303.

EBME 306. Introduction to Biomedical Materials (3)
Biomaterials design and application in different tissue and organ systems. The relationship between the physical and chemical structure of biomaterials, functional properties, and biological response. Recommended preparation: EBME 201 and EBME 202.

EBME 307. Biomechanical Prosthetic Systems (3)
Introduction to the basic biomechanics of human movement and applications to the design and evaluation of artificial devices intended to restore or improve movement lost due to injury or disease. Measurement techniques in movement biomechanics, including motion analysis, electromyography, and gait analysis. Design and use of upper and lower limb prostheses. Principles of neuroprostheses with
applications to paralyzed upper and lower extremities. Recommended preparation: Consent of instructor and senior standing.


EBME 315. Applied Tissue Engineering (3) This course is designed to provide students with understanding and expertise of the basic tools in tissue engineering research. Through lectures the students will be introduced to the array of methods and materials available to tissue engineering researchers, learn how to rationally determine suitable choices for their applications, and receive instruction on how to implement those designs. Much of the course will be spent in the BME Tissue Engineering Laboratory getting hands-on experience (1) on the materials end with materials selection, characterization, and scaffold fabrication; (2) on the cell end with cell culture, tissue characterization and bioactor design. The class will be assessed by a weekly grading of the students’ lab notebooks, as well as a final exam based on the content learned throughout the semester.

EBME 317. Excitable Cells: Molecular Mechanisms (3) Ion channels are the molecular basis of membrane excitability in all cell types, including neural, heart, and muscle cells. This course presents the structure and the mechanism of function of ion channels at the molecular level. It introduces the basic principles and methods in the ion channel study including the ionic basis of membrane excitability, thermodynamic and kinetic analysis of channel function, voltage clamp and patch clamp techniques, and molecular and structural biology approaches. The course will cover structure of various potassium, calcium, sodium, and chloride channels and their physiological function in neural, cardiac, and muscle cells. Exemplary channels that have been best studied will be discussed to illustrate the current understanding of the molecular mechanisms of channel gating and permeation. Graduate students will present exemplary papers in the journal club style. Recommended preparation: EBME 201 or equivalent. Offered as EBME 317 and EBME 417.

EBME 318. Biomedical Engineering Laboratory I (1) Experiments for measurement, assisting, replacement, or control of various biomedical systems. Students choose a few lab experiences from a large number of offerings relevant to all BME sequences. Experiments are conducted primarily in faculty labs with 3-8 students participating. Recommended preparation: EBME 201, EBME 202, ENGR 210.

EBME 319. Biomedical Engineering Laboratory II (1) Experiments for measurement, assisting, replacement, or control of various biomedical systems. Students choose a few lab experiences from a large number of offerings relevant to all BME sequences. Experiments are conducted primarily in faculty labs with 3-8 students participating. Recommended preparation: EBME 201, EBME 202, and ENGR 210.

EBME 320. Medical Imaging Fundamentals (3) General principles, instrumentation, and biomedical applications of medical imaging. Topics include: x-ray, ultrasound, MRI, nuclear imaging, image reconstruction, and image quality. Recommended preparation: EBME 308, ENGR 210, and EBME 202 or equivalent.

EBME 322. Applications of Biomedical Imaging (3) This course will provide an introduction to biomedical imaging and its applications in measurements of physiological function, stem cell biology, and drug delivery. Students will learn about imaging technologies including basic principles of imaging (resolution and contrast), optical microscopy and in vivo imaging, and magnetic resonance imaging. Emerging techniques in cellular and molecular imaging, including targeted imaging agents and reporter gene imaging will be discussed. Biomedical applications will include such topics as tumor characterization in drug assessment, functional brain mapping, targeted drug delivery, functional cardiovascular measurements, and stem cell research will be demonstrated. Prereq: EBME 201, EBME 202, EBME 308, PHYS 121, PHYS 122.

EBME 325. Introduction to Tissue Engineering (3) The goal of this course is to present students with a firm understanding of the primary components, design principles, and engineering concepts central to the field of tissue engineering. First, the biological principles of tissue formation during morphogenesis and wound repair will be examined. The cellular processes underlying these events will be presented with an emphasis on microenvironmental regulation of cell behavior. Biomimetic approaches to controlling cell function and tissue formation via the development of biomaterial systems will then be investigated. Case studies of regeneration strategies for specific tissues will be presented in order to examine the different tissue-specific engineering strategies that may be employed. Special current topics in tissue engineering will also be covered. Recommended preparation: EBME 306, BIOL 362, and CHEM 223.


EBME 328. Biomedical Engineering R&D Training I (1) This course will provide research and development training in the laboratory of a mentoring faculty member. Varied R&D experiences will include activities in biomedical instrumentation, tissue engineering, imaging, drug delivery, and neural engineering. Each student must identify a faculty mentor, and together they will create description of the training experience prior to the first class. Prereq: EBME 201 and EBME 202.

EBME 329. Biomedical Engineering R&D Training II (1) This course will provide research and development training in the laboratory of a mentoring faculty member. Varied R&D experiences will include activities in biomedical instrumentation, tissue engineering, imaging, drug delivery, and neural engineering. Each student must identify a faculty mentor, and together they will create a description of the training experience prior to the first class. Recommended preparation: EBME 328. Prereq: EBME 201 and EBME 202.

EBME 350. Quantitative Molecular Bioengineering (3) The objective of this course is to equip the students with a “molecular toolbox”–a set of quantitative skills that permit rational designs for engineering tissues starting at the molecular level. The course will build on the physical and chemical principles in equilibrium, kinetics, and mass transport. Specific examples in bioengineering systems will be used throughout the course to illustrate the importance of understanding and application of these principles to tissue engineering. Recommended preparation: ENGR 225. Offered as EBME 350 and ECHE 355.


EBME 360. Biomedical Instrumentation Laboratory (1) A laboratory which focuses on the basic components of biomedical instrumentation and provides hands-on experience for students in EBME 310. Biomedical Instrumentation. The purpose of the course is to develop design skills and laboratory skills in analysis and circuit development. Coreq: EBME 310.
EBME 370. Principles of Biomedical Engineering Design (2)
The design process required to produce biomedical devices, research equipment, and clinical tools is developed. Topics include identification of need; requirements specification; project management; working in teams; solutions conceptualization, refinement, and selection; hazard and risk analysis and mitigation; verification; validation; regulatory requirements; and medical device pathways to the market. Through critical examination of contemporary medical research and clinical problems, students, working in teams, will identify a need to develop a specific problem statement, project plan, input requirements, solution concept and risk analysis. Students will provide periodic oral progress reports and a final oral presentation with a written design report. Recommended preparation: EBME 310.

EBME 380. Biomedical Engineering Design Experience (3)
This course is the culmination of the BME educational experience in which the student will apply acquired skills and knowledge to create a working device or product to meet a medical need. Students will learn how to apply engineering skills to solve problems and physically realize a project design. The course structure includes regular meetings with a faculty project advisor, regular reports of accomplished activity, hands on fabrication of devices, and several lectures from leading engineers from industry and academia that have first hand experience in applying the principles of design to Biomedical Engineering. Students will also provide periodic oral progress reports and a final oral presentation with a written design report. Prereq: EBME 370. SAGES Senior Cap

EBME 396. Special Topics in Undergraduate Biomedical Engineering I (1 - 18) (Credit as arranged.)

EBME 398. Senior Project Laboratory I (3)
Students learn and implement the design process to produce working prototypes of medical devices with potential commercial value to meet significant clinical needs. Critical examination of contemporary medical problems is used to develop a specific problem statement divided into teams of 3 to 4 students. Each team integrates their knowledge and skills to design a device to meet their clinical need. Project planning and management, including resource allocation, milestones, and documentation, are required to ensure successful completion of projects within the allotted time and budget. Formal design reviews by a panel of advisors and outside medical device experts are required every four weeks. Every student is required to give oral presentations at each formal review and complete design statements at each formal review and is responsible for writing the principles of design to Biomedical Engineering. Students will assess the educational plan to ensure that it provides the needs of the intended biological function will be presented. Clinical evaluation, including recent advances and current problems associated with different polymer implants. Recommended preparation: EBME 306 or equivalent. Offered as EBME 406 or EMAC 471. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 401. Bioelectric Phenomena (3)
The goal of this course is to provide working knowledge of the theoretical methods that are used in the fields of electrophysiology and bioelectricity for both neural and cardiac systems. These methods will be applied to describe, from a theoretical and quantitative perspective, the electrical behavior of excitable cells, the methods for recording their activity and the effect of applied electrical and magnetic fields on excitable issues. A team modeling project will be required. Recommended preparation: differential equations, circuits. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 402. Muscles, Biomechanics, and Control of Movement (4)
Quantitative and qualitative descriptions of the action of muscles in relation to human movement. Introduction to rigid body dynamics and dynamics of multi-link systems using Newtonian and Lagrangian approaches. Muscle models with application to control of multi-joint movement. Forward and inverse dynamics of multi-joint, muscle driven systems. Dissection, observation and recitation in the anatomy laboratory with supplemental lectures concentrating on kinesiology and muscle function. Recommended preparation: EMAE 181 or equivalent. Offered as EBME 402 and EMAE 402. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 403. Biomedical Instrumentation (3)
Quantitative and qualitative descriptions of the action of muscles in relation to human movement. Introduction to rigid body dynamics and dynamics of multi-link systems using Newtonian and Lagrangian approaches. Muscle models with application to control of multi-joint movement. Forward and inverse dynamics of multi-joint, muscle driven systems. Dissection, observation and recitation in the anatomy laboratory with supplemental lectures concentrating on kinesiology and muscle function. Recommended preparation: EMAE 181 or equivalent. Offered as EBME 402 and EMAE 402. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 404. Polymers in Medicine (3)
This course covers the important fundamentals and applications of polymers in medicine, and consists of three major components: (i) the blood and soft-tissue reactions to polymer implants; (ii) the structure, characterization and modification of biomedical polymers; and (iii) the application of polymers in a broad range of cardiovascular and extravascular devices. The chemical and physical characteristics of biomedical polymers and the properties required to meet the needs of the intended biological function will be presented. Clinical evaluation, including recent advances and current problems associated with different polymer implants. Recommended preparation: EBME 306 or equivalent. Offered as EBME 406 or EMAC 471. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 405. Materials for Prosthetics and Orthotics (3)

EBME 406. Polymers in Biomedical Engineering (3)
The goal of this course is to provide working knowledge of the theoretical methods that are used in the fields of electrophysiology and bioelectricity for both neural and cardiac systems. These methods will be applied to describe, from a theoretical and quantitative perspective, the electrical behavior of excitable cells, the methods for recording their activity and the effect of applied electrical and magnetic fields on excitable issues. A team modeling project will be required. Recommended preparation: differential equations, circuits. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 407. Neural Interfacing (3)
Neural interfacing refers to the principles, methods, and devices that bridge the boundary between engineered devices and the nervous system. It includes the methods and mechanisms to get information efficiently and effectively into and out of the nervous system to analyze and control its function. This course examines advanced engineering, neurobiology, neurophysiology, and the interaction between all of them to develop methods of connecting to the nervous system. The course builds on a sound background in Bioelectric Phenomenon to explore fundamental principles of recording and simulation, electrochemistry of electrodes in biological tissue, tissue damage generated by electrical stimulation, materials and material properties, and molecular functionalization of devices for interfacing with the nervous system. Several examples of the state-of-art neural interfaces will be analyzed and discussed. Recommended preparation: EBME 401. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 408. Learning from Nature's Paradigms (3)
This course aims to provide students with a foundation based on “nature’s” design and optimization criteria for engineering tissues and biomaterials. This will be achieved through focused review of the principles of development, wound healing, regeneration, and repair through remodeling, using nature as a paradigm. Principles of transport will be explored quantitatively and in relation to multi-organismal evolution. Cellular engineering principles will be explored, including current state of the art in stem cell physiology and therapeutic applications. Endogenous engineering approaches to surgical tissue reconstruction will be analyzed. An overview of contemporary approaches to tissue and cell engineering will be given, including tissue scaffold design, use of bioreactors in tissue engineering, and molecular surface modifications for integration of engineered tissues in situ. Fundamental engineering principles will be augmented through case studies involving specific applications. Ethical considerations related to clinical non-clinical application of tissue and cell engineering technology will be integrated into each lecture. Prereq: Graduate standing
or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 409. Systems and Signals in Biomedical Engineering (3)

EBME 410. Medical Imaging Fundamentals (3)
Physical principles of medical imaging. Imaging devices for x-ray, ultrasound, magnetic resonance, etc. Image quality descriptions. Patient risk. Recommended preparation: EBME 308 and EBME 310 or equivalent. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 417. Excitable Cells: Molecular Mechanisms (3)
Ion channels are the molecular basis of membrane excitability in all cell types, including neural, heart, and muscle cells. This course presents the structure and the mechanism of function of ion channels at the molecular level. It introduces the basic principles and methods in the ion channel study including the ionic basis of membrane excitability, thermodynamic and kinetic analysis of channel function, voltage clamp and patch clamp techniques, and molecular and structural biology approaches. The course will cover structure of various potassium, calcium, sodium, and chloride channels and their physiological function in neural, cardiac, and muscle cells. Exemplar channels that have been best studied will be discussed to illustrate the current understanding of the molecular mechanisms of channel gating and permeation. Graduate students will present exemplary papers in the journal club style. Recommended preparation: EBME 201 or equivalent. Offered as EBME 317 and EBME 417. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 418. Electronics for Biomedical Engineering (3)
Fundamental concepts of analog design with special emphasis on circuits for biomedical applications. Analysis and design of discrete and integrated circuit amplifiers; application, high CMRR biomedical amplifiers, implantable circuits, circuits for electrochemistry and circuits for optical recordings, circuits for recording neural activity, electrical safety and telemetry. A team project will be required for all students. Recommended preparation: EECS 343 or consent of instructor. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 419. Applied Probability and Stochastic Processes for Biology (3)
Applications of probability and stochastic processes to biological systems. Mathematical topics will include: introduction to discrete and continuous probability spaces (including numerical generation of pseudo random numbers from specified probability distributions), Markov processes in discrete and continuous time with discrete and continuous sample spaces, point processes including homogeneous and inhomogeneous Poisson processes and Markov chains on graphs, and diffusion processes including Brownian motion and the Ornstein-Uhlenbeck process. Biological topics will be determined by the interests of the students and the instructor. Likely topics include: stochastic ion channels, molecular motors and stochastic ratchets, actin and tubulin polymerization, random walk models for neural spike trains, bacterial chemotaxis, signaling and genetic regulatory networks, and stochastic predator-prey dynamics. The emphasis will be on practical simulation and analysis of stochastic phenomena in biological systems. Numerical methods will be developed using both MATLAB and the R statistical package. Student projects will comprise a major part of the course. Offered as BIOL 319, EECS 319, MATH 319, BIOL 419, EBME 419, and PHOL 419.

EBME 420. Biomedical Ultrasound Technologies (3)

EBME 425. Tissue Engineering and Regenerative Medicine (3)
This course will provide advanced coverage of tissue engineering with a focus on stem cell-based research and therapies. Course topics of note include stem cell biology and its role in development, modeling of stem cell function, controlling stem cell behavior by engineering materials and their microenvironment, stem cells’ trophic character, and state-of-the-art stem cell implementation in tissue engineering and other therapeutic strategies. Offered as EBME 425 and PATH 435. Prereq: EBME 325 or equivalent and graduate standing.

EBME 427. Movement Biomechanics and Rehabilitation (3)
Introduction to the basic biomechanics of human movement and applications to the design and evaluation of artificial devices intended to restore or improve movement lost due to injury or disease. Measurement techniques in movement biomechanics, including motion analysis, electromyography, and gait analysis. Design and use of upper and lower limb prostheses. Principles of neuroprostheses with applications to paralyzed upper and lower extremities. Term paper required. Recommended preparation: Consent of instructor and graduate standing. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 431. Physics of Imaging (3)
Description of physical principles underlying the spin behavior in MR and Fourier imaging in multidimensions. Introduction of conventional, fast, and chemical shift imaging techniques. Spin echo, gradient echo, and variable flip-angle methods. Projection reconstruction and sampling theorems. Bloch equations, T1 and T2 relaxation times, rf penetration, diffusion and perfusion. Flow imaging. MR angiography, and functional brain imaging. Sequence and coil design. Prerequisite may be waived with consent of instructor. Recommended preparation: PHYS 122 or PHYS 124 or EBME 410. Offered as EBME 431 and PHYS 431.

EBME 440. Translational Research for Biomedical Engineers (3)
Translation of laboratory developments to improve biomedical and clinical research and patient care. Interdisciplinary and team communication. Evaluation of technology and research planning with clinical and engineering perspectives. Discussing clinical situations, shadowing clinicians, attending Grand ROUNDS and Morbidity-Mortality conferences. Validation study design. Regulatory/oversight organization. Protocol design and informed consent for Institutional Review Board (IRB) approval. NIH requirements for human subject research. Special project reports to produce IRB protocol or NIH-style proposal. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 447. Rehabilitation for Scientists and Engineers (3)
Medical, psychological, and social issues influencing the rehabilitation of people with spinal cord injury, stroke, traumatic brain injury, and limb amputation. Epidemiology, anatomy, pathophysiology, and natural history of these disorders, and the consequences of these conditions with respect to impairment, disability, handicap and quality of life. Students will directly observe the care of patients in each of these diagnostic groups throughout the full continuum of care starting from the acute medical and surgical interventions to acute and subacute re habilitation, outpatient medical and rehabilitation management and finally to community re-entry.

EBME 451. Molecular and Cellular Physiology (3)
This course is the first in the pair of BME physiology core courses EBME 451 and 452. The emphasis of EBME 451 is on the molecular and cellular mechanisms underlying physiological processes. Structure-function relationship will be addressed throughout the course. The primary goal of the course is to develop understanding of the principles of the physiological processes at molecular and cellular level and to promote independent thinking and ability to solve unfamiliar problems. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

EBME 452. Tissue and Organ Systems Physiology (3)
Mechanisms of membrane and capillary-tissue transport, tissue mechanics, electrical propagation,
signaling, control and regulation processes. Cardiac vascular, renal, respiratory, gastro-intestinal, neural, sensory, motor, musculoskeletal, and skeletal systems. Basic engineering analysis for quantitative understanding of physiological concepts. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

**EBME 460. Advanced Topics in NMR Imaging (3)**
Frontier issues in understanding the practical aspects of NMR imaging. Theoretical descriptions are accompanied by specific examples of pulse sequences, and basic engineering considerations in MRI system design. Emphasis is placed on implications and trade-offs in MRI pulse sequence design from real-world versus theoretical perspectives. Recommended preparation: EBME 431 or PHYS 431. Offered as EBME 460 and PHYS 460. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

**EBME 461. Biomedical Image Processing and Analysis (3)**
Principles of image processing and analysis with applications to biomedical images from the nano-scale to 3D whole organ imaging. Topics include image filtering, enhancement, restoration, registration, morphological processing, and segmentation. Recommended preparation: EBME 409 or equivalent. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

**EBME 462. Cellular and Molecular Imaging (3)**
Frontier issues in biomedical imaging that address problems at the cellular and molecular levels. Topics include endogenous methods to assess molecular compositions, imaging agents, reporter genes and proteins, and drug delivery, which will be discussed in the context of applications in cancer, cardiology, central nervous system, ophthalmology, musculoskeletal diseases, pulmonary diseases, and metabolic diseases. Emphasis is placed on an interdisciplinary problem-based approach to investigate the application of biomedical imaging to biological and disease areas. Recommended preparation: EBME 410 and EBME 451 or consent of instructor. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

**EBME 474. Biotransport Processes (3)**
Biomedical mass transport and chemical reaction processes. Basic mechanisms and mathematical models based on thermodynamics, mass and momentum conservation. Analytical and numerical methods to simulate in vivo processes as well as to develop diagnostic and therapeutic methods. Applications include transport across membranes, transport in blood, tumor processes, bioreactors, cell differentiation, chemotaxis, drug delivery systems, tissue engineering processes. Recommended preparation: EBME 350 and EBME 409 or equivalent. Offered as EBME 474 and ECHE 474. Prereq: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

**EBME 478. Computational Neuroscience (3)**
Computer simulations and mathematical analysis of neurons and neural circuits, and the computational properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course introduces students to dynamical systems theory for the analysis of neurons and neural learning, models of brain systems, and their relationship to artificial and neural networks. Term project required. Students enrolled in MATH 478 will make arrangements with the instructor to attend additional lectures and complete additional assignments addressing mathematical topics related to the course. Recommended preparation: MATH 223 and MATH 224 or BIOL 300 and BIOL 306. Offered as BIOL 378, COGS 378, MATH 378, BIOL 478, EBME 478, EECS 478, MATH 478 and NEUR 479.

**EBME 479. Seminar in Computational Neuroscience (3)**
Readings and discussion in the recent literature on computational neuroscience, adaptive behavior, and other current topics. Offered as BIOL 479, EBME 479, EECS 479, and NEUR 479.

**EBME 500T. Graduate Teaching II (0)**
This course will provide the Ph.D. candidate with experience in teaching graduate or undergraduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational opportunity for the students. Recommended preparation: EBME 400T, BME Ph.D. student.

**EBME 503. Biomolecular Forces (3)**
Advanced course on the theory, measurement, and analysis of the intermolecular physical forces that dominate cell and molecular interactions in dynamical systems. The aim of this course is to provide students involved in biomaterials engineering and studies on cell and molecular interactions with (i) a quantitative and fundamental understanding of the intermolecular forces (electrostatic, van der Walls, solvation forces) that direct cell and molecular adhesion, self-assembling systems (bilayers, cell membranes) and specific and non-specific receptor-ligand binding; (ii) the ability to develop mechanistic models for surface adhesion, self-assembly, cell surface binding and signal transduction; and (iii) skills for measurement and quantitative analysis of forces (nano- to pico-Newton levels) in the “near-surface” (1-10 nm) domain by atomic force microscopy and related force measurement techniques. Recommended preparation: EBME 405 or EBME 406, undergraduate electricity and magnetism, undergraduate physical chemistry, or consent of instructor.

**EBME 504. Transport Processes of Biomedical Systems (3)**
Mass and heat transport processes in dispersive, convective, and reactive systems. Applications include cell metabolism, drug delivery, tumor growth and ablation, cell migration and adhesion, ventilation inhomogeneity, tissue responses to heating, Critical analysis of journal articles. Simulation projects related to student research. Recommended preparation: EBME 409, Offered as EBME 504 and ECHE 504. Prereq: Graduate standing.

**EBME 507. Motor System Neuroprostheses (3)**
Fundamentals of neural stimulation and sensing, neurophysiology and pathophysiology of common neurological disorders, general implantation and clinical deployment issues. Specialist discussions in many application areas such as motor prostheses for spinal cord injury and stroke, cochlear implants, bladder control, simulation for pain management, deep brain stimulation, and brain computer interfacing. Prereq: Graduate standing.

**EBME 513. Biomedical Optical Diagnostics (3)**
Engineering design principles of optical instrumentation for medical diagnostics. Elastic and inelastic light scattering theory and biomedical applications. Confocal and multiphoton microscopy. Light propagation and optical tomographic imaging in biological tissues. Design of minimally invasive spectroscopic diagnostics. Recommended preparation: EBME 403 or PHYS 326 or consent. Prereq: Graduate standing.

**EBME 519. Parameter Estimation for Biomedical Systems (3)**

**EBME 523. Biomedical Sensing (3)**
Analysis and design of biosensors are discussed in the context of biomedical measurements. Base sensors using electrochemical, optical, piezoelectric, and other principles are introduced. Binding equilibria, enzyme kinetics, and mass transport modalities are then analyzed. Adding the “bio” element to base sensors results including mathematical aspects of data evaluation. Prereq: Graduate standing.

**EBME 600T. Graduate Teaching III (0)**
This course will provide the Ph.D. candidate with experience in teaching graduate or undergraduate students. The experience is expected to consist of direct student contact, but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational opportunity for the students. Recommended preparation: EBME 500T, BME Ph.D. student.

**EBME 601. Research Projects (1 - 18)**
EBME 602. Special Topics (1 - 18)

EBME 607. Neural Engineering Topics (1)
The goal of this class is to explore topics in Neural Engineering not covered in the curriculum. A single topic will be chosen per semester. Four speakers with expertise in the chosen area will be invited to the campus. Each speaker will give a seminar and participate in a 2-hour workshop/journal club on the specific topic. The students will be assigned one or two seminal papers written by the speaker prior to the visit. Students will take turns presenting these papers to the rest of the class. The paper and the topic will then be open for discussion. At the end of the semester, the students will collaborate to write a single review article in a publishable format on the topic of the semester.

EBME 611. BME Departmental Seminar I (0)
Required of all first-year graduate students in BME.

EBME 612. BME Departmental Seminar II (0)
Continuation of EBME Departmental Seminar 1. Required of all first-year graduate students in BME.

EBME 621. BME Research Rotation I (0)
Opportunity for trainees to participate in BME research under supervision of faculty.

EBME 651. Thesis M.S. (1 - 18)
Ph.D. candidates only. Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

EBME 701. Dissertation Ph.D. (1 - 18)
EBME 319, Biomedical Engineering Lab II (0-3-1)
ENGL 398, Professional Communication (2-0-2)
ENGR 210, Intro to Circuits & Instrumentation (3-0-3)
EBME Specialty Sequence (3-0-3)
Total (16-0-16)

Second Year

Fall
EBME 201, Physiology - Biophysics I (3-0-3)
MATH 223, Calculus for Science and Engineering III (3-0-3)
PHYS 122, General Physics II (4-0-4)
ME 303, Biomechanics (4-0-4)
USXX University Seminar (3-0-3)
Total (16-0-16)

Spring
EBME 202, Physiology - Biophysics II (3-0-3)
MATH 234, Intro to Dynamic Systems (3-0-3)
ENGR 210, Intro to Circuits & Instrumentation (3-0-3)
EBME Specialty Sequence (3-0-3)
Total (15-3-16)

Third Year Class-Lab-Credit Hours

Fall
EBME 306, Introduction to Biomaterials (3-0-3)
EBME 318, Biomedical Engineering Lab I (0-3-1)
ENGL 398, Professional Communication (2-0-2)
ENGR 398 Professional Communication for Engineers (2-0-1)
EBME 308, Biomedical Systems & Signals (3-3-4)
ENGR 398, Professional Communication I (2-0-1)
Total (16-0-16)

Fourth Year

Fall
EBME 309, Modeling of Biomedical Systems (3-0-3)
EBME 359, Biomedical Engineering Lab II (0-3-1)
EBME 380, Design in BME (1-6-3)
ME 303, Biomechanics (4-0-4)
EPHED 102, Physical Education (0-3-0)
Total (15-3-15)

a. This is a typical program. Specialty sequence is designed with courses in a desired order that might vary from the one here. Programs must be planned with a faculty advisor in the Department of Biomedical Engineering.

b. This optional course is limited to freshmen. This can be replaced by an open elective.
c. University Seminars (6 semester hours, minimum of 2 seminars selected from different thematic groups and different thematic group from that of FSCC 100).
d. Courses are chosen depending on the BME specialty sequence as listed below.
e. Students take at least one math or science course approved by BME department.
f. SAGES BME Departmental Seminar, ENGL 398 and ENGR 398 must be taken together.
g. STAT 312, STAT 333, or STAT 332 fulfill the statistics requirement. Check with sequence advisor to determine the most appropriate class.

DEPARTMENT OF CHEMICAL ENGINEERING
T16 A.W. Smith Building (7217)
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Donald L. Feke, Interim Chair
e-mail: dlf4@case.edu
http://www.case.edu/cse/eche/

The profession of chemical engineering involves the analysis, design, operation and control of processes that convert matter and energy to more useful forms, encompassing processes at all scales from the molecular to the megascale. Traditionally, chemical engineers are responsible for the production of basic chemicals, plastics, and fibers. However, today’s chemical engineers are also involved in food and fertilizer production, synthesis of electronic materials, waste recycling, and power generation. Chemical engineers also develop new materials (ceramic composites and electronic chips, for example) as well as biochemicals and pharmaceuticals. The breadth of training in engineering and the sciences gives chemical engineers a particularly wide spectrum of career opportunities. Chemical engineers work in the chemical and materials-related industries, in government, and are readily accepted by graduate schools in engineering, chemistry, medicine, or law (mainly for patent law).

The department offers Bachelor of Science in Engineering, Master of Science, and Doctor of Philosophy degree programs that provide preparation for work in all areas of chemi-
cal engineering. Breadth elective sequences in biochemical engineering, biomedical engineering, computing, electrochemical engineering, electronic materials, environmental engineering, management/entrepreneurship, polymer science, systems and control, or advanced studies provide depth and specialization for undergraduates majoring in chemical engineering. A special biochemical engineering track is available, where students integrate biochemistry, biology, and bioengineering courses into the standard chemical engineering curriculum. In addition, for students with a strong interest in polymer science and engineering, a minor in macromolecular science can be integrated with the chemical engineering curriculum. Chemical engineering undergraduates are members of the student chapter of the American Institute of Chemical Engineers (AIChE). The AIChE chapter sponsors social events, field trips to local industry, technical presentations by outside speakers, and employment counseling. Information about the AIChE can be obtained through the department, the chapter president or the chapter advisor. There are eleven full-time faculty members, all of whom are pursuing active research programs. The research of the faculty is aimed at advanced and emerging areas of chemical engineering.

FACULTY
Donald L. Feke, Ph.D.
(Princeton University)
Professor, Interim Chair, and Vice Provost for Undergraduate Education
Colloidal and transport phenomena, dispersive mixing, particle science and processing

John C. Angus, Ph.D.
(University of Michigan)
Professor Emeritus
Chemical vapor deposition of diamond, electrochemistry of diamond gallium nitride synthesis

Harihara Baskaran, Ph.D.
(The Pennsylvania State University)
Associate Professor
Transport Phenomena in Biology and Medicine

Daniel Lacks, Ph.D.
(Harvard University)
C. Benson Branch Professor of Chemical Engineering
Molecular simulation, statistical mechanics

Uziel Landau, Ph.D.
(University of California, Berkeley)
Professor
Electrochemical engineering, modeling of electrochemical systems, electrodeposition, batteries and fuel cells

Chung-Chiun Liu, Ph.D.
(Case Institute of Technology)
Wallace R. Persons Professor of Technology and Control
Electrochemical sensors, electrochemical synthesis, electrochemistry related to electronic materials

J. Adin Mann Jr., Ph.D.
(Iowa State University)
Professor
Surface phenomena, interfacial dynamics, colloid science, light scattering, biometrics, molecular electronics

Heidi B. Martin, Ph.D.
(Case Western Reserve University)
Assistant Professor of Engineering
Conductive diamond films; electrochemical sensors; chemical modification of surfaces for electrochemical and biomedical applications; biomaterials; microfabrication of sensors and devices

Syed Qutubuddin, Ph.D.
(Carnegie Mellon University)
Professor
Surfactant and polymer solutions, separations, nanoparticles, novel polymeric materials, nanocomposites

R. Mohan Sankaran, Ph.D.
(California Institute of Technology)
George S. Mayer Assistant Professor of Engineering
Microplasmas, nanoparticle synthesis

Robert F. Savinell, Ph.D.
(University of Pittsburgh)
George S. Dively Professor
Electrochemical engineering, electrochemical reactor design and simulation, electrode processes, batteries and fuel cells

Thomas A Zawodzinski, Ph.D.
(State University of New York at Buffalo)
Ohio Eminent Scholar in Fuel Cells and F. Alex Nason Professor of Engineering
Fuel cells, transport and electrochemistry in energy conversion and storage devices, NMR spectroscopy and imaging, transport/structure property relationships in polymer electrolytes, self-assembly chemistry

UNDERGRADUATE PROGRAMS
Departmental Mission

The chemical engineering department seeks to provide the expertise, environment, facilities, and administrative structure that inspire learning and the pursuit of scholarly activities in chemical engineering and related science and engineering disciplines. The Department will provide an educational program and research environment that will permit our graduates to compete in the evolving workplace, to permit students and faculty to advance knowledge at the highest levels of the profession, and to address the technological and personnel needs of industry, governments, and society.

The Bachelor of Science degree is accredited by the Engineering Accreditation Commission (EAC) of ABET, Inc. 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700.

Program Objectives
The undergraduate program in Chemical Engineering seeks to produce graduates who will:

1. apply the knowledge and skills acquired through the chemical engineering curriculum to their professional careers
2. assume positions of responsibility and/or leadership in industry, government, and business
3. pursue professional careers across a broad range of industries
4. succeed in post-graduate and professional degree programs

Program Outcomes
As preparation for meeting the above program objectives, the Department of Chemical Engineering provides an undergraduate program designed that students attain:

1. an ability to apply knowledge of mathematics, science, and engineering
2. an ability to design and conduct experiments, as well as to analyze and interpret data
3. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. an ability to function on multidisciplinary teams
5. an ability to identify, formulate, and solve engineering problems
6. an understanding of professional and ethical responsibility
7. an ability to communicate effectively
8. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
9. a recognition of the need for, and an ability to engage in life-long learning
10. a knowledge of contemporary issues
11. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Elective Sequences
A distinctive feature of the chemical engineering program is the three-course breadth elective sequence taken during the junior and senior years that permits a student to major in chemical engineering and, at the same time, pursue an interest in a related field. Ten elective sequences have standing departmental approval: biochemical engineering, biomedical engineering, computing, electrochemical engineering, electronic materials, environmental engineering, management/entrepreneurship, polymer science, undergraduate research and systems and control. There is also an advanced study sequence for students in the combined B.S./M.S. program.

Biochemical Engineering Concentration
Biochemical engineering can be defined as the field of application of chemical engineering principles to systems that utilize biomolecules or bioorganisms to bring forth biotransformation. Biochemical engineering applications are versatile, ranging from waste-water treatment to production of therapeutic proteins. For the Biochemical Engineering Concentration, students take the Biochemical Engineering Breadth Sequence, and replace the Science and Materials electives by BIOL 300 Dynamics of Biological Systems; BIOL 301 Biotechnology Lab; and two of the following: BIOL 334 Proteins and Enzymes, BIOL 382 Drugs, Brain & Behavior, BIOC 308 Genes & Genetic Engineering, EVHS 401B/402B Biochemical Toxicology. Note one additional course must be taken for the Biochemical Engineering Concentration.

Pre-Medical Concentration
The Pre-Medical Concentration provides a focused approach to medical school preparation for Chemical Engineering majors. By using the flexibility provided by science and technical electives in the curriculum, students are able to pursue courses that provide the background needed for medical school.

Students take the Pre-Medical Breadth Sequence, CHEM 224/324 and CHEM 336 as Science electives, and substitute CHEM 233 for CHEM 290.

Minor in Polymer Engineering
The department highly recommends two minor programs in the Department of Macromolecular Science as listed below.

POLYMER SYNTHESIS
- EMAC 270. Intro to Polymer Science
- EMAC 272. Polymer Analysis Laboratory
- EMAC 276. Polymer Properties and Design
- EMAC 378. Polymer Production and Technology
- EMAC 398. Polymer Science and Engineering Project (Choose synthesis project)

POLYMER PROCESSING
- EMAC 270. Intro to Polymer Science
- EMAC 372. Polymer Processing and Testing Laboratory
- EMAC 376. Polymer Engineering
- EMAC 377. Polymer Processing
- EMAC 378. Polymer Production and Technology

Minor Sequence in Chemical Engineering
The Department of Chemical Engineering offers a minor in chemical engineering for students majoring in other disciplines. In total, 15 credit hours in chemical engineering courses are required for the minor. To complete the minor, students should take ECHE 260 and ECHE 360, plus any two of the following courses: ECHE 361, 363, 364, 365, or 367.

Five-Year Combined B.S./M.S. Program
This program offers outstanding undergraduate students the opportunity to obtain an M.S. degree, with a thesis, in one additional year of study beyond the B.S. degree. (Normally, it takes two years beyond the B.S. to earn an M.S. degree.) In this program, an undergraduate student can take up to nine hours of graduate credit that simultaneously satisfies undergraduate degree requirements. Typically, students in this program start their research leading to the M.S. thesis in the fall semester of the senior year. The department supports such students through the following summer and academic year at the normal stipend for entering graduate students. The B.S. degree is awarded at the completion of the senior year.

Application for admission to the five-year B.S./M.S. program is made after completion of five semesters of coursework. Minimum requirements are a 3.2 grade point average and the recommendation of the department.

Five-and-a Half Year Cooperative B.S./M.S. Program
The cooperative bachelor’s/master’s program enables outstanding students who are enrolled in the cooperative education program to earn an M.S. in one semester beyond the B.S. degree. Students complete six credits of a graduate project (ECHE 660) during the second co-op period and follow an Advanced Study elective sequence. The courses ECHE 460, ECHE 461, and an agreed-upon mathematics course are used to satisfy both graduate and undergraduate requirements. At the end of the fifth year, the student receives the B.S. degree. Upon completion of an additional 12 credits of graduate work the following semester, the student receives the M.S. degree (non-thesis). Application for admission to the five-and-a-half-year co-op B.S./M.S. program is made during the second semester of the junior year (this semester is taken in the fall of the fourth year). Minimum requirements are a 3.2 grade point average, satisfactory performance in the previous co-op assignment, and the recommendation of the department.

GRADUATE PROGRAMS

Master of Science Program
Each M.S. candidate must complete a minimum of 27 hours of graduate-level credits. These credits can be distributed in one of two ways.

PLAN A.
Students electing Plan A take 19 hours of graduate-level course work (six courses plus ECHE 401 Chemical Engineering Communications) and complete at least 9 credit hours of M.S. thesis research.

PLAN B.
Part-time students, and those in the 5-1/2-year B.S./M.S. cooperative program, may opt for Plan B, which requires completion of 24 credit hours (eight courses) of approved graduate course work and a 3 credit hour project replacing the M.S. thesis. In special cases, a student may be permitted to complete a 6 credit project. In this case only seven courses will be required.

All M.S. students are required to take the
following courses:
ECHE 460, Thermodynamics of Chemical Systems (3); ECHE 461, Transport Phenomena (3); ECHE 462, Chemical Reaction Engineering (3); and ECHE 475, Chemical Engineering Analysis (3) or an equivalent graduate-level math course.

The other courses should be technical graduate-level courses selected after consultation with the advisor. In special circumstances, e.g., students have taken a similar or complementary course at another university, one of the required courses may be waived from the program of study. All full-time M.S. students are expected to do some teaching as part of their education. Also, at various points during their thesis research, students will be required to present seminars and reports on their progress.

Master of Engineering Program
The Department of Chemical Engineering also participates in the practice-oriented Master of Engineering program offered by the Case School of Engineering. In this program, students complete a core program. The Department of Chemical Engineering participates in the Chemical and Materials Processing and Synthesis sequence.

Doctor of Philosophy Program
The degree of Doctor of Philosophy is awarded in recognition of deep and detailed knowledge of chemical engineering and a comprehensive understanding of related subjects together with a demonstration of the ability to perform independent research, to suggest new areas for research, and to communicate results in an acceptable manner. A total of 12 courses (36 credit hours) is typical for the Ph.D. degree. The minimum course requirement is as follows:

CORE COURSES
All programs of study must include: ECHE 460, Thermodynamics (3); ECHE 461, Transport Phenomena (3); ECHE 462, Chemical Reaction Engineering (3); ECHE 475, Chemical Engineering Analysis (3); plus a minimum of two other electives (in chemical engineering or other departments). At least one of these electives must be in a Basic Science (i.e., Chemistry, Physics, Biology, Biochemistry, Mathematics, or Statistics).

Advanced Chemical Engineering Courses
A minimum of two ECHE courses at the 500-level must be taken.

BREADTH COURSES
A minimum of two breadth courses, subject to the following guidelines, must be taken. Up to two Special Topics courses may be taken. With department approval, a 300-level lecture course can be used to replace a special topics course.

PROFESSIONAL DEVELOPMENT COURSES
ECHE 401 and ECHE 402, Chemical Engineering Communications are required. In addition, six semesters of ECHE 470, Graduate Research Colloquium Is required. All Ph.D. students are required to assist in three teaching experiences as part of their degree requirements. Students enroll In ECHE 400T, 500T, and 600T for these teaching experiences.

Comments on Ph.D. Guidelines
The department anticipates that from time to time, special cases will arise which are exceptions to the above guidelines, e.g., a student may have taken a graduate-level thermodynamics course at another school. In these cases, the student must submit a statement with the Planned Program of Study justifying the departure from the guidelines. It should be noted that the above guidelines are a minimum requirement. All programs are chosen with the approval of the student’s faculty advisor.

OTHER REQUIREMENTS
FOR THE PH.D. DEGREE
Students who wish to enter the Ph.D. program must pass a First Proposition oral examination (with an accompanying written report) that tests a student’s ability to think creatively, grasp new research concepts, and discuss such concepts critically and comprehensively. The First Proposition serves as the qualifying examination for the Ph.D. degree. A Second Proposition focusing on the students own research topic is required by the end of the second year in the program. All Ph.D. students must satisfy the residency requirements of the university and the Case School of Engineering. In addition, at various points in the course of the dissertation research, students will be required to prepare reports and seminars on their work, and defend their dissertation. The Chemical Engineering Graduate Student Handbook contains a more detailed description of the department’s Ph.D. requirements and a time schedule for their completion.

Current Research Topics
Research in the department is sponsored by a variety of state and federal agencies, by private industry, and by foundations. Current active research topics include:

ENERGY CONVERSION AND STORAGE
• Fuel cells
• Batteries
• Supercapacitors
• Transport/structure properties of polymer electrolytes for fuel cell applications
• Electrocratalysis
• Photovoltaics

ELECTROCHEMICAL DEVICES
• Electrochemical sensors
• Implantable electrochemical devices
• Electrochemical reactor design
• Electrode processes
• Metallization of semiconductor devices by plating

BIOMEDICAL APPLICATIONS OF CHEMICAL ENGINEERING
• Cell/cellular transport processes in inflammation
• Tissue engineering
• Wound healing
• Neurosensing and neural stimulation
• Engineering of surfaces for sensing applications
• Implantable electrochemical devices
• BioMEMS and biosensors
• Dental implants
• Drug delivery

DIAMOND AND DIAMOND-LIKE MATERIALS
• Chemical vapor deposition of diamond
• Electrochemistry on diamond
• Conductive diamond films

DESIGN AND SYNTHESIS OF ADVANCED MATERIALS
• Growth of single-crystal Group III nitrides
• Plasma and plasma processing
• Nanoparticles, nanotubes, nanowires
• Molecular electronics
• Electrochemical synthesis of alloys and compounds
• Microvascular constructs
• Functional polymers and composites

PROCESSING AND CHARACTERIZATION OF NOVEL MATERIALS
• Nanomaterials and polymer nanocomposites
• Development of responsive additives for
CHEMICAL ENGINEERING (ECHE)

Course Descriptions
ECHE C100. Co-op Seminar I for Chemical Engineering (1)
Professional development activities for students returning from cooperative education assignments. Recommended preparation: COOP 001.

ECHE C200. Co-op Seminar II for Chemical Engineering (2)
Professional development activities for students returning from cooperative education assignments. Recommended preparation: COOP 002 and ECHE C100.

ECHE 151. Introduction to Chemical Engineering at Case (0)
Introduction to the Chemical Engineering Department and its activities: faculty and faculty research areas, breadth elective sequences, cooperative education, Summer Lab in Denmark, Junior Year in Edinburgh, industrial employment opportunities, non-traditional employment opportunities. Required of Chemical Engineering students before their junior year.

ECHE 250. Honors Research I (1 - 3)
A special program which affords a limited number of students the opportunity to conduct research under the guidance of one of the faculty. At the end of the first semester of the sophomore year, students who have a strong interest in research are encouraged to discuss research possibilities with the faculty. Assignments are made based on mutual interest. Subject to the availability of funds, the faculty employs students through the summers of their sophomore and junior years, as members of their research teams.

ECHE 251. Honors Research II (1 - 3)
(See ECHE 250.) Recommended preparation: ECHE 250.

ECHE 260. Introduction to Chemical Systems (3)
Material and energy balances. Conservation principles and the elementary laws of physical chemistry applied to chemical processes. Developing skills in quantitative formulation and solution of word problems.

ECHE 340. Biochemical Engineering (3)
Chemical engineering principles applied to biological and biochemical systems and related processes. Microbiology and biochemistry linked with transport phenomena, kinetics, reactor design and analysis, and separations. Specific examples of microbial and enzyme processes of industrial significance. Recommended preparation: BIOL 107, BIOL 108, BIOL 403 and ECHE 364, or permission of instructor.

ECHE 350. Undergraduate Research Project I (3)
This course affords a student the opportunity to conduct research under the guidance of one of the faculty, as part of the Chemical Engineering Research breadth elective sequence. Students who have a strong interest in research are encouraged to discuss research possibilities with the faculty. Assignments are made base on mutual interest.

ECHE 355. Quantitative Molecular Bioengineering (3)
The objective of this course is to equip the students with a "molecular toolbox"—a set of quantitative skills that permit rational designs for engineering tissues starting at the molecular level. The course will build on the physical and chemical principles in equilibrium, kinetics, and mass transport. Specific examples in bioengineering systems will be used throughout the course to illustrate the importance of understanding and application of these principles to tissue engineering. Recommended preparation: ENGR 225. Offered as EBME 350 and ECHE 355.

ECHE 360. Transport Phenomena for Chemical Systems (4)
Fundamentals of fluid flow, heat and mass transport from the microscopic and macroscopic perspectives. Applications to chemical systems, including steady and transient operations, convective and molecular (conduction and diffusion) effects, and interfacial transport. Design of unit operations (e.g., heat exchangers). Heat and mass transfer analogies. Vector/tensor analysis and dimensional analysis used throughout. Recommended preparation: MATH 223 and ENGR 225.

ECHE 361. Separation Processes (3)
Analysis and design of separation processes involving distillation, extraction, absorption, adsorption, and membrane processes. Design problems and the physical and chemical processes involved in separation. Equilibrium stage, degrees of freedom in design, graphical and analytical design techniques, efficiency and capacity of separation processes. Recommended preparation: ECHE 260 and ECHE 363.

ECHE 362. Chemical Engineering Laboratory (4)
Experiments in the operation of separation and reaction equipment, including design of experiments, technical analysis, and economic analysis. Experiments cover distillation, liquid-liquid extraction, heat transfer, fluidized beds, control, membrane separations, and chemical and electrochemical reactors. Recommended preparation: ECHE 360, ECHE 361, ECHE 363, and ECHE 364.

ECHE 362D. Chemical Engineering Laboratory in Denmark (4)
Chemical Engineering Laboratory in Denmark. A version of ECHE 362 taught during the summer at DTU in Lyngby.

ECHE 363. Thermodynamics of Chemical Systems (3)
First law, second law, phase equilibria, phase rule, chemical reaction equilibria, and applications to engineering problems. Thermodynamic properties of real substances, with emphasis on solutions. Thermodynamic analysis of processes including chemical reactions. Recommended preparation: ECHE 260 and ENGR 225 or consent of instructor and concurrent enrollment in MATH 224.

ECHE 364. Chemical Reaction Processes (3)

ECHE 365. Measurements Laboratory (3)
Laboratory introduction to the measurement process in engineering. Matching measurements to approximate and exact physical models is stressed. Extraction of physical parameters and estimation of the errors in the parameter estimates is an important part of the course. Example projects cover steady and unsteady state heat transfer, momentum transfer, and the first law of thermodynamics. Recommended preparation: ECHE 360.

ECHE 367. Process Control (4)
Theoretical and practical aspects of feedback control of chemical processes. The course involves extensive use of computer software with some exams taken using the computer. Short laboratories and Labview training are integrated into the course. Topics include: analysis of linear dynamical systems using Laplace transforms, derivation of unsteady state mathematical models of simple chemical processes, dynamic simulation of linear and nonlinear models, design of PID controllers by model inverse methods, tuning of controller to accommodate process model uncertainty, two degrees of freedom controllers, feed-forward and cascade control. The Labview training covers programming basics, interfacing to a data acquisition system, and incorporating control algorithms. Recommended preparation: MATH 224 and ECHE 260 or permission of instructor.

ECHE 370. Fluid Mechanics for Chemical Systems (3)
This course introduces the physical and mathematical concepts associated with the motion of material and the transfer of momentum. These concepts will be applied to the analysis of engineering systems to obtain both exact solutions and practical estimates. Both analytical and numerical solutions will be utilized.

ECHE 371. Heat and Mass Transfer for Chemical Systems (3)
This course introduces the physical and mathematical concepts associated with the transfer of heat and mass. These will be applied to the analysis of engineering situations to obtain both exact solutions and practical estimates. Analytical and numerical solutions will be utilized.

ECHE 380. Electrochemical Technology (3)

ECHE 381. Electrochemical Engineering (3)
Engineering aspects of electrochemical processes including current and potential distribution, mass transport and fluid mechanical effects. Examples from industrial processes including electroplating, industrial electrolysis, corrosion, and batteries. Recommended preparation: ECHE 260 or permission of instructor. Offered as ECHE 381 and ECHE 480.

ECHE 383. Chemical Engineering Applied to Microfabrication and Devices (3)
Silicon based microfabrication and micromachining require many chemical engineering technologies. Microfabricated devices such as sensors are also directly related to chemical engineering. The applications of chemical engineering principles to microfabrication and micromachining are introduced. Oxidation processing, chemical vapor deposition, etching and patterning techniques, electrophotating and other technologies are discussed. Graduate students will submit an additional final project on some technical aspect of microfabrication technology or devices. Recommended preparation: ECHE 363 and ECHE 371. Offered as ECHE 383 and ECHE 483.

ECHE 396. Research and Innovation (3)
This course is an opportunity for undergraduate students to experience research—how to approach a research problem, design experiments and analyze data. This will be accomplished through (a) hands-on laboratory experiences with important research techniques, (b) assignment of open-ended projects on research topics, and (c) discussion of specific interdisciplinary research being pursued at Case. It is meant to be a mechanism for students to become involved in a research project; the final assignment is to submit a proposal for this project. Example interdisciplinary research areas to be included are Fuel Cells and Batteries, Sensors, Biomaterials, and Micro and Nano-fabricated Devices.

ECHE 397. Special Topics in Chemical Engineering (3)
Special topics within an area of chemical engineering.

ECHE 398. Process Analysis and Design (3)

ECHE 399. Chemical Engineering Design Project (3)
This is a course that uses the small teams approach to solve chemical process design problems. Numerous exercises involving process design are used to integrate material taught in previous and concurrent courses. This includes application of computer based design tools, economics, scheduling, decision making with uncertainty, and proposal and report preparation. This work leads to one comprehensive process design project done by the class, which includes a written and oral report. Recommended preparation: ECHE 398. SAGES Senior Cap

ECHE 400T. Graduate Teaching I (0)
All Ph.D. students are required to take this course.

The experience includes elements from the following tasks: development of teaching or lecture materials, teaching recitation groups, providing laboratory assistance, tutoring, exam/quiz/homework preparation and grading, mentoring students. Recommended preparation: Entering Ph.D. student in Chemical Engineering.

ECHE 401. Chemical Engineering Communications I (3)
Introductory course in communication for Chemical Engineering graduate students: preparation of first proposal for thesis, preparation of technical reports and scientific papers, literature sources, reviewing proposals, and manuscripts for professional journals, and making effective technical presentations.

ECHE 402. Chemical Engineering Communications II (2)
This course is a continuation of ECHE 401 and is designed to develop skills in writing proposals for funding research projects. The federal requirements are reviewed for submitting proposals to the major granting agents including NSF, NIH and DoD. We will study strategies for developing fundable projects. Each student will submit a research proposal for a thesis project and do an oral presentation of the project.

ECHE 460. Thermodynamics of Chemical Systems (3)
Phase equilibria, phase rule, chemical reaction equilibria in homogeneous and heterogeneous systems, ideal and non-ideal behavior of fluids and solutions, thermodynamic analysis of closed and open chemical systems with applications. Recommended preparation: ECHE 363.

ECHE 461. Transport Phenomena (3)

ECHE 462. Chemical Reaction Engineering (3)

ECHE 464. Surfaces and Adsorption (3)
Thermodynamics of interfaces, nature of interactions across phase boundaries, capillary wetting properties of adsorbed films, friction and lubrication, fluctuation, detergency, the surface of solids, relation of bulk to surface properties of materials, non-catalytic surface reactions. Recommended preparation: CHEM 335 or equivalent.

ECHE 466. Colloid Science (3)
Stochastic processes and interparticle forces in colloidal dispersions. DLVO theory, stability criteria,

ECHE 469. Chemical Engineering Seminar (0) Distinguished outside speakers present current research in various topics of chemical engineering science. Graduate students also present technical papers based on thesis research.

ECHE 470. Graduate Research Colloquium (S) Outside speakers present lectures on their current research. Various topics in the areas of chemical engineering science, basic and applied chemistry, bioengineering, material science, and applied mathematics are covered in the lectures. Graduate students also present technical papers based on their own research. Students are graded on the submission of one-page summary reports on any two lectures.

ECHE 474. Biotransport Processes (3) Biomedical mass transport and chemical reaction processes. Basic mechanisms and mathematical models based on thermodynamics, mass and momentum conservation. Analytical and numerical methods to simulate in vivo processes as well as to develop diagnostic and therapeutic methods. Applications include transport across membranes, transport in blood, tumor processes, bioreactors, cell differentiation, chemotaxis, drug delivery systems, tissue engineering processes. Recommended preparation: EBME 350 and EBME 409 or equivalent. Offered as EBME 474 and ECHE 474.


ECHE 477. Data Acquisition and LabVIEW Bootcamp (1) This course will introduce and implement basic data acquisition concepts and LabVIEW virtual instrumentation programming, providing hands-on experience with hardware and software. It is intended to help those with little or no data acquisition experience to get started on setting up data acquisition for their application. No prior experience with LabVIEW is required. Consult with the instructor for additional details.

ECHE 480. Electrochemical Engineering (3) Engineering aspects of electrochemical processes including current and potential distribution, mass transport and fluid mechanical effects. Examples from industrial processes including electroplating, industrial electrolysis, corrosion, and batteries. Recommended preparation: ECHE 260 or permission of instructor. Offered as ECHE 381 and ECHE 480.

ECHE 483. Chemical Engineering Applied to Microfabrication and Devices (3) Silicon based microfabrication and micromachining require many chemical engineering technologies. Microfabricated devices such as sensors are also directly related to chemical engineering. The applications of chemical engineering principles to microfabrication and micromachining are introduced. Oxidation processing, chemical vapor deposition, etching and patterning techniques, electroplating and other technologies are discussed. Graduate students will submit an additional final project on some technical aspect of microfabrication technology or devices. Recommended preparation: ECHE 363 and ECHE 371. Offered as ECHE 383 and ECHE 483.

ECHE 500T. Graduate Teaching II (0) All Ph.D. students are required to take this course. The experience will include elements from the following tasks: development of teaching or lecture materials, teaching recitation groups, providing laboratory assistance, tutoring, exam/quiz/homework preparation and grading, mentoring students. Recommended preparation: Ph.D. student in Chemical Engineering.


ECHE 701. Dissertation Ph.D. (1 - 18) Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Chemical Engineering First Year Class-Lab-Credit Hours Fall

MATH 122/124 Calculus for Science and Engineering I (4-3-4) CHEM 111 Principles of Chemistry I (4-0-4) MATH 121/123 Calculus for Science and Engineering I (4-0-4) FSxx 1xx SAGES First Seminar I (1-1-4) ECHE 151 Chemical Engineering at Case (1-0-0) PHED 101 Physical Education Activities (0-3-0) Total (16-7-16)

Spring

PHYS 121/125 General Physics I. Mechanics * (4-3-4) CHEM 112 Principles of Chemistry II (4-0-4) MATH 122/124 Calculus for Science and Engineering II * (4-0-4) ENGR 131 Elementary Computer Programming (2-2-3) USxx 2xx SAGES University Seminar I (3-0-3) PHED 102 Physical Education Activities (0-3-0) Total (17-8-18)

Second Year

Fall


Spring

PHYS 122/126 General Physics II. Electricity and Magnetism * (4-3-4) ENGR 145 Chemistry of Materials (4-0-4) MATH 222/224 Calculus for Science and Engineering IV * (4-0-4) ENGR 131 Elementary Computer Programming (2-2-3) USxx 2xx SAGES University Seminar I (3-0-3) PHED 102 Physical Education Activities (0-3-0) Total (17-0-16)

Third Year

PHYS 122/125 General Physics I. Mechanics * (4-3-4) CHEM 111 Principles of Chemistry I (4-0-4) MATH 121/123 Calculus for Science and Engineering I (4-0-4) FSxx 1xx SAGES First Seminar I (1-1-4) ECHE 151 Chemical Engineering at Case (1-0-0) PHED 101 Physical Education Activities (0-3-0) Total (16-7-16)

Electives: SAGES University Seminar I (3-0-3) SAGES University Seminar II (3-0-3) Total (6-0-6)
Fall
ECHE 360 Transport Phenomena for Chemical Systems (4-0-4)
ECHE 367 Process Control (4-0-4)
ENGR 210 Circuits and Instrumentation (2-2-4)
CHEM 290 Advanced Chemical Laboratory Methods (1-6-3)
Breadth elective sequence I \( ^c \) (3-0-3)
Total (14-8-18)

Spring
ECHE 361 Separation Processes (3-0-3)
ECHE 365 Measurements Lab (0-3-3)
ENGR 398 Professional Communications for Engineers \( ^d \) (1-0-1)
ENGL 398 Professional Communications for Engineers \( ^d \) (2-0-2)
ECHE 364 Chemical Reaction Processes (3-0-3)
Humanities/Social Science elective II (3-0-3)
Total (12-3-15)

Fourth Year
Fall
ECHE 398 Process Analysis and Design (3-0-3)
ECHE 362 Chemical Engineering Laboratory (0-4-4)
Materials elective \( ^c \) (3-0-3)
Breadth elective sequence II \( ^e \) (3-0-3)
Humanities/Social Science elective III (3-0-3)
Total (12-4-16)

Spring
ECHE 399 Chemical Engineering Design Project \( ^f \) (3-0-3)
ENGR 200 Statics and Strength of Materials (3-0-3)
CHEM 336 Physical Chemistry II (3-0-3)
Breadth elective sequence III \( ^c \) (3-0-3)
Humanities/Social Science elective IV (3-0-3)
Total (15-0-15)

Hours required for graduation: 129-131 (depending on breadth elective sequence)

a. Higher number (advanced or honors)
courses are available to students by invitation only.
b. Must take one course from each thematic group: FSSY or USSY—Thinking about the symbolic world, FSNA or USNA—Thinking about the natural world and FSSO or USSO—Thinking about the social world. Specific seminar topics will change periodically.
c. A three-course (9 credit hours minimum) breadth sequence (approved by the Chemical Engineering faculty). Pre-approved sequences include: biochemical engineering, biomedical engineering, computing, electrochemical engineering, electronic materials processing, environmental engineering, management, polymer science, systems and control, and advanced study (BS/MS).
d. SAGES Departmental Seminar.
e. Science elective, chosen from: PHYS 221 General Physics III. Modern (F, Sp), CHEM 224/324 Organic Chemistry II (Sp), CHEM 311 Inorganic Chemistry I (F), or BIOL 300 Dynamics of Biological Systems (Sp).
f. One Materials elective is required. Suggested courses include: EMSE 201 Introduction to Materials Science and Engineering, EMAC 270 Introduction to Polymer Science (F, Sp), EMAC 276 Polymer Properties and Design (F, Sp), EMSE 314 Electrical, Magnetic, Optical Properties of Materials (F), EMSE 316 Applications of Ceramic Materials, CHEM 336 Introductory Physical Chemistry II or a course approved by the faculty.
g. SAGES Capstone Course

APPROVED BREADTH ELECTIVE SEQUENCES

Biochemical Engineering (Advisor: Dr. Qutubuddin)
BIOC 307 General Biochemistry (4) Fall, third year
BIOL 343 Microbiology (3) Spring, third year
ECHE 340 Biochemical Engineering (3) Spring, fourth year

Biomedical Engineering (Advisor: Dr. Baskaran)
EMBE 201 Physiology-Biophysics I (3) Fall, third year
EMBE 202 Physiology-Biophysics II (3) Spring, third year
EMBE 309 Modeling of Biomedical Systems (3) or EMBE 310 Biomedical Instrumentation (3) Spring, fourth year

Computing (Advisor: Dr. Lacks)
ECES 281 Logic Design and Computer Organization (4) Fall, third year
EECS 233 Introduction to Data Structures (4) Spring, third year
EECS 346 Engineering Optimization (3) Spring, fourth year

Electrochemical Engineering\( ^g \) (Advisor: Dr. Landau)
ECHE 380 Electrochemical Technology (3) or Fall, third year
ECHE 381 Electrochemical Engineering (3) Spring, third year
ECHE 383 Chemical Engineering Applied to Microfabrication and Devices (3) Fall, fourth year
EMSE 314 Electronic, Magnetic, and Optical Properties of Materials (3) Fall, fourth year
EECS 281 Logic Design and Computer Organization (4) Fall, fourth year
EECS 306 Control Engineering II (3) or ECHE 463 Model Based Control (3) Spring, fourth year

EMSE 411, Environmental Effects on Materials Behavior (3) Spring, fourth year

Electronic Materials\( ^h \) (Advisor: Dr. Liu)
ECHE 383 Chemical Engineering Applied to Microfabrication and Devices (3) Fall, third year
EECS 309 Electromagnetic Fields I (3) Fall, fourth year
plus one additional course selected from:
EMSE 314 Electronic, Magnetic, and Optical Properties of Materials (3) Fall, fourth year
EECS 321 Semiconductor Electronic Devices (4) Spring, fourth year

Environmental Engineering (Advisor: Dr. Feke)
GEOL 303 Environmental Law (3) Fall, junior
ECIV 352/GEOL 352 Environmental Chemistry and Engineering (3) Spring, junior
ECIV 362 Solid and Hazardous Waste Management (3) or Spring, third year
BIOL 350 Introduction to Ecosystems Analysis and Environmental Science (3) Fall, fourth year

Management/Entrepreneurship (Advisor: Dr. Savinell)
ACCT 101 Introduction to Financial Accounting (3) Fall, third year
BAFI 353 Corporation Finance (3) Fall, fourth year
ENTP 311 New Venture Creation (3) or Spring, third year
ENTP 310 Entrepreneurial Financing (3) Fall, fourth year

Polymers Science\( ^i \) (Advisor: Dr. Mann)
EMAC 270 Introduction to Polymer Science (3) Fall, third year
plus any two courses selected from:
EMAC 276 Polymer Properties and Design (3) Fall, fourth year
EMAC 376 Polymer Engineering (3) Spring, third year
EMAC 377 Polymer Processing (4) Spring, fourth year
EMAC 378 Polymer Production and Technology (3) Spring, fourth year

Research (Advisor: Dr. Martin)
ECHE 396 Research and Innovation Spring, third year
ECHE 350 Undergraduate Research Project I (3) Fall, fourth year
ECHE 351 Undergraduate Research Project II (3) or Research elective Spring, fourth year

Systems and Control (Advisor: Dr. Lacks)
EECS 346 Engineering Optimization (3) Spring, third year
EECS 281 Logic Design and Computer Organization (4) Fall, fourth year
EECS 306 Control Engineering II (3) or ECHE 463 Model Based Control (3) Spring, fourth year

Advanced Study Sequence (Advisor:}
Dr. Qutubuddin
ECHE 460 Thermodynamics (3) or
ECHE 475 Chemical Engineering Analysis (3) Fall, fourth year
ECHE 651 Master’s Thesis (3) Fall, fourth year
ECHE 651 Master’s Thesis (3) Spring, fourth year

h. In these sequences, coordinate your choice of breadth electives with your choice for the Materials elective.
i. Students should take a 300-level undergraduate or introductory graduate course that would be relevant to their research project and is approved by the department.
j. This sequence is designed for students entering the five-year B.S./M.S. program. Students taking this sequence should rearrange scheduling of the breadth elective sequence and humanities/social science courses in the third and fourth years to accommodate these courses.

DEPARTMENT OF CIVIL ENGINEERING

Bingham Building (7201)
Phone: 216-368-2950; Fax: 216-368-5229
Xiangwu (David) Zeng, Ph.D., Professor and Chair
email: xzz16@case.edu
http://civil.case.edu

Programs in Environmental, Geotechnical, and Structural Engineering, Construction Engineering and Management, and Engineering Mechanics

Civil engineering is concerned with the environment and with the planning, design, and construction of facilities for meeting the needs of modern society. Examples of such facilities are transportation systems, schools and office buildings, bridges, dams, land reclamation projects, water treatment and distribution systems, commercial buildings, and industrial plants. Civil engineers can choose from a broad spectrum of opportunities in industry and consulting practice as well as research and development in firms in which civil engineers often participate as owners or partners. Employment can be found among a wide variety of industrial, governmental, construction, and private consulting organizations. There is a large demand for civil engineers nationally. The program at Case Western Reserve University is built around small classes, good faculty-student relationships and advising, and a program flexible enough to meet students’ personal career aims.

The Department of Civil Engineering of the Case School of Engineering offers an accredited Bachelor of Science degree in Civil Engineering with courses in almost all the traditional civil engineering subjects. The graduate program offers the Master of Science and Doctor of Philosophy degrees in structures, engineering mechanics, geotechnical and environmental engineering. A cooperative education program involving participating engineering firms is available for both undergraduate and graduate students.

An active research program gives the students opportunities to participate in projects related to design, analysis, and testing. Projects are in areas such as computational mechanics, probabilistic design, bridges, dynamics and wind engineering, response of concrete and steel structures, fracture mechanics, static and dynamic behavior of soils, earthquake engineering, subsurface and ex situ remediation, colloid behavior in environmental systems, and contaminated sediment dynamics.

MISSION STATEMENT AND OBJECTIVES

The Civil Engineering Department developed its own mission statement and educational objectives that are consistent with those of the Engineering School. This process involved the entire Civil Engineering faculty and the Civil Engineering Development Committee. It was conducted during regular faculty meetings and special meetings called for this purpose. It is an ongoing process. Mission Statement:

Our mission is to prepare students for leadership roles in civil and environmental engineering. The department will provide facilities and research expertise to advance the state of the civil engineering profession within the mission of the Case School of Engineering. Students will be taught to address problems building on solid technical foundations while taking advantage of advanced technologies. Our graduates will adhere to high technical and ethical standards, in service to the public. Graduates will be prepared for the pursuit of advanced learning in civil engineering and related fields, as well as for the practice of civil and environmental engineering at the highest professional levels.

Program Objectives

The ECIV program committed itself to the establishment of a new set of Program Educational Objectives. In consultation with our stakeholders, the following reconstituted set of Program Educational Objectives has been established:

- Graduates of the ECIV Program will enter the profession of Civil Engineering and advance to positions of greater responsibility and leadership, in line with ASCE Professional Grade Descriptions.
- Graduates of the ECIV Program will enter and successfully progress in, or complete, advanced degree programs within their fields of choice.
- Graduates of the ECIV Program will progress toward or complete professional registration and licensure.

FACULTY

Xiangwu (David) Zeng, Ph.D.
(Cambridge University)
Professor and Chair
Geotechnical earthquake engineering; centrifuge modeling; foundation vibration

Dario A. Gasparini, Ph.D.
(Massachusetts Institute of Technology)
Professor
Structures; wind and earthquake engineering; applied random processes; history of engineering

(University of California, Berkeley), P.E.
Professor
Structures; design and dynamics; earthquake engineering; bridge engineering

Aaron A. Jennings, Ph.D.
(University of Massachusetts), P.E.
Professor
Environmental and geoenvironmental engineering; groundwater contamination; hazardous waste management; uncertainty analysis for environmental models

Robert L. Mullen, Ph.D.
(Northwestern University), P.E.
Frank H. Neff Professor
Computational mechanics; finite elements; boundary elements.

Vassilis P. Panoskaltsis, Ph.D.
(University of California, Berkeley)
Associate Professor
Constitutive modeling of civil engineering materials; thermomechanics of solids; viscoelasticity, plasticity, damage mechanics; fatigue; computational mechanics

Adel S. Saada, Ph.D.
(Princeton University), P.E.
Professor
Mechanics of materials; static and dynamic mechanical behavior of soils; foundation engineering
Xiong (Bill) Yu, Ph.D.
(Purdue University), P.E
Assistant Professor
Geotechnical engineering; infrastructure; construction material testing; information technology

EMERITUS FACULTY
J. Ludwig Figueroa, Ph.D.
(University of Illinois)
Professor Emeritus

ADJUNCT FACULTY
Cynthia Collyard, Adjunct Instructor
Philip DeSantis, Adjunct Professor
Dan Ghiochel, Adjunct Professor
Samuel S. Jeyanayagam, Adjunct Professor
Kenneth L. Klika, Adjunct Professor
Winston Perera, Adjunct Professor
Mark D. Rokoff, Adjunct Assistant Professor
Randall H. Ruddeman, Adjunct Professor
John Stevenson, Adjunct Professor
Kirk C. Valanis, Adjunct Professor
Erwin V. Zaretsky, Adjunct Professor

UNDERGRADUATE PROGRAM
The faculty of the civil engineering department believe very strongly that undergraduate education should prepare students to be productive engineers upon receiving the degree. For this reason, particular emphasis in undergraduate teaching is placed on the application of engineering principles to the solution of problems. After completing a broad civil engineering core program undergraduate students must choose an elective sequence in one of the areas of civil engineering of particular interest, such as structural, geotechnical or environmental engineering; construction management or engineering mechanics.

In order to provide undergraduates with experience in industry, the department attempts to arrange summer jobs for the three summers between their semesters at Case Western Reserve University. By working for organizations in all areas of design and construction, students can gain an invaluable knowledge of the way the industry functions. This experience lets them gain more from their education and makes them more attractive to prospective employers upon graduation.

A cooperative education program is also available, which requires the student to spend two full semesters working full-time in an engineering capacity with a contractor, consulting engineer, architect, or materials supplier during the course of his or her education. The aim of the program is to enable students to make their education more meaningful by gaining familiarity with the industry they will work in after graduation and to help students finance their education.

The undergraduate program in civil engineering at Case Western Reserve University is accredited by the Engineering Accreditation Commission (EAC) of ABET, Inc. 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700.

The curriculum has been designed so that the student chooses a sequence of four (4) or more approved elective courses. The sequence is intended to give students the chance to pursue in some depth a particular area related to their careers as civil engineers. Samples of courses from which elective sequences could be chosen follow the civil engineering curriculum in this bulletin. In addition, the students are required to do a senior project in their area of interest.

Students enrolled in other majors may elect to pursue a minor in civil engineering or in environmental engineering. Department approval and a minimum of 15 credit hours are required.

Most classes at Case Western Reserve University are small, and the student has close contact with the faculty. Students have an opportunity to gain practical experience as well as earn a supplemental income by assisting faculty members on consulting work during vacation periods.

Cooperative Education is a formalized academic program which enables students to alternate classroom studies with career-based experiences in industry. Cooperative Education is an extension of the classroom. It is a learning experience designed to integrate classroom theory with practical experience and professional development.

EDUCATIONAL OBJECTIVES
- Graduates of the ECIV Program will enter the profession of Civil Engineering and advance to positions of greater responsibility and leadership, in line with ASCE Professional Grade Descriptions.
- Graduates of the ECIV Program will enter and successfully progress in, or complete, advanced degree programs within their fields of choice.
- Graduates of the ECIV Program will progress toward or complete professional registration and licensure.

Program Outcomes

As preparation for meeting the above program objectives, the Department of Civil Engineering provides an undergraduate program designed so that students attain:

a. an ability to apply knowledge of mathematics (including differential equations) science (including calculus-based physics and general chemistry and one additional area of science
b. an ability to design and conduct experiments, as well as to analyze and interpret data in more than one area of civil engineering
c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. an ability to function on multi-disciplinary teams
e. an ability to identify, formulate, and solve engineering problems
f. an understanding of professional and ethical responsibility and the role of civil engineers in providing for the safety and well-being of the general public
g. an ability to communicate effectively in written and oral form
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i. a recognition of the need for, and an ability to engage in lifelong learning
j. a knowledge of contemporary issues
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice and the design of functional civil engineering facilities
l. proficiency in probability and statistics, as applied to civil engineering design and planning issues
m. an understanding of professional practice issues, including the role of civil engineering design and management professionals in the construction process, public policy and leadership
n. an understanding of the importance of professional licensure and the ethical use of a professional license

ELECTIVE SEQUENCE

Structural Engineering
SELECT A MINIMUM OF 15 CREDIT HOURS FROM THE FOLLOWING LIST OF COURSES (APPROVAL OF THE DEPARTMENT IS REQUIRED):

**Environmental Engineering**
- ENGR 225, Thermodynamics, Fluid Mechanics, Heat & Mass Transfer (4)
- GEOL 321, Hydrogeology (3)
- ECIV 351, Engineering Hydraulics and Hydrology (3)
- ECIV 361, Water Resources Engineering (3)
- ECIV 362, Solid and Hazardous Waste Management (3)
- ECIV 368, Environmental Engineering (3)
- ECIV 460, Environmental Remediation (3)

Computer use is an integral part of the civil engineering curriculum. From required courses in computer programming and numerical analysis to subsequent use and development of civil engineering programs, the student fully utilizes the computer as a planning, analysis, design, and managerial tool.

All sequences are constructed to provide a balance of marketable skills and theoretical bases for further growth. With departmental approval other sequences can be developed to meet students’ needs.

**GRADUATE PROGRAM IN CIVIL ENGINEERING**

The graduate programs in structural engineering, geotechnical engineering, engineering mechanics and environmental engineering prepare students for careers in industry, professional practice, research and teaching. Experience has shown that job opportunities are excellent for students who receive advanced degrees in civil engineering at Case Western Reserve University. Recent advanced degree recipients have found positions in universities, consulting firms, petroleum companies, plant design firms, and aerospace firms, among others.

Each student’s program of course work and research is tailored to his or her interests, in close consultation with the faculty advisor. For students working toward the Master of Science degree there are two possible plans, A and B. In plan A, a research thesis is required. In plan B, a project and additional course work are substituted for the thesis. For students working toward the Doctor of Philosophy degree a research thesis is required.

**MINOR IN ENVIRONMENTAL ENGINEERING**

Students enrolled in other majors may elect to pursue a minor in Civil Engineering. A minimum of 15 credit hours is required, as follows:

**Required Course**
- ENGR 200, Statics and Strength of Materials (3)

Select a minimum of 12 credit hours from one of the following areas (approval of the department is required):

**Solid Mechanics**
- ECIV 310, Strength of Materials (3)
- ECIV 405, Solid Mechanics I (3)
- ECIV 406, Constitutive Modeling Theories (3)
- ECIV 411, Applied Elasticity (3)
- ECIV 420, Finite Element Analysis (3)
- ECIV 430, Foundation Engineering (3)
- GEOL 110, 119, Physical Geology (3), Lab (1)
- GEOL 330, Geophysical Field Methods (4)

**Structural & Geotechnical Engineering**
- ECIV 211, Civil Engineering Materials (3)
- ECIV 320, Structural Analysis I (3)
- ECIV 321, Structural Analysis II (3)
- ECIV 322, Structural Design I (3)
- ECIV 323, Structural Design II (3)
- ECIV 330, Soil Mechanics (4)
- ECIV 430, Foundation Engineering (3)
- ECIV 433, Soil Dynamics (3)

**Construction Engineering and Management**

Two of the courses must be
- ECIV 340, Construction Management (3)
- ECIV 341, Construction Scheduling and Estimating (3)

Two or more courses chosen from
- ACCT 303, Survey of Accounting (3)
- BAFI 355, Corporation Accounting (3)
- BLAW 329, Law & Management (3)
- ECIV 341, Construction Scheduling and Estimating (3)
- ECIV 430, Foundation Engineering (3)
- ECON 361, Managerial Economics (3)
- LHRP 251, Industrial Relations & Administrative Practices (3)
- LHRP 311, Labor Problems (3)

**MINOR IN CIVIL ENGINEERING**

Students enrolled in other majors may elect to pursue a minor in Civil Engineering. A minimum of 15 credit hours is required, as follows:

**Required Course**
- ENGR 200, Statics and Strength of Materials (3)

Select a minimum of 12 credit hours from one of the following areas (approval of the department is required):

**Solid Mechanics**
- ECIV 310, Strength of Materials (3)
- ECIV 405, Solid Mechanics I (3)
- ECIV 406, Constitutive Modeling Theories (3)
- ECIV 411, Applied Elasticity (3)
- ECIV 420, Finite Element Analysis (3)
- ECIV 430, Foundation Engineering (3)
- GEOL 110, 119, Physical Geology (3), Lab (1)
- GEOL 330, Geophysical Field Methods (4)

**Structural & Geotechnical Engineering**
- ECIV 211, Civil Engineering Materials (3)
- ECIV 320, Structural Analysis I (3)
- ECIV 321, Structural Analysis II (3)
- ECIV 322, Structural Design I (3)
- ECIV 323, Structural Design II (3)
- ECIV 330, Soil Mechanics (4)
- ECIV 430, Foundation Engineering (3)
- ECIV 433, Soil Dynamics (3)

**Construction Engineering and Management**

Two of the courses must be
- ECIV 340, Construction Management (3)
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- ACCT 303, Survey of Accounting (3)
- BAFI 355, Corporation Accounting (3)
- BLAW 329, Law & Management (3)
- ECIV 341, Construction Scheduling and Estimating (3)
- ECIV 430, Foundation Engineering (3)
- ECON 361, Managerial Economics (3)
- LHRP 251, Industrial Relations & Administrative Practices (3)
- LHRP 311, Labor Problems (3)
ENGINEERING MECHANICS
The graduate program in engineering mechanics prepares the students for a career in research and analysis in solid and computational mechanics. Courses in mechanics of solids, applied plasticity, damage mechanics, viscoelasticity, viscoplasticity, stability, dynamics, finite elements and boundary integral methods, computational mechanics, constitutive methods, fracture mechanics, plates and shells give the student the necessary knowledge and skill to study the behavior of modern materials and structures as well as advance the state of the art. For more information contact the chair of the Department of Civil Engineering.

FACILITIES

Bingham Structures Laboratory
The major component of this laboratory is a 14-foot by 60-foot structural test slab, which is the top flange of a 12-foot deep reinforced concrete box girder. Load and tiedown points are provided by 3-inch diameter holes spaced at 2-foot centers. Loading is accomplished by hydraulic jacks. The laboratory also contains 200k, 50k, 25k universal testing machines, and two (2) 55k MTS hydraulic actuators with a controller and a separate hydraulic service manifold system.

Strength of Materials Laboratory
This laboratory is equipped with two (2) MTS servo-hydraulic materials test systems. Capabilities include: fracture toughness evaluation of various materials, crack growth kinetics under different loading histories, and micro-structural damage analysis and micromechanics studies. The second MTS unit is capable of applying simultaneous axial and torsional loads. An environmental chamber is available. There is equipment available for fracture surface characterization and image analysis and a grinding-polishing unit.

Bingham Concrete Laboratory
A concrete laboratory is available for undergraduate instruction. A 100 percent humidity room is available for curing concrete specimens. Other equipment includes a concrete mixer, screening equipment, an air entrainment meter, facilities for prestressing specimens, and a 400k axial compression machine.

Environmental Engineering Laboratory
This laboratory is one in a suite of new laboratories that support environmental engineering teaching and research. The facilities include a teaching laboratory, an advanced instrumentation laboratory, a remediation research laboratory and an electronic classroom/software laboratory. The Environmental Engineering laboratory is equipped for conventional Standard Methods analysis of water, wastewater, soil, solid waste and air samples (pH meters, furnaces, ovens, incubators, hoods, etc.) and for aerobic microbiology work. The lab also offers generous bench top space for student teams to explore laboratory procedures and provides direct access to research, instrumentation, and computational facilities.

Environmental Instrumentation Laboratory
This laboratory is equipped for state-of-the-art analysis of environmental contaminants. The room supports a computer controlled Dionex DX-500 IC/HPLC system, a computer controlled Varian SPECTRAA 200/SIPS 10 (flame & furnace) AA system, and a computer controlled Hewlett Packard 6890 GC/MS analysis system for organic and inorganic pollutant analysis. Where appropriate, machines have been equipped with autosamplers to improve productivity.

Remediation Research and Colloid Science Laboratory
This laboratory is designed to support physical research on the applied science and design of remediation engineering and the analysis of colloidal particles. The laboratory provides a modeling floor for the assembly of laboratory scale remediation schemes, and provides immediate access to instrumentation and computational facilities for data analysis.

Soil Mechanics Laboratory
This laboratory has a full array of both instructional and research units: notable are automated triaxial units for generalized extension and compression tests, units permitting simultaneous application of hydrostatic, axial, and torsional static and dynamic stresses, a cubical device for true triaxial testing, units by means of which one-dimensional consolidation in the triaxial cell can be automatically achieved, and various pore pressure force and deformation measuring devices. Tests are monitored and instantly evaluated by data acquisition-computer systems. Also available is a longitudinal and torsional resonant column device and a large size oedometer equipped with bender elements. The laboratory has a SP2000 high speed camera to study dynamic phenomena. A 20 g-tons fully automated centrifuge with a servo-hydraulic earthquake shaker is in operation. The laboratory has a full set of equipment for TDR tests.

Neff Civil Engineering Undergraduate Computer Laboratory
This laboratory provides Civil Engineering students with access to all the computer resources needed for both course work and research. The laboratory is supplemented by other facilities provided by the university. The Neff Laboratory has Pentium class computers running Windows/XP operating system. All of the computers in the Neff lab can act as independent workstations or provide access via a fiber optic link to other campus computers.

Computational Mechanics Laboratory
This laboratory includes workstations running UNIX, for graduate instructional and research use. The workstations are connected to the network via a fiber optic link.

RESEARCH
Research under way in civil engineering includes work in analytical, design and experimental areas and is sponsored by industry, state, and federal government sources. Major areas of research interest are:

- Structures
- Random vibration
- Engineering materials
- Behavior of reinforced and prestressed concrete
- Wind engineering
- Earthquake analysis and design of structures
- Finite element methods
- Boundary element method
- Nondestructive Testing of Structures
- Passive and active control of the vibration of structures
- Transient response of nonlinear structures
- Blast loading of structures
- Engineering Mechanics
- Adaptive finite element and boundary element methods
- Modeling of micro electromechanical systems
- Reliable Engineering Computation
- Biomechanics of the human mid face and mandible
- Finite element modeling of coupled systems
- Fracture mechanics of brittle matrix composites
CIVIL ENGINEERING (ECIV)

Course Descriptions

ECIV 160. Surveying and Computer Graphics (3)

Principles and practice of surveying; error analysis, topographic mapping, introduction to photogrammetry and GIS; principles of graphics; computer-aided-drafting. Laboratory.

ECIV 211. Civil Engineering Materials (3)


ECIV 300. Undergraduate Research (3)

Research conducted under the supervision of a sponsoring Civil Engineering faculty member. Research can be done on an independent topic or as part of an established on-going research activity. The student will prepare a written report on the results of the research. Course may fulfill one technical elective requirement.

ECIV 310. Strength of Materials (3)


ECIV 320. Structural Analysis I (3)


ECIV 321. Structural Analysis II (3)


ECIV 322. Structural Design I (3)


ECIV 323. Structural Design II (3)


ECIV 330. Soil Mechanics (4)

The physical, chemical, and mechanical properties of soils. Soil classification, capillarity, permeability, and flow nets. One dimensional consolidation, stress and settlement analysis. Shear strength, stability of cuts, and design of embankments, retaining walls and footings. Standard laboratory tests performed for the determination of the physical and mechanical properties of soils. Laboratory. Recommended preparation: ECIV 310.

ECIV 340. Construction Management (3)

Selected topics in construction management including specifications writing, contract documents, estimating, materials and labor, bidding procedures and scheduling techniques. The course is augmented by guest lecturers from local industries.

ECIV 341. Construction Scheduling and Estimating (3)

The focus is on scheduling, and estimating and bidding for public and private projects. This includes highways as well as industrial and building construction. The use of computers with the latest software in estimating materials, labor, equipment, overhead, and profit is emphasized. Recommended preparation: ECIV 340 and consent of instructor.

ECIV 351. Engineering Hydraulics and Hydrology (3)

Application of fluid statics and dynamics to Civil Engineering Design. Hydraulic machinery, pipe network analysis, thrust, hammer, open channel flow, sewer system design, culverts, flow gauging, retention/detention basin design. Applied hydrology; hydrograph analysis and hydraulic routing will also be introduced. Recommended preparation: Concurrent enrollment in ENGR 225.

ECIV 350. Civil Engineering Systems (3)

Decision-making methods in civil engineering. Engineering economics. Linear and nonlinear programming; planning, scheduling, and CPM methods. Probability and reliability analysis for decisions with risk and uncertainty.

ECIV 361. Water Resources Engineering (3)

Water doctrine, probabilistic analysis of hydrologic data, common and rare event analysis, flood forecasting and control, reservoir design, hydrologic routing, synthetic streamflow generation, hydroelectric power, water resource quality, water resources planning. Recommended preparation: ECIV 351.

ECIV 362. Solid and Hazardous Waste Management (3)


ECIV 368. Environmental Engineering (3)

Principle and practice of environmental engineering. Water and waste engineering unit operations and processes including related topics from industrial waste disposal, air pollution and environmental health.

ECIV 370. Unit Operations and Processes in Environmental Engineering (3)

Physical, chemical, and biological operations and processes for the treatment of water supplies and municipal, industrial, and hazardous waste streams. Emphasis will be given to theoretical understanding and analysis of the involved processes and the design of treatment operations. Laboratory. Recommended preparation: ECIV 368.
mended preparation: ECIV 368.

ECIV 396. Civil Engineering Special Topics I (1 - 3) Special topics in civil engineering in which a regular course is not available. Conferences and report.

ECIV 397. Civil Engineering Topics II (3) Special topics in civil engineering in which a regular course is not available. Conferences and report.

ECIV 398. Civil Engineering Senior Project (3) A project emphasizing research and/or design must be completed by all civil engineers. Requirements include periodic reporting of progress, plus a final oral presentation and written report. SAGES Senior Cap

ECIV 400T. Graduate Teaching I (0) This series of three courses will provide Ph.D. students with practical experience in teaching at the university level and will expose them to effective teaching methods. Each course assignment will be organized in coordination with the student’s dissertation advisor and the department chair. Assignments will successively require more contact with students, with duties approaching the teaching requirements of a faculty member in the Ph.D. student's area of study. Prereq: Ph.D. students in Civil Engineering.


ECIV 421. Advanced Reinforced Concrete Design (3) Properties of plain and reinforced concrete, ultimate strength of reinforced concrete structural elements, flexural and shear design of beams, bond and cracking, torsion, moment redistribution, limit analysis, yield line analysis of slabs, direct design and equivalent frame method, columns, fracture mechanics concepts. Recommended preparation: ECIV 322 and consent of instructor.

ECIV 422. Advanced Structural Steel Design (3) Selected topics in structural steel design including plastic design, torsion, lateral buckling, torsional-flexural buckling, frame stability, plate girders, and connections, including critical review of current design specifications relating to these topics. Recommended preparation: ECIV 322.

ECIV 423. Prestressed Concrete Design (3) Design of prestressed concrete structures, mechanical behavior of concrete suitable for prestressing and prestressed steels, load balancing, partial prestressing, prestressing losses, continuous beams, prestressed slab design, columns. Recommended preparation: ECIV 323 or ECIV 421 and consent of instructor.

ECIV 424. Structural Dynamics (3) Modeling of structures as single and multidegree of freedom dynamic systems. The eigenvalue problem, damping, and the behavior of dynamic systems. Deterministic models of dynamic loads such as wind and earthquakes. Analytical methods, including modal, response spectrum, time history, and frequency domain analyses. Recommended preparation: ECIV 321 and consent of instructor.

ECIV 425. Structural Design for Dynamic Loads (3) Structural design problems in which dynamic excitations are of importance. Earthquake, wind, blast, traffic, and machinery excitations. Human sensitivity to vibration, mechanical behavior of structural elements under dynamic excitation, earthquake response and earthquake-resistant design, wind loading, damping in structures, hysteretic energy dissipation, and ductility requirements. Recommended preparation: ECIV 424.


ECIV 432. Mechanical Behavior of Soils (3) Soil statics and stresses in a half space-tridimensional consolidation and sand drain theory; stress-strain relations and representations with rheological models. Critical state and various failure theories and their experimental justification for cohesive and noncohesive soils. Laboratory measurement of rheological properties, pore water pressures, and strength under combined stresses. Laboratory. Recommended preparation: ECIV 330.


ECIV 451. Infrastructure Engineering Practice (3) Case studies presenting significant accomplishments in infrastructure engineering presented by distinguished practicing engineers. Case studies will examine the historical development of our infrastructure, assessing cultural value of our built environment, alternate infrastructure models, public empowerment, sustainability, stewardship, financing, legal issues, and concepts for future development of infrastructure systems. Students will write environmental and cultural assessments of specific infrastructure projects.

ECIV 452. Infrastructure Aging and Assessment Technologies (4) Mechanical, thermal, and electrochemical processes that cause degradation of our built infrastructure. Reinforced concrete carbonation and freezing and
thawing; fatigue, brittle fracture, and corrosion of steel; weathering of masonry; degradation of asphalt pavements; deterioration of underground systems; aging of polymer-based construction products such as sealants and coatings. Assessment technologies, including non-destructive testing and mathematical modeling. Laboratory and field experiences.

ECIV 453. Infrastructure Rehabilitation Design (4) Rehabilitation materials and systems; mechan- cal, electrochemical, thermal, environmental, and aesthetic criteria for decision-making; design principles; specifications and control of construction processes; rehabilitation case studies. Application to structures, pipelines, pavements, and drainage systems.

ECIV 454. Modeling Infrastructure Systems (4) Examination of the properties that distinguish infra- structure performance models from more traditional engineering analysis models. Infrastructure software structure performance models from more traditional

ECIV 455. Infrastructure Engineering Decision Making (3) Aspects of decision theory applied to infrastructure systems. Review of probability and statistics, engineering economics, cost-benefit analysis, impact of social, historical, environmental and government policies on decisions. Emergency management and security considerations. Methods of project financing, asset management and asset optimization.

ECIV 456. Intelligent Infrastructure Systems (3) Topics on smart infrastructure systems; smart materials fabrication, embedded sensing technology for infrastructure condition monitoring, the system models for infrastructural condition diagnosing and adaptive controlling, and spatial-temporal integrat-ed infrastructure management system.

ECIV 460. Environmental Remediation (3) Evolution of proactive environmental engineering to recover contaminated air, water, and soil environments. Lake and river remediation, contaminated sediments, indoor air quality, chemical spills, underground storage tanks, contaminated soils, solid and hazardous waste sites, superfund remediation. Recommended preparation: ECIV 368 or consent of instructor.

ECIV 500T. Graduate Teaching II (0) This series of three courses will provide Ph.D. stu-dents with practical experience in teaching at the university level and will expose them to effective teaching methods. Each course assignment will be organized in coordination with the student’s dissertation advisor and the department chair. Assignments will successively require more contact with students, with duties approaching the teaching requirements of a faculty member in the Ph.D. student’s area of study. Prereq: Ph.D. student in Civil Engineering.

ECIV 505. Solid Mechanics II - Advanced Elas-ticity (3) Boundary value problems in linear and nonlinear elasticity using complex variables. Green’s functions, and integral transform techniques; thermoelasticity; wave propagation; micromechanics and the equivalent inclusion method; dislocations; composite materials; thin films; energy methods. Recommended preparation: ECIV 405 or consent of instructor.


ECIV 521. Stochastic Materials Behavior (3) Applications of random processes to characterization of material structure; elements of quantitative stereology; micromechanical stochastic modeling of stress-strain behavior and static strength; modeling of fatigue strength and crack growth; stochastic simulation of material structure and deformation processes. Recommended preparation: ECIV 405 or ECIV 410, ECIV 520 or consent of instructor.


ECIV 561. Groundwater Analysis (3) Principles of mass transport through porous me dia, formulation of saturated and unsaturated flow equations in alternative coordinate systems, analyti-cal and numerical solutions of flow equations, application of existing groundwater software, analysis of solute transport problems.


ECIV 587. Advanced Mechanics Seminar (3) Advanced topics in mechanics of solids. Thermodynamics with internal variables; thermoelasticity; plasticity; gradient theories; finite theories of plasticity; damage mechanics; endochronic plasticity; non-linear fracture mechanics; probabilistic me-chanics. Recommended preparation: ECIV 406, ECIV 420, ECIV 505 or consent of instructor.

ECIV 600T. Graduate Teaching III (0) This series of three courses will provide Ph.D. stu-dents with practical experience in teaching at the university level and will expose them to effective teaching methods. Each course assignment will be organized in coordination with student’s dissertation advisor and the department chair. Assignments will successively require more contact with students, with duties approaching the teaching requirements of a faculty member in the Ph.D. student’s area of study. Prereq: Ph.D. students in Civil Engineering.

ECIV 601. Independent Study (1 - 18) Plan B.

ECIV 611. Civil Engineering Graduate Seminar (0) Distinguished outside speakers present current research in various topics of Civil Engineering. Graduate students also present technical papers based on thesis research.

ECIV 650. Infrastructure Project (1 - 6) Project based experience in the application of infra-structure engineering principles to a complex infra-structure system.

ECIV 651. Thesis M.S. (1 - 18) Plan A.

ECIV 660. Special Topics (1 - 18) Topics of special interest to students and faculty. Topics can be those covered in a regular course when the student cannot wait for the course to be offered.

ECIV 701. Dissertation Ph.D. (1 - 18) Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Civil Engineering
First Year (Class-Lab-Credit Hours) Fall
Approved elective \(^3\) (3-0-3)
Approved elective \(^3\) (3-0-3)
Total (12-6-15)

**Spring**

Humanities or Social Science (3-0-3)
ECIV 360 Civil Engineering Systems (3-2-3)
PHYS 221 or approved Natural Sciences substitute (3-0-3)
Approved elective \(^3\) (3-0-3)
Open elective (3-0-3)
Total (15-2-15)

**Hours required for graduation:** 130
a. May substitute EECS 251.
b. Must be part of an approved sequence.

### DEPARTMENT OF ELECTRICAL ENGINEERING

#### AND COMPUTER SCIENCE

Glenman Building (7071)
Phone: 216-368-2800; Fax: 216-368-6888
Z. Meral Ozsoyoglu, Chair
Andrew R. Jennings Professor of Computing Sciences
e-mail: zmo@eecs.cwru.edu
http://www.eecs.cwru.edu

The Department of Electrical Engineering and Computer Science (EECS) spans a spectrum of degree programs and research areas that combine topics from (i) materials, devices, and circuits, (ii) applied physics, control, signals and systems, and (iii) software and computation to enhance connectivity, creativity, productivity, knowledge, information, education, training, perception, health, entertainment, reliability, safety, and memory, in our lives. EECS disciplines are, for example, responsible for developing microprocessors and personal computers, and the operating systems, computer software, and Internet applications that run on them. EECS disciplines are also responsible for the telecommunications advancements in our world, as well as many of the sensors that enhance our safety and convenience.

EECS is at the heart of a modern university, profoundly impacting medicine, arts, sciences, business, law, social behavior, etc. EECS drives intellectual property and wealth generation. Many other industries build on EECS. For example, healthcare builds on EECS technology at a pace that is consistently increasing (medical informatics, bioinformatics, system biology, data mining and visualization, micro/nano systems, electronics/instrumentation, imaging, robotics, etc.). EECS drives job creation, i.e. the Department of Labor Statistics estimate ~1.12M new jobs in EECS by 2010 versus ~0.2M new jobs in mechanical and civil engineering combined versus less than 0.1M new jobs in biomedical, macromolecular, and materials engineering combined.

EECS at Case supports four synergistic degree programs: computer science, computer engineering, systems and control engineering, and electrical engineering. Each degree program leads to the Bachelor of Science degree at the undergraduate level. The department also offers a Bachelor of Arts in computer science for those students who wish to combine a technical degree with a broad education in the liberal arts. At the graduate level, the department offers the Master of Science and Doctor of Philosophy degrees in electrical engineering, systems and control engineering, computer engineering, and computing and information sciences (i.e., computer science). For supplemental information to this bulletin as well as the latest updates, please visit the department Web site at http://www.eecs.case.edu.

### DEPARTMENT STRUCTURE

EECS at Case is organized internally into two informal divisions: (i) Computer Science; and (ii) Electrical and Computer Engineering, which includes Systems and Control Engineering. The acting associate chair of computer science (CS) is Professor Meral Ozsoyoglu. The associate chair of electrical and computer engineering is Professor Steven Garverick.

### EDUCATIONAL PHILOSOPHY

The EECS department is dedicated to developing high-quality graduates who will take positions of leadership in their careers. We recognize that the increasing role of technology in virtually every facet of our society, life, and culture makes it vital that our students have access to progressive and cutting-edge higher education programs. The program objectives for all of the degree programs in the department are:

- mastery of fundamentals
- creativity
- social awareness
- leadership skills
- professionalism

Stressing excellence in these core values helps to ensure that our graduates are valued and contributing members of our global society and that they will carry on the tradition of engineering leadership established by our alumni.

Our goal is to graduate students who have fundamental technical knowledge of their
profession and the requisite technical breadth and communications skills to become leaders in creating the new techniques and technologies which will advance their fields. To achieve this goal, the department offers a wide range of technical specialties consistent with the breadth of electrical engineering and computer science, including recent developments in the field. Because of the rapid pace of advancement in these fields, our degree programs emphasize a broad and foundational science and technology background that equips students for future developments. Our programs include a wide range of electives and our students are encouraged to develop individualized programs which can combine many aspects of electrical engineering and computer science.

FACULTY

Electrical and Computer Engineering Division

Swarup Bhunia, Ph.D.  
(Purdue University)  
Associate Professor  
Low power and robust nanoelectronics, adaptive nanocomputing, hardware security and protection, implantable electronics

Michael S. Branicky, Sc.D.  
(Massachusetts Institute of Technology)  
Professor  
Intelligent systems and control, hybrid systems, learning, real-time and distributed control over networks, applications to robotics, manufacturing, and biology

Marc Buchner, Ph.D.  
(Michigan State University)  
Associate Professor  
Computer gaming and simulation, virtual reality, software defined radio, wavelets, joint time frequency analysis

M. Cenk Cavusoglu, Ph.D.  
(University of California, Berkeley)  
Associate Professor  
Medical robotics, human-machine interfaces, haptics, teleoperation; computer graphics/virtual environments: surgical simulation, physical modeling; systems and control theory: intelligent control, modeling and simulation of biological systems

Vira Chankong, Ph.D.  
(Case Western Reserve University)  
Associate Professor  
Large-scale optimization; logic-based optimization; multi-objective optimization; optimization applications in radiation therapy treatment planning, medical imaging, manufacturing and production systems, and engineering design problems

Steven L. Garverick, Ph.D.  
(Massachusetts Institute of Technology)  
Associate Professor and Associate Chair of ECE  
Mixed-signal integrated circuit design, microelectromechanical system integration, sensor/actuator signal interfacing, data conversion, wireless communication, analog neural network circuits, medical instrumentation

Weilin (Wei) Lin, Ph.D.  
(Washington University)  
Professor  
Nonlinear control, dynamic systems and homogeneous systems theory, H-infinity and robust control, adaptive control, system parameter estimation and fault detection, nonlinear control applications to under-actuated mechanical systems, biologically-inspired systems and systems biology

Kenneth Loparo, Ph.D.  
(Case Western Reserve University)  
Nord Professor of Engineering  
Dynamic systems, nonlinear control, homogeneous systems theory, robust and adaptive control, control of nonholonomic or under-actuated mechanical systems, robotics and MEMS devices, nonlinear observers and identification, network congestion control, system biology and biologically inspired systems

Behnam Malakooti, Ph.D.  
(Purdue University)  
Professor  
Design and multi-objective optimization, manufacturing/production/operations systems, intelligent systems and networks, artificial neural networks, biological systems, intelligent decision making

Mehran Mehregany, Ph.D.  
(Massachusetts Institute of Technology)  
Goodrich Professor of Engineering Innovation  
Research and development at the intersections of micro/nano-electro-mechanical systems, semiconductor silicon carbide and integrated circuits

Frank Merat, Ph.D.  
(Case Western Reserve University)  
Associate Professor  
Computer and robot vision, digital image processing, sensors, artificial intelligence, RF communications, optical sensors and optical MEMS

Mihajlo D. Mesarovic, Ph.D.  
(University of Belgrade)  
Research Professor  
Complex systems theory, global issues and sustainable development, systems biology

Pedram Mohseni, Ph.D.  
(University of Michigan)  
Assistant Professor  
Biomedical microsystems, bioelectronics, wireless neural interfaces, CMOS interface circuits for MEMS, low-power wireless sensing/actuating microsystems

Wyatt Newman, Ph.D.  
(Massachusetts Institute of Technology)  
Professor  
Mechatronics, high-speed robot design, force and vision-based machine control, artificial reflexes for autonomous machines, rapid prototyping, agile manufacturing

C.A. Papachristou, Ph.D.  
(Johns Hopkins University)  
Professor  
VLSI design and CAD, computer architecture and parallel processing, design automation, embedded system design

Daniel Saab, Ph.D.  
(University of Illinois at Urbana-Champaign)  
Associate Professor  
Computer architecture, VLSI system design and test, CAD design automation

N. Sreenath, Ph.D.  
(University of Maryland)  
Associate Professor  
Systems Biology, large-scale and hierarchical systems, sustainable development, integrated assessment, global and environmental policy issues (water resources and global climate change), control theory applications, medical informatics

Norman Tien, Ph.D.  
(University of California, San Diego)  
Dean and Nord Professor of Engineering  
Ohio Eminent Scholar, Department of Physics  
MEMS for micro-optical applications in communications and biomedical systems, wireless integrated circuits, and environmental monitoring

Darrin Young, Ph.D.  
(University of California, Berkeley)  
Associate Professor  
Wireless sensing technology, micromachined sensors, micromachined RF high-Q passive devices, integrated low power and low noise analog circuits

Christian A. Zorman, Ph.D.  
(CASE WESTERN RESERVE UNIVERSITY)
Computer Science Division

Shudong Jin, Ph.D.
(Boston University)
Assistant Professor
Computer networks and protocols, multimedia networking, internet content delivery and performance evaluation

Mehmet Koyuturk, Ph.D.
(Purdue University)
Assistant Professor
Bioinformatics and computational biology, computational modeling and algorithm development for systems biology, integration, mining and analysis of biological data, algorithms for distributed systems

Michael Lewicki, Ph.D.
(California Institute of Technology)
Associate Professor
Computational perception and scene analysis, visual representation and processing, auditory representation and analysis

Jing Li, Ph.D.
(University of California, Riverside)
Assistant Professor
Computational biology and bioinformatics, statistical genomics and functional genomics, systems biology, algorithms

Vincenzo Liberatore, Ph.D.
(Rutgers University)
Associate Professor
Distributed Systems, Internet computing, randomized algorithms

Gultekin Ozsoyoglu, Ph.D.
(University of Alberta, Canada)
Professor
Graph databases and data mining problems in metabolic networks, metabolomics, and systems biology, bioinformatics, web data mining

Z. Meral Ozsoyoglu, Ph.D.
(University of Alberta, Canada)

Andrew R. Jennings Professor of Computing Sciences and Chair of EECS
Database systems, database query languages and optimization, data models, index structures, bioinformatics, medical informatics

Andy Podgurski, Ph.D.
(University of Massachusetts, Amherst)
Associate Professor
Software engineering methodology and tools, especially use of data mining, machine learning, and program analysis techniques in software testing, fault detection and localization, reliable engineering and software security

Michael Rabinovich, Ph.D.
(University of Washington)
Professor
Computer networks, Internet performance evaluation, databases, utility computing

Soumya Ray, Ph.D.
(University of Wisconsin, Madison)
Assistant Professor
Artificial intelligence, machine learning, reinforcement learning, automated planning, applications to interdisciplinary problems including medicine and bioinformatics

Jiong Yang, Ph.D.
(University of Illinois at Urbana-Champaign)
Assistant Professor
Data mining, bioinformatics

GQ (Guo-Qiang) Zhang, Ph.D.
(Cambridge University, England)
Professor
Programming languages, theory of computation, logic and topology in computer science, knowledge representation, information technology

Active Emeritus Faculty

George W. Ernst, Ph.D.
(Carnegie Institute of Technology)
Emeritus Professor
Learning problem solving strategies, artificial intelligence, expert systems, program verification

Dov Hazony, Ph.D.
(University of California, Los Angeles)
Emeritus Professor
Network syntheses, ultrasonics, communications

Wen H. Ko, Ph.D.
(Case Institute of Technology)
Emeritus Professor
Solid state electronics, Micro and nano sensors, biomedical instrumentation, implant telemetry

Lee J. White, Ph.D.
(University of Michigan)
Emeritus Professor
Software testing: regression testing, GUI testing, specification-based testing, testing of object-oriented software

Secondary Faculty Appointments

Alexis Abramson, Ph.D.
(University of California, Berkeley)
Assistant Professor, Mechanical and Aerospace Engineering

Robert V. Edwards, Ph.D.
(Johns Hopkins University)
Professor, Chemical Engineering

Joseph Koonce, Ph.D.
(University of Wisconsin, Madison)
Professor, Biology

Joseph Nadeau, Ph.D.
(Boston University)
James H. Jewel Professor of Genetics and Chair, Genetics

Tomas Radivoyevitch, Ph.D.
(Medical University of South Carolina)
Assistant Professor, Epidemiology and Biostatistics

Matthew J. Sobel, Ph.D.
(Stanford University)
Professor, Operations

Adjunct Faculty Appointments

Mark Allman
(Ohio University)
Adjunct Instructor

Randall Beer, Ph.D.
(Case Western Reserve University)
Adjunct Professor

Mark Dohring, Ph.D.
(Case Western Reserve University)
Adjunct Assistant Professor

Aaron Fleischman, Ph.D.
(Case Western Reserve University)
Adjunct Assistant Professor

Boris Igelnik, Ph.D.
(Academy of Sciences of the USSR)
Adjunct Associate Professor

Frank Li, Ph.D.
(Youngstown State University)
Adjunct Assistant Professor

Stephen Phillips, Ph.D.
(Arizona State University)
Adjunct Professor

CASE SCHOOL OF ENGINEERING
RESEARCH ACTIVITIES

The department’s over-arching research theme is exploring the intersections of “bio-micro/nano-info”. Within this theme, the research thrusts of the Electrical Engineering and Computer Science department include: (i) Micro/Nano systems; (ii) Electronics and Instrumentation; (iii) Embedded Systems; (iv) Robotics and Intelligent Systems; (v) Systems Biology; (vi) Bioinformatics and Computational Biology; (vii) Knowledge and Data Discovery; (viii) Information Networks and Distributed Software, and (ix) Medical Informatics.


FACILITIES

Computer Facilities

The department computer facilities incorporate both Unix (primarily Solaris) and Microsoft Windows-based operating systems on high end computing workstations for education and research. A number of file, printing, database, and authentication servers support these workstations, as well as the administrative functions of the department. Labs are primarily located in the Olin and Glennan buildings, but include Nord hall, and are networked via the Case network.

The Case network is a state-of-the-art, high-speed fiber optic campus-wide computer network that interconnects laboratories, faculty and student offices, classrooms, and student residence halls. It is one of the largest fiber-to-desktop networks anywhere in the world. Every desktop has a 1 Gbps (gigabit per second) connection to a fault-tolerant 10 Gbps backbone. To complement the wired network, over 1,200 wireless access points (WAPs) are also deployed allowing anyone with a laptop or wireless enabled PDA to access resources from practically anywhere on campus.

Off campus users, through the use of virtual private network (VPN) servers, can use their broadband connections to access many on campus resources, as well as software, as if they were physically connected to the Case network. The department and the university participate in the Internet2 and National Lambda Rail projects, which provides high-speed, inter-university network infrastructure allowing for enhanced collaboration between institutions. The Internet2 infrastructure allows students, faculty and staff alike the ability to enjoy extremely high performance connections to other Internet2 member institutions.

Aside from services provided through a commodity Internet connection, Case network users can take advantage of numerous online databases such as EUCLIDplus, the University Libraries’ circulation and public access catalog, as well as Lexus-Nexus™ and various CD-ROM based dictionaries, thesauri, encyclopedias, and research databases. Many regional and national institutional library catalogs are accessible over the network, as well.

EECS faculty are active users of the Microfabrication Laboratory and participants in the Advanced Platform Technology Center described under Interdisciplinary Research Centers.

ADDITIONAL DEPARTMENT FACILITIES

Sally & Larry Sears Undergraduate Design Laboratory

This laboratory supports all department courses in circuits and includes a state-of-the-art lecture hall, a modernistic glass-encased lab, and a student lounge and meeting area. Specialized lab space is available for senior projects and sponsored undergraduate programs. In addition, there is also a “sandbox” area where students can “play and tinker” with technology and foster their innovation and creativity. The laboratory supports this mission by providing students access to wireless and wired PCs, oscilloscopes, signal generators, logic analyzers, and specialized equipment such as spectrum analyzers and r.f. signal generators. In addition, the lab includes full-time staff dedicated to the education, guidance and mentoring of undergraduates in the “art and practice” of hands-on engineering.

This is the central educational resource for students taking analog, digital, and mixed-signal courses in electronics and has been supported by Hewlett-Packard, Agilent, and Keithley corporations in addition to alumnus Larry Sears, a successful engineer and entrepreneur. All instrumentation in the lab is computer-interfaced. Basic workstations consist of Windows-based computers equipped with LabView software, as well as Hewlett-Packard 546xx oscilloscopes, 33120A Waveform Generators, 34401A Digital Multimeters, and E3631A power supplies. Advanced workstations are similarly configured with have additional hardware such as a Hewlett-Packard 4155B semiconductor parameter, Hewlett-Packard 54616TC mixed-signal test stations, Hewlett Packard logic analyzers, and Hewlett-Packard high-frequency oscilloscopes.

Jennings Computer Center Lab

Supported by an endowment from the Jennings Foundation, this lab provides our students with the educational resources necessary for their coursework and exploration of the art of computing. This lab has both PCs and Sun Unix workstations, and includes two high-speed laser printers.

EECS Undergraduate Computer Lab
This recently renovated laboratory on the 8th floor of Olin building is accompanied by a suite of instructor/TA offices, and supports the freshman ENGR 131 Elementary Computer Programming class. Thirty student-Macintosh workstations with underlying UNIX operating systems are available for hands-on instruction, and support the study of introductory programming at the university.

Nord Computer Laboratory
This is a general-purpose computer facility that is open 24 hours a day, to all students. The lab contains 50 PCs running Windows and four Apple Macintosh computers. Facilities for color printing, faxing, copying and scanning are provided. Special software includes PRO/Engineer, ChemCAD and Visual Studio. Blank CDs, floppy disks, transparencies and other supplies are available for purchase. Visit http://www.scl.cwru.edu for more information.

Virtual Worlds (Gaming and Simulation) Laboratory
The Virtual Worlds Gaming and Simulation Lab forms the basis for experiential work in existing game related courses such as Artificial Intelligence, Graphics, and Simulation and for new gaming/simulation courses. Multi-disciplinary senior projects also use the lab facilities. In addition, a large number of significant cross-disciplinary immersive learning opportunities are available with the Cleveland Institute of Art, the Case Music department, and the Case School of Medicine.

The Virtual Worlds laboratory includes a PC room, a Console room, an Immersion room, an Audio room, a Medical Simulation room, and a Virtual Reality room containing:

- 24 networked high-performance Alienware gaming quality PCs
- Virtual reality components including three head mounted displays, three data gloves, a four sensor magnetic tracker, two inertial trackers, and three haptic interfaces
- Game consoles, e.g. PS2, Xbox, Gamecube, Nintendo DS, PSP
- Large screen 2-D and 3-D projection displays
- Audio and music synthesis and production equipment
- Database and Bioinformatics Research Laboratory

Primarily funded by equipment grants from the National Science Foundation and Microsoft Research, this laboratory provides PCs running Windows and Linux supporting research in database systems and bioinformatics.

Networks Laboratory
Supported through donations from both Cisco Systems and Microsoft Research, the networks lab has 15 stations complete with a PC, a Cisco switch and router, IP telephony equipment, as well as network patches back to a central rack where devices at one workstation may be routed to other equipment in the lab. A “library” of related equipment is also available.

Intelligent Networks & Systems Architecting (INSA) Research Laboratory
The Intelligent Networks & Systems Architecting (INSA) Research Laboratory is a state-of-the-art research facility dedicated to intelligent computer networks, systems engineering, design, and architecting. It includes optimization, simulation, artificial intelligent, visualization, and emulation. This lab has been partially supported by NASA’s Space Exploration programs for Human and Robotic Technology (H&RT). The INSA Lab is equipped with 10 high-performance workstations and 2 servers in a mixed Windows and Linux environment, with over 40 installed network interface cards providing connectivity to its wired and wireless research networks. It includes software packages such as GINO and LINDO, Arena simulation, ns2 and OPNET, as well as the STK satellite toolkit, artificial neural network, systems architecting and modeling, and statistical analysis and data management packages such as SPSS. The INSA Lab is also used for research in heterogeneous, sensor web, and mobile ad-hoc networks with space and battlefield applications.

VLSI Design Laboratory
This lab has been supported by the Semiconductor Research Corporation, NSF, NASA, Synopsys and Sun Microsystems. This laboratory has a number of advanced UNIX workstations that run commercial CAD software tools for VLSI design and is currently used to develop design and testing techniques for embedded system-on-chip.

Embedded Systems Laboratory
The Embedded Systems Laboratory is equipped with several Sun Blade Workstations running Solaris and Intel PCs running Linux. This lab has been recently equipped with advanced FPGA Virtex II prototype boards from Xilinx, including about 100 Xilinx Virtex II FPGAs and Xilinx CAD tools for development work. A grant-in-aid from Synopsys has provided the Synopsys commercial CAD tools for software development and simulation. This Lab is also equipped with NIOS FPGA boards from Altera, including software tools.

Mixed-Signal Integrated Circuit Laboratory
This research laboratory includes a cluster of Windows workstations and a UNIX server with integrated circuit design software (Cadence Custom IC Bundle), as well as a variety of equipment used in the characterization of mixed-signal (analog and digital) integrated circuits, which are typically fabricated using the MOSIS foundry service. Test equipment includes an IC probe station, surface-mount soldering equipment, logic and network/spectrum analyzers, an assortment of digital oscilloscopes with sample rates up to 1 GHz, and a variety of function generators, multi-meters, and power supplies.

Wireless Microsystem Lab
This research laboratory focuses on developing key technologies, such as micromachined sensors, actuators, and low-power and low-noise integrated sensing and communication circuits, to implement advanced high-performance wireless microsystems for biomedical, communication, and general industrial applications. The laboratory is equipped with PCs, various computer simulation software (Hspice, 3D Maxwell, and Intellisense), high temperature annealing furnace, laser Doppler vibrometer, and various electronic measurement equipment including high frequency spectrum analyzer, network analyzer, impedance analyzer, RF signal generator, multi-channel digital oscilloscopes, probe station with microwave capabilities.

Microelectromechanical Systems (MEMS) Research Laboratory
The MEMS Research Laboratory is equipped for microfabrication processes that do not require a clean room environment. These include chemical-mechanical polishing (two systems), bulk silicon etching, aqueous chemical release of free standing micromechanical components, and supercritical point drying. In addition to the fabrication capabilities, the lab is also well equipped for testing and evaluation of MEMS components as it houses wafer-scale
Advanced Metrology and Nano-Device Applications (AMANDA) Laboratory
http://www.eecs.case.edu/misc/AMANDA/Research/research.html
AMANDA is equipped with state-of-the-art atomic force microscopy (AFM) systems capable of imaging topography and electromagnetic properties of materials and devices at the nanometer-scale. These nano-metrology tools are unique and enable imaging embedded nanostructures with unprecedented resolution over a wide range of frequencies, covering up to 100 GHz. In support of these imaging systems, AMANDA has microwave engineering tools including automated network analyzers, sources and detectors and microwave design simulation capabilities. Optical measurements and spectroscopy, as well as a whole gamut of dc and ac characterization systems enable AMANDA group to measure device characteristics including photconductivity, S-parameters, magnetoresistivity, capacitance, conductance, and breakdown and leakage behavior as a function of temperature, field strength and frequency. Equipped with probe stations, and microscopes with online CCDs, AMANDA is capable of recording and imaging microfluidic, dielectrophoretic, osmotic processes and MEMS devices in real-time and under different operating conditions. AMANDA is also equipped with a CVD reactor to grow carbon nano-tubes and solid-electrolytes on semiconductors, dielectrics and metals. A metal deposition and sputtering facility, and simple processing stations enable rapid prototyping of large-scale devices followed by their characterization in a very efficient manner.

BioMicroSystems Laboratory
This research laboratory focuses on developing wireless integrated circuits and microsystems for a variety of applications in biomedical and neural engineering. The laboratory contains several PC computers, software packages for design, simulation, and layout of high-performance, low-noise, analog/mixed-signal/RF circuits and systems, and testing/measurement equipment such as dc power supply, arbitrary function generator, multichannel mixed-signal oscilloscope, data acquisition hardware, spectrum analyzer, potentiostat, and current source meter.

Emerging Materials Development and Evaluation Laboratory
The EMDE Laboratory is equipped with tools useful in characterizing materials for MEMS applications. The laboratory contains a PC-based apparatus for load-deformation and burst testing of micromachined membranes, a custom-built test chamber for evaluation and reliability testing of MEMS-based pressure transducers and other membrane-based devices, a probe station for electrical characterization of micro-devices, a fume hood configured for wet chemical etching of Si, polymers, and a wide variety of metals, tools for electroplating, an optical reflectometer, and a supercritical-point dryer for release of surface micromachined devices. The lab also has a PC with layout and finite element modeling software for device design, fabrication process design and analysis of testing data.

Process Control Laboratory
This laboratory contains process control pilot plants and computerized hardware for data acquisition and process control that is used for demonstrations, teaching and for research. This laboratory also has access to steam and compressed air for use in the pilot processes that include systems for flow and temperature control, level and temperature control, pH control, and pressure control plants.

Dynamics and Control Laboratory
This laboratory contains data acquisition and control devices, PLCs, electromechanical systems, and mechanical, pneumatic, and electrical laboratory experiments for demonstrations, teaching and research. Particular systems include: AC/DC servo systems, multi-degree of freedom robotic systems, rectilinear and torsional multi-degree of freedom vibration systems, inverted pendulum, magnetic levitation system, and PLC-controlled elevator system, distributed train layout for signaling and control, and model crane system.

UNDERGRADUATE PROGRAMS
The EECS department engineering offers accredited programs leading to B.S. degrees in
(a) Electrical Engineering;
(b) Systems and Control Engineering;
(c) Computer Engineering; and
(d) Computer Science.

These programs provide students with a strong background in the fundamentals of mathematics, science, and engineering. Students can use their technical and open electives to pursue concentrations in bioelectrical engineering, complex systems, automation and control, digital systems design, embedded systems, micro/nano systems, robotics and intelligent systems, signal processing and communications, and software engineering. In addition to an excellent technical education, all students in the department are exposed to societal issues, ethics, professionalism, and have the opportunity to develop leadership and creativity skills.

All Bachelor of Science engineering degree programs in the department are accredited by the Engineering Accreditation Commission (EAC) of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone: 410-347-7700. The Computer Science Bachelor of Science degree program is accredited by the Computing Accreditation Commission (CAC) of ABET, Inc.

ELECTRICAL ENGINEERING

The Bachelor of Science program in electrical engineering provides our students with a broad foundation in electrical engineering through combined classroom and laboratory work, and prepares our students for entering the profession of electrical engineering, as well as for further study at the graduate level.

The educational mission of the electrical engineering program is to graduate students who have fundamental technical knowledge of their profession and the requisite technical breadth and communications skills to become leaders in creating the new techniques and technologies that will advance the general field of electrical engineering.

Core courses provide our students with a strong background in signals and systems, computers, electronics (both analog and digital), and semiconductor devices. Students are required to develop depth in at least one of the following technical areas: electromagnetics, signals and systems, solid state, computer hardware, computer software, control, and circuits. Each electrical engineering student must complete the following requirements.

Breadth Requirements
• ENGR 131 Elementary Computer Programming
Depth Requirement

Each student must show a depth of competence in one technical area by taking at least three courses from one of the following seven areas. This depth requirement may be met using a combination of the above core courses and a selection of open and technical electives.

AREA I: SIGNALS & SYSTEMS
- EECS 246 Signals and Systems
- EECS 313 Signal Processing
- EECS 351 Communications and Signal Analysis
- EECS 354 Digital Communications
- EECS 381 Hybrid Systems

AREA II: COMPUTER SOFTWARE
- EECS 233 Data Structures
- EECS 337 Systems Programming
- EECS 338 Operating Systems
- EECS 393 Software Engineering

AREA III: SOLID STATE
- EECS 321 Semiconductor Electronic Devices
- EMSE 314 Electrical, Optical and Magnetic Properties of Matter
- EECS 322 Integrated Circuits and Electronic Devices
- EECS 415 Integrated Circuit Technology I

AREA IV: CONTROL
- EECS 304 Control Engineering I
- EECS 346 Engineering Optimization
- EECS 381 Hybrid Systems
- EECS 483 Data Acquisition and Control

AREA V: CIRCUITS
- EECS 245 Electronic Circuits
- EBME 310 Biomedical Instrumentation
- EECS 344 Electronic Circuit Design
- EBME 418 Biomedical Electronics
- EECS 426 MOS Integrated Circuit Design

AREA VI: COMPUTER HARDWARE
- EECS 281 Computer Organization
- EECS 301 Computer Design Lab
- EECS 314 Computer Architecture
- EECS 315 Digital Systems Design
- EECS 316 Computer Design
- EECS 318 VLSI/CAD

STATISTICS REQUIREMENT
- STAT 332 Statistics of Signal Processing (STAT 333 may be substituted for STAT 332 with approval of advisor)
- Applied Statistics elective (Class which uses statistics in some aspect of electrical engineering. Student may choose from EECS 313, EECS 351, EECS 354 or another class approved by advisor.)

DESIGN REQUIREMENT
- EECS 398 Engineering Projects I
- EECS 399 Engineering Projects II

In consultation with a faculty advisor, a student completes the program by selecting technical and open elective courses that provide in-depth training in one or more of a spectrum of specialties such as digital and microprocessor-based control, communications and electronics, solid state electronics, and integrated circuit design and fabrication. With the approval of the advisor a students may emphasize other specialties by selecting elective courses from other programs or departments.

Many courses have integral or associated laboratories in which students gain “hands-on” experience with electrical engineering principles and instrumentation. Students have ready access to the teaching laboratory facilities and are encouraged to use them during nonscheduled hours in addition to the regularly scheduled laboratory sessions. Opportunities also exist for undergraduate student participation in the wide spectrum of research projects being conducted in the department.

Minor in Electrical Engineering
Students enrolled in degree programs in other engineering departments can have a minor specialization by completing the following courses:

- EECS 245 Electronic Circuits I (4)
- EECS 246 Signals and Systems (4)
- EECS 281 Logic Design and Computer Organization (4)
- EECS 309 Electromagnetic Fields I (3)
- Approved technical elective (3)

Minor in Electronics

Cooperative Education Program

There are many excellent Cooperative Education (CO-OP) opportunities for electrical engineering majors. A CO-OP student does two CO-OP assignments in industry or government. The length of each assignment is a semester plus a summer which is enough time for a student to complete a significant engineering project. The CO-OP program takes five years to complete because the student is typically gone from campus for two semesters.

B.S./M.S. Program

The department encourages highly motivated and qualified students to apply for admission to the five-year B.S./M.S. Program in the junior year. This integrated program, which permits substitution of M.S. thesis work for the senior design project, provides a high level of fundamental training and in-depth advanced training in the student’s selected specialty. It also offers the opportunity to complete both the Bachelor of Science in Engineering and Master of Science degrees within five years.

SYSTEMS AND CONTROL ENGINEERING

The Bachelor of Science program in systems and control engineering provides our students with the basic concepts, analytical tools, and engineering methods which are needed in analyzing and designing complex technological and non-technological systems. Problems relating to modeling, decision-making, control, and optimization are studied. Some examples of systems problems which are studied
include: modeling and analysis of complex energy, environmental, and biological systems; computer control of industrial plants; developing world models for studying environmental policies; and optimal planning and management in large-scale systems. In each case, the relationship and interaction among the various components of a given system must be modeled. This information is used to determine the best way of coordinating and regulating these individual contributions to achieve the overall goal of the system.

The mission of the Systems and Control Engineering program is to provide internationally recognized excellence for graduate and undergraduate education and research in systems analysis, design, and control. These theoretical and applied areas require cross-disciplinary tools and methods for their solution. There are four elective sequences available within the B.S. program in systems and control engineering curriculum that represent the breadth of the discipline:

**AREA 1 DYNAMIC SYSTEMS, CONTROL AND SIGNAL PROCESSING**
- MATH 201 Linear Algebra
- EECS 351 Communication and Signal Analysis
- EECS 381 Hybrid Systems
- EECS 401 Digital Signal Processing
- EECS 408 Intro. to Linear Systems
- EECS 416 Convex Optimization in Engineering
- EECS 452 Random Signals
- EECS 483 Introduction to Digital Control
- EECS 489 Robotics I

**AREA 2 SYSTEMS BIOLOGY AND COMPLEX SYSTEMS ANALYSIS**
- MATH 201 Linear Algebra
- EECS 381 Hybrid Systems
- EECS 391 Artificial Intelligence
- EECS 396 Systems Biology
- EECS 408 Intro. to Linear Systems
- EECS 416 Convex Optimization in Engineering
- BIOL 325 Cell Biology

**AREA 3 MANUFACTURING, ROBOTICS AND OPERATIONAL SYSTEMS**
- EECS 350/450 Operations Systems Engineering
- EECS 360/460 Manufacturing and Automation Systems
- EECS 489 Robotics I
- OPMT 450 Project Management
- OPMT 420 Managing Quality with Six Sigma
- OPMT 476 Supply Management in the Supply Chain
- OPMT 477 Enterprise Resource Planning in the Supply Chain

**AREA 4 INFORMATION SYSTEMS**
- EECS 233 Data Structures
- EECS 325 Computer Networks I
- EECS 370/470 Intelligent Architecture and Networks
- EECS 381 Hybrid Systems
- EECS 391 Artificial Intelligence
- EECS 484 Computational Intelligence
- EECS 491 Intelligent Systems I
- MATH 413 Graph Theory

**MINOR PROGRAM IN SYSTEMS AND CONTROL ENGINEERING**
A total of five courses (15 credit hours) are required to obtain a minor in systems and control engineering. At least 9 credit hours must be selected from:
- EECS 246 Signals and Systems (4)
- EECS 304 Control Engineering I (3)
- EECS 346 Engineering Optimization (3)
- EECS 352 Engineering Economics and Decision Analysis (3)

The remaining credit hours can be chosen from EECS courses with the written approval of the faculty member (see the EECS Web page for the current responsible faculty member) in charge of the minor program in the Systems and Control Program. A list of suggested EECS courses to complete the minor is:
- EECS 324 Simulation Methods in Engineering
- EECS 313 Signal Processing
- EECS 350 Production and Operational Systems
- EECS 360 Manufacturing and Integrated Systems

**Cooperative Education Program**
There are many excellent Cooperative Education (CO-OP) opportunities for systems and control engineering majors. A CO-OP student does two CO-OP assignments in industry or government. The length of each assignment is a semester plus a summer which is enough time for the student to complete a significant engineering project. The CO-OP program takes five years to complete because the student is typically gone from campus for two semesters.

**B.S./M.S. Program**
The department encourages highly motivated and qualified students to apply for admission to the five-year B.S./M.S. Program in the junior year. This integrated program, which permits substitution of M.S. thesis work for the senior design project, provides a high level of fundamental training and in-depth advanced training in the student’s selected specialty. It also offers the opportunity to complete both the Bachelor of Science in Engineering and Master of Science degrees within five years.

**COMPUTER ENGINEERING**
The Bachelor of Science program in Computer Engineering is designed to give a student a strong background in the fundamentals of computer engineering through combined classroom and laboratory work. A graduate of this program will be able to use these fundamentals to analyze and evaluate computer systems, both hardware and software. A computer engineering graduate would also be able to design and implement a computer system for general purpose or embedded computing incorporating state-of-the-art solutions to a variety of computing problems. This includes systems which have both hardware and software component, whose design requires a well-defined interface between the two, and the evaluation of the associated trade-offs.

The educational mission of the computer engineering program is to graduate students who have fundamental technical knowledge of their profession along with requisite technical breadth and communications skills to become leaders in creating the new techniques and technologies which will advance the general field of computer engineering. Core courses provide our students with a strong background in digital systems design, computer organization, hardware architecture, and digital electronics.

**Major in Computer Engineering**
Following are the required courses for students with major in computer engineering.
- ENGR 131 Elementary Computer Programming
- ENGR 210 Circuits and Instrumentation
- EECS 233 Introduction to Data Structures
- EECS 281 Logic Design and Computer Organization
- EECS 301 Digital Laboratory
- EECS 302 Discrete Mathematics
The corresponding two-course software sequence is:

- EECS 314 Computer Architecture
- EECS 315 Digital Systems Design
- EECS 337 Systems Programming
- EECS 338 Introduction to Operating Systems or EECS 318 VLSI/CAD

**STATISTICS REQUIREMENT**

- One Statistics elective

(The elective may be chosen from MATH 380 Introduction to Probability, STAT 312 Basic Statistics for Engineering and Science, STAT 313 Statistics for Experimenter, STAT 332 Statistics for Signal Processing, STAT 333 Uncertainty in Engineering and Science.)

**DESIGN REQUIREMENT**

- EECS 398 Engineering Projects I

In consultation with a faculty advisor, a student completes the program by selecting technical and open elective courses that provide in-depth training in principles and practice of computer engineering. With the approval of the advisor a student may emphasize a specialty of his/her choice by selecting elective courses from other programs or departments.

Many courses have integral or associated laboratories in which students gain “hands-on” experience with computer engineering principles and instrumentation. Students have ready access to the teaching laboratory facilities and are encouraged to use them during nonscheduled hours in addition to the regularly scheduled laboratory sessions. Opportunities also exist for undergraduate student participation in the wide spectrum of research projects being conducted in the department.

**Minor in Computer Engineering**

The department also offers a minor in computer engineering. The minor has a required two course sequence followed by a two course sequence in either hardware or software aspects of computer engineering. The following two courses are required for any minor in computer engineering:

- EECS 281 Logic Design and Computer Organization
- EECS 233 Introduction to Data Structures
- EECS 314 Computer Architecture
- EECS 315 Digital Systems Design

The two-course hardware sequence is:

- EECS 338 Introduction to Operating Systems
- EECS 337 Systems Programming

In addition to these two standard sequences, a student may design his/her own depth area with the approval of the minor advisor. A student cannot have a major and a minor, or two minors, in both Computer Engineering and Computer Science because of the significant overlap between these subjects.

**Cooperative Education Program**

There are many excellent Cooperative Education (CO-OP) opportunities for computer engineering majors. A CO-OP student does two CO-OP assignments in industry or government. The length of each assignment is a semester plus a summer which is enough time for the student to complete a significant computing project. The CO-OP program takes five years to complete because the student is typically gone from campus for two semesters.

**B.S./M.S. Program**

Highly motivated and qualifier students are encouraged to apply to the B.S./M.S. Program which will allow them to get both degrees in five years. The B.S. can be in Computer Engineering or a related discipline, such as mathematics or electrical engineering. Integrating graduate study in computer engineering with the undergraduate program allows a student to satisfy all requirements for both degrees in five years.

**COMPUTER SCIENCE**

The Bachelor of Science program in Computer Science is designed to give a student a strong background in the fundamentals of mathematics, and computer science. A graduate of this program should be able to use these fundamentals to analyze and evaluate software systems and the underlying abstractions upon which they are based. A graduate should also be able to design and implement software systems which are state-of-the-art solutions to a variety of computing problems; this includes problems which are sufficiently complex to require the evaluation of design alternatives and engineering trade-offs. In addition to these program specific objectives, all students in the Case School of Engineering are exposed to societal issues, professionalism, and are provided opportunities to develop leadership skills.

Our mission is to graduate students who have fundamental technical knowledge of their profession and the requisite technical breadth and communications skills to become leaders in creating the new techniques and technologies which will advance the field of computer science.

The Bachelor of Arts program in Computer Science is a combination of a liberal arts program and a computing major. It is a professional program in the sense that graduates can be employed as computer professionals, but it is less technical than the Bachelor of Science program in Computer Science. This degree is particularly suitable for students with a wide range of interests. For example, students can major in another discipline in addition to computer science and routinely complete all of the requirements for the double major in a 4 year period. This is possible because over a third of the courses in the program are open electives. Furthermore, if a student is majoring in computer science and a second technical field such as mathematics or physics many of the technical electives will be accepted for both majors. Another example of the utility of this program is that it routinely allows students to major in computer science and take all of the pre-med courses in a four-year period.

**Minor in Computer Science (B.S. or B.S.E.)**

For students pursuing a B.S. or B.S.E. degree, the following three courses are required for a minor in computer science:

- EECS 233 Introduction to Data Structures
- EECS 338 Introduction to Operating Systems
- EECS 340 Algorithms and Data Structures

A student must take an additional 4 credit hours of computing courses with the exclusion of ENGR 131. EECS 302 (Discrete Mathematics) may be used in place of three of these credit hours since it is a prerequisite for EECS 340.

**Minor in Computer Science (B.A.)**

For students pursuing B.A. degrees, the following courses are required for a minor in computer science:

- ENGR 131 Elementary Computer Programming
- EECS 233 Introduction to Data Structures
- MATH 125 Mathematics I

Two additional computing courses are also required for this minor.

**Cooperative Education Program**
There are many excellent Cooperative Education (CO-OP) opportunities for computer science majors. A CO-OP student does two CO-OP assignments in industry or government. The length of each assignment is a semester plus a summer which is enough time for the student to complete a significant computing project. The CO-OP program takes five years to complete because the student is typically gone from campus for two semesters.

**B.S./M.S. Program**

Students with a grade point average of 3.2 or higher are encouraged to apply to the B.S./M.S. Program which will allow them to get both degrees in five years. The B.S. can be in Computer Science or a related discipline, such as mathematics or electrical engineering. Integrating graduate study in computer science with the undergraduate program allows a student to satisfy all requirements for both degrees in five years.

**GRADUATE PROGRAMS**

The EECS department offers graduate study leading to the Master of Science and Doctor of Philosophy degrees in (a) Electrical Engineering; (b) Systems and Control Engineering; (c) Computer Engineering; and (d) Computer Science. These graduate programs provide a balance of breadth and depth appropriate for each degree and support the department’s research thrust areas by emphasizing:

**Electrical Engineering**

Research in computational intelligence, robotic control, solid state devices, microelectromechanical systems (MEMS), micro/nano sensors, micro/nano scale imaging, wireless implantable biosensors, surgical robotics and simulation, and CMOS and mixed-signal integrated circuit design.

**Systems and Control Engineering**

Research in non-linear control, optimization, signal processing, global modeling, and systems biology.

**Computer Engineering**

Research in VLSI design, programmable logic, computer architectures, embedded systems, design for testability, and reconfigurable processors.

**Computer Science**

Research in bioinformatics, databases, software engineering, data mining and visualization, machine learning, pervasive networks, distributed systems, computational biology and medical Informatics.

Incoming students are encouraged to apply for departmental teaching assistantships. In addition, research funds are used to provide assistantships that support the thesis research of graduate students. A limited number of fellowships providing partial support may also be available for students enrolled in the B.S./M.S. program.

The department believes that the success of its graduates at all levels is due to emphasis on project and problem-oriented course material coupled with the broad-based curricular requirements.

M.S. Students may select either Plan A which requires a research thesis or Plan B which does not require a thesis. Doctoral dissertations in all programs must be original contributions to the existing body of knowledge in engineering and science.

Academic requirements for graduate degrees in engineering are as specified by the Case School of Engineering in this bulletin. A more detailed set of rules and regulations for each degree program contained here is available from the department, and may also be found on the department Web page.

**ELECTRICAL ENGINEERING AND COMPUTER SCIENCE (EECS)**

**Course Descriptions**


EECS 214. Signals, Systems, and Control Laboratory (1) A laboratory course based on the material in EECS 212. Analysis and simulation using MATLAB/ Simulink. Laboratory experiments involving signal processing and control. Recommended preparation: concurrent enrollment in EECS 212.

EECS 216. Fundamental System Concepts (3) Develops framework for addressing problems in science and engineering that require an integrated, interdisciplinary approach, including the effective management of complexity and uncertainty. Introduces fundamental system concepts in an integrated framework. Properties and behavior of phenomena regardless of the physical implementation through a focus on the structure and logic of information flow. Systematic problem solving methodology using systems concepts. Recommended preparation: MATH 224.

EECS 233. Introduction to Data Structures (4) The programming language Java; pointers, files, and recursion. Representation and manipulation of data: one way and circular linked lists, doubly linked lists; the available space list. Different representations of stacks and queues. Representation of binary trees, trees and graphs. Hashing; searching and sorting. Laboratory. Recommended preparation: ENGR 131.


EECS 251. Numerical Methods (3) Introduction to basic concepts and algorithms used in the numerical solution of common problems including solving non-linear equations, solving systems of linear equations, interpolation, fitting curves to data, integration and solving ordinary differential equations. Computational error and the efficiency of various numerical methods are discussed in some detail. Most homework requires the implementation of numerical methods on a computer. Recommended preparation: ENGR 131 and MATH 122.

EECS 281. Logic Design and Computer Organization (4) Fundamentals of digital systems in terms of both computer organization and logic level design. Organization of digital computers; information representation; boolean algebra; analysis and synthesis of combinational and sequential circuits; datapaths and register transfers; instruction sets and assembly language; input/output and communication; memory. Recommended preparation: ENGR 131.

EECS 290. Introduction to Computer Game Design and Implementation (5) This class begins with an examination of the history of video games and of game design. Games will be examined in a systems context to understand gam-
ing and game design fundamentals. Various topics relating directly to the implementation of computer games will be introduced including graphics, animation, artificial intelligence, user interfaces, the simulation of motion, sound generation, and networking. Extensive study of past and current computer games will be used to illustrate course concepts. Individual and group projects will be used throughout the semester to motivate, illustrate and demonstrate the course concepts and ideas. Group game development and implementation projects will culminate in classroom presentations and evaluation. Recommended preparation: ENGR 131.

EECS 295. Special Topics (1 - 3)
Limited to freshmen and sophomores. Recommended preparation: ENGR 131.

EECS 301. Digital Logic Laboratory (2)
This course is an introductory experimental laboratory for digital networks. The course introduces students to the process of design, analysis, synthesis and implementation of digital networks. The course covers the design of combinational circuits, sequential networks, registers, counters, synchronous/asynchronous Finite State Machines, register based design, and arithmetic computational blocks. Recommended preparation: EECS 281.

EECS 302. Discrete Mathematics (3)
A general introduction to basic mathematical terminology and the techniques of abstract mathematics in the context of discrete mathematics. Topics introduced are mathematical reasoning, Boolean connectives, deduction, mathematical induction, sets, functions, algorithms, graphs, combinatorial reasoning. Offered as EECS 302 and MATH 304. Prereq: MATH 122 or MATH 124 or MATH 126.

EECS 304. Control Engineering I with Laboratory (3)

EECS 305. Control Engineering I Laboratory (1)
A laboratory course based on the material in EECS 304. Modeling, simulation, and analysis using MATLAB. Physical experiments involving control of mechanical systems, process control systems, and design of PID controllers. Recommended preparation: EECS 212 or equivalent and EECS 304.

EECS 306. Control Engineering II with Laboratory (3)
Advanced techniques for control of dynamic systems. State-space modeling, analysis, and controller synthesis: introduction to nonlinear control systems: phase plane methods, bang-bang control, time-optimal control; describing functions analysis and design techniques; discrete time systems and controllers. Advanced control design methods implementation. Recommended preparation: EECS 304.

EECS 309. Electromagnetic Fields I (3)
Maxwell’s integral and differential equations, boundary conditions, constitutive relations, energy conservation and Pointing vector, wave equation, plane waves, propagating waves and transmission lines, characteristic impedance, reflection coefficient and standing wave ratio, in-depth analysis of coaxial and strip lines, electro- and magneto-quasistatics, simple boundary value problems, correspondence between fields and circuit concepts, energy and forces. Recommended preparation: MATH 223 and PHYS 122 and concurrent enrollment in MATH 224.

EECS 310. Electromechanical Energy Conversion (4)
Electromechanical dynamics, modeling and control. Forces in quasistatic magnetic systems. Energy conversion properties of rotating machines. Analysis and control of DC servomotors, AC servomotors, reluctance machines, inductance machines, and magnetic bearing. Analysis of electromagnetic sensors. Electronic communication, torque linearization through computer controls and flux-vector control. Electromechanical properties are measured in the lab and high-performance controls are constructed and tested. Recommended preparation: EECS 309.

EECS 311. Electromagnetic Fields II (3)
Boundary value problems, guided electromagnetic waves, rectangular and circular waveguides, strip lines, losses in waveguiding structures, scattering, wave optics and wave propagation in anisotropic media, ferrites and plasmas, resonant systems, cavities, microwave networks, multiplex networks, scattering matrix formulation, radiation and antennas, radiation from dipoles, apertures and simple arrays. Recommended preparation: EECS 309.

EECS 313. Signal Processing (3)

EECS 314. Computer Architecture (3)
This course provides students the opportunity to study and evaluate a modern computer architecture design. The course covers topics in fundamentals of computer design, performance, cost, instruction set design, processor implementation, control unit, pipelining, communication and network, memory hierarchy, computer arithmetic, input-output, and an introduction to RISC and super-scalar processors. Recommended preparation: EECS 281.

EECS 315. Digital Systems Design (4)
This course gives students the ability to design modern digital circuits. The course covers topics in logic level analysis and synthesis, digital electronics: transistors, CMOS logic gates, CMOS layout, design metrics space, power, delay. Programmable logic (partitioning, routing), state machine analysis and synthesis, register transfer level block design, datapath, controllers, ASM charts, microsequencers, emulation and rapid prototyping, and switch/logic-level simulation. Recommended preparation: EECS 281.

EECS 316. Computer Design (3)
Methodologies for systematic design of digital systems with emphasis on programmable logic implementations and prototyping. Laboratory which uses modern design techniques based on hardware description languages such as VHDL, CAD tools, and Field Programmable Gate Arrays (FPGAs). Recommended preparation: EECS 281; EECS 315 or consent of instructor.

EECS 317. Computer Design Laboratory (2)
Sequence of laboratory projects provide practical experience in computer-aided design techniques for computer and digital system design. Hardware system modeled and simulated at register transfer and switching transistor level.

EECS 318. VLSI/CAD (4)
With Very Large Scale Integration (VLSI) technology, there is an increased need for Computer-Aided Design (CAD) techniques and tools to help in the design of large digital systems that deliver both performance and functionality. Such high performance tools are of great importance in the VLSI design process, both to perform functional, logical, and behavioral modeling and verification to aid the testing process. This course discusses the fundamentals in behavioral languages, both VHDL and Verilog, with hands-on experience. Recommended preparation: EECS 281, EECS 315.

EECS 319. Applied Probability and Stochastic Processes for Biology (3)
Applications of probability and stochastic processes to biological systems. Mathematical topics will include: introduction to discrete and continuous probability spaces (including numerical generation of pseudo random samples from specified probability distributions). Markov processes in discrete and continuous time with discrete and continuous sample spaces, point processes including homogeneous and inhomogeneous Poison processes and Markov chains on graphs, and diffusion processes including Brownian motion and the Ornstein-Uhlenbeck process. Biological topics will be determined by the interests of the students and the instructor. Likely topics include: stochastic ion channels, molecular motors and stochastic ratchets, actin and tubulin polymerization, random walk models for neural spike trains, bacterial chemotaxis, signaling and genetic regulatory networks, and stochastic predator-prey dynamics. The emphasis will be on practical simulation and analysis of stochastic phenomena in biological systems. Numerical methods will be developed using both MATLAB and the R statistical package. Student projects will comprise a major part of the course. Offered as BIOL 319, EECS 319, MATH 319, BIOL 419, ECEM 419, and PHOL 419. Prereq: MATH 224 or MATH 223 and BIOL 300 or BIOL 306 and MATH 201 or MATH 307 or consent of instructor.
EECS 321. Semiconductor Electronic Devices (4)
Energy bands and charge carriers in semiconductors and their experimental verifications. Excess carriers in semiconductors. Principles of operation of semiconductor devices that rely on the electrical properties of semiconductor surfaces and junctions. Development of equivalent circuit models and performance limitations of these devices. Devices covered include: junctions, bipolar transistors, Schottky junctions, MOS capacitors, junction gate and MOS field effect transistors, optical devices such as photodetectors, light-emitting diodes, solar cells and lasers. Laboratory experiments to characterize some of the above devices. Recommended preparation: EECS 309.

EECS 322. Integrated Circuits and Electronic Devices (3)
Technology of monolithic integrated circuits and devices, including crystal growth and doping, photolithography, vacuum technology, metallization, wet etching, thin film basics, oxidation, diffusion, ion implantation, epitaxy, chemical vapor deposition, plasma processing, and micromachining. Basics of semiconductor devices including junction diodes, bipolar junction transistors, and field effect transistors. Recommended preparation: EECS 321.

EECS 324. Simulation Techniques in Engineering (3)
Discrete event systems and simulation concepts. Discrete event simulation with batch and interactive languages. Recommended preparation: Concurrent enrollment in ENGL 398.

EECS 325. Computer Networks I (3)

EECS 326. Instrumentation Electronics (3)
A second course in instrumentation in emphasis on sensor interface electronics. General concepts in measurement systems, including accuracy, precision, sensitivity, linearity, and resolution. The physics and modeling of resistive, reactive, self-generating, and direct-digital sensors. Signal conditioning for same, including bridge circuits, coherent detectors, and a variety of amplifier topologies: differential, instrumentation, charge, and transimpedance. Noise and drift in amplifiers and resistors. Practical issues of interference, including grounding, shielding, supply/return, and isolation amplifiers. Prereq: ENGR 210 and EECS 246 or EEMI 308 or EMAE 350.

EECS 337. Compiler Design (4)
Design and implementation of compilers and other language processors. Scanners and lexical analysis; regular expressions and finite automata; scanner generators; parsers and syntax analysis; context free grammars; parser generators; semantic analysis; intermediate code generation; runtime environments; code generation; machine independent optimization; data flow and dependence analysis. There will be a significant programming project involving the use of compiler tools and software development tools and techniques. Recommended preparation: EECS 233 and EECS 281.

EECS 338. Introduction to Operating Systems (4)
CPU scheduling, memory management, concurrent processes, semaphores, monitors, deadlocks, secondary storage management, file systems, protection, UNIX operating system, fork, exec, wait, UNIX System V IPCs, sockets, remote procedure calls, threads. Must be proficient in C programming language. Recommended preparation: EECS 337.

EECS 339. Web Data Mining (3)

EECS 340. Algorithms and Data Structures (3)
Efficient sorting algorithms, external sorting methods, internal and external searching, efficient string processing algorithms, geometric and graph algorithms. Recommended preparation: EECS 233 and MATH 304.

EECS 341. Introduction to Database Systems (3)
Relational model, ER model, relational algebra and calculus, SQL, OBE, security, views, files and physical database structures, query processing and query optimization, normalization theory, concurrency control, object relational systems, multimedia databases, Oracle SQL server, Microsoft SQL server. Recommended preparation: EECS 233. Prereq: EECS 302.

EECS 342. Introduction to Global Issues (3)
This systems course is based on the paradigm of the world as a complex system. Global issues such as population, world trade and financial markets, resources (energy, water, land), global climate change, and others are considered with particular emphasis put on their mutual interdependence. A reasoning support computer system which contains extensive data and a family of models is used for future assessment. Students are engaged in individual, custom-tailored, projects of creating conditions for a desirable or sustainable future based on data and scientific knowledge available. Students at CWRU will interact with students from fifteen universities that have been strategically selected in order to give global coverage to UNESCO’S Global-problem-attique Education Network Initiative (GENIe) in joint, participatory scenario analysis via the internet.

EECS 343. Theoretical Computer Science (3)
Introduction to mathematical logic, different classes of automata and their correspondence to different classes of formal languages, recursive functions and computability, assertions and program verification, denotational semantics. MATH/EECS 343 and MATH 410 cannot both be taken for credit. Offered as EECS 343 and MATH 343.

EECS 344. Electronic Analysis and Design (3)
The design and analysis of real-world circuits. Topics include: junction diodes, non-ideal op-amp models, characteristics and models for large and small signal operation of bipolar junction transistors (BJTs) and field effect transistors (FETs), selection of operating point and biasing for BJT and FET amplifiers. Hybrid-pi model and other advanced circuit models, cascaded amplifiers, negative feedback, differential amplifiers, oscillators, tuned circuits, and phase-locked loops. Computers will be extensively used to model circuits. Selected experiments and/or laboratory projects. Recommended preparation: EECS 245.

EECS 345. Programming Language Concepts (3)
This course studies important concepts underlying the design, definition, implementation and use of modern programming languages including syntax, semantics, names/scopes, types, expression, assignment, subprograms, data abstraction, and inheritance. Imperative, object-oriented, concurrent, functional, and logic programming paradigms are discussed. Illustrative examples are drawn from a variety of popular languages, such as C++, Java, Ada, Lisp, and Prolog. Recommended preparation: EECS 233, EECS 337.

EECS 346. Engineering Optimization (3)
Optimization techniques including linear programming and extensions; transportation and assignment problems; network flow optimization; quadratic, integer, and separable programming; geometric programming; and dynamic programming. Nonlinear optimization topics: optimality criteria, gradient and other practical unconstrained and constrained methods. Computer applications using engineering and business case studies. Recommended preparation: MATH 201.

EECS 347. Network Synthesis (3)
Design techniques for the construction of filters, delays, predictors, analog computer networks, and necessary and sufficient requirements for the realization of practical networks. Recommended preparation: EECS 246 or equivalent.

EECS 348. Communication Electronic Cir (4)

EECS 350. Operations and Systems Design (3)
Introduction to design, modeling, and optimization of operations and scheduling systems with applications to computer science and engineering problems. Topics include, forecasting and time series, strategic, tactical, and operational planning, life cycle analysis, learning curves, resources allocation, materials requirement and capacity planning, sequencing, scheduling, inventory control, project management and planning. Tools for analysis include: multi-objective optimization, queuing models, simulation, and artificial intelligence.

EECS 351. Communications and Signal Analysis (3)
Fourier transform analysis and sampling of signals.
AM, FM and SSB modulation and other modulation methods such as pulse code, delta, pulse position, PSK and FSK. Detection, multiplexing, performance evaluation in terms of signal-to-noise ratio and bandwidth requirements. Recommended preparation: EECS 246 or equivalent.


EECS 355. RF Communications (3) Coverage of modern communications circuits and systems with a particular emphasis upon mobile communications. Cellular communications, modulation methods, user access schemes. Individual system components: tuned small signal amplifiers and power amplifiers, mixers, detectors, and frequency synthesizers. Low-power design considerations. Recommended preparation: EECS 351.

EECS 356. Microwave Engineering (3) Transmission lines and circuit analysis, waveguides, modes of propagation, impedance matching techniques, scattering matrix, waveguide components, striplines, resonators, microwave theory, filters, microwave solid state devices. Recommended preparation: EECS 311.

EECS 359. Bioinformatics in Practice (3) This course covers basic computational methods of organizing and analyzing biological data, targeting senior undergraduate and graduate students from both mathematical/computational sciences and life sciences. The aim of the course is to provide the students with basic skills to be able to understand molecular biology data and associated abstractions (sequences, structure, gene expression, molecular network data), access to available resources (public databases, computational tools on the web). Implement basic computational methods for biological data analysis, and use understanding of these methods to solve other problems that arise in biological data analysis. Topics covered include DNA and protein sequence databases, pairwise sequence alignment and sequence search (dynamic programming, BLAST), multiple sequence alignment (HMMs, CLUSTAL-W), sequence clustering, motif finding, pattern matching, phylogenetic analysis (tree reconstruction, neighbor joining, maximum parsimony, maximum likelihood), gene finding, functional annotation, biological ontologies, analysis of gene expression data, and network biology (protein protein interactions, topology, modularity).

EECS 360. Manufacturing and Automated Systems (3) Formulation, modeling, planning, and control of manufacturing and automated systems with applications to computer science and engineering problems. Topics include, design of products and processes, location/spatial problems, transportation and assignment, product and process layout, group technology and clustering, cellular and network flow layouts, computer control systems, reliability and maintenance, and statistical quality control. Tools and analysis include: multi-objective optimization, artificial intelligence, and heuristics for combinatorial problems. Offered as EECS 360 and EECS 460.

EECS 365. Complex Systems Biology (3) Complex Systems Biology is an interdisciplinary course based on systems science, engineering, biology, and medicine. The objective is to provide students with an understanding of the current state of systems biology and major challenges ahead. The biological phenomena across the level of complexity will be considered from molecular to organisms and ecology to provide universality of the systems concepts for understanding the functions and behavior of biological systems. Case studies are used and a course project is required to be completed. Prereq: Junior Standing.


EECS 370. Intelligent Networks and Systems (3) This course covers the development of the next-generation intelligent networks. It involves an in-depth study of design, planning, optimization, and analysis for communications information networks. It will include design and optimization of telecommunication networks and protocols. The course provides applications of Artificial Intelligence methodologies including mathematical learning, neural networks, clustering, modeling and automating human decision making process, and mobile agents to the design of intelligent networks. There will be weekly homework/reading assignments, some presentations by students, and a large project. Offered as EECS 370 and EECS 470.

EECS 381. Hybrid Systems (3) Today, the most interesting computer code and microprocessor designs are “embedded” and hence interact with the physical world, producing a mixture of digital and analog domains. The class studies an array of tools for understanding and designing these “hybrid systems.” Topics include: basics of language and finite state automata theory, discrete-event dynamic systems, Petri nets, timed and hybrid automata, and hybrid dynamical systems. Simulation, verification, and control concepts and languages for these models. Recommended preparation: MATH 224 and either EECS 246 or MATH 304.

EECS 382. Microprocessor-Based Design (3) Microprocessor architectures, memory design, timing, polled and interrupt driven I/O, microprocessor support devices, microcontrollers, integrated hardware/software design considerations. Recommended preparation: ENGR 210 and EECS 281.


EECS 385. Engineering in Community Service IV (3) Project-oriented course; students work on “real” engineering projects of benefit to the community and in partnership with community “customers.” Project teams consists of a mix of sophomores, juniors, and seniors. Students perform engineering design, project specification, and technical research as appropriate to their technical background. Emphasis on project planning and organization, teamwork, project management, communication skills, customer awareness, and professional responsibility. Recommended preparation: Junior or Senior standing in EECS.

EECS 390. Advanced Game Development Project (3) This game development project course will bring together an interdisciplinary group of advanced undergraduate students in the fields of Electrical Engineering and Computer Science, Art, Music, and English to focus on the design and development of a complete, fully-functioning computer game (as an interdisciplinary team). The student teams are given complete liberty to design their own fully functional games from their original concept to a playable finished product, i.e., from the initial idea through to the wrapped box. The student teams will experience the entire game development cycle as they execute their projects. Responsibilities include creating a game idea, writing a story, developing the artwork, designing characters, implementing music and sound effects, programming and testing the game, and documenting the entire project. Recommended preparation: Junior or Senior standing and consent of instructor.

EECS 391. Introduction to Artificial Intelligence (3) Overview of artificial intelligence, knowledge representation, search, game-playing, logic rule-based systems, AI programming languages, learning, neural networks, evolutionary algorithms, natural lan-
guage understanding, planning, robotics. Recommended preparation: ENGR 131.

EECS 393. Software Engineering (3)  
Topics: Introduction to software engineering; software lifecycle models; development team organization and project management; requirements analysis and specification techniques; software design techniques; programming practices; software validation techniques; software maintenance practices; software engineering ethics. Undergraduates work in teams to complete a significant software development project. Graduate students are required to complete a research project. Recommended preparation for EECS 493; EECS 337. Offered as EECS 393 and EECS 493. Prereq: EECS 337. SAGES Senior Cap

EECS 395. Senior Project in Computer Science (4)  
Capstone course for computer science (BS major) seniors. Material from previous and concurrent courses used to solve computer programming problems and to develop software systems. Professional engineering topics such as project management, engineering design, communications, and professional ethics. Requirements include periodic reporting of progress, plus a final oral presentation and written report. Scheduled formal project presentations during last week of classes. Prereq: Senior Standing.

EECS 396. Special Topics in Computer Science (1 - 18)  
Special topics in areas of computer science.

EECS 397. Special Topics in Electrical, Computer and Systems Engineering (1 - 6)  
Special topics in electrical, computer, and systems and control engineering.

EECS 398. Engineering Projects I (4)  
Capstone course for electrical, computer and systems and control engineering seniors. Material from previous and concurrent courses used to solve engineering design problems. Professional engineering topics such as project management, engineering design, communications, and professional ethics. Requirements include periodic reporting of progress, plus a final oral presentation and written report. Scheduled formal project presentations during last week of classes. Recommended preparation: Senior standing. SAGES Senior Cap

EECS 399. Engineering Projects II (4)  
Continuation of EECS 398. Material from previous and concurrent courses applied to engineering design and research. Requirements include periodic reporting of progress, plus a final oral presentation and written report. Recommended preparation: EECS 398 or concurrent enrollment.

EECS 400T. Graduate Teaching I (0)  
This course will provide the Ph.D. candidate with experience in teaching undergraduate or graduate students. The experience is expected to involve direct student contact but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience for the student. Students in this course may be expected to perform one or more of the following teaching related activities: grading homeworks, quizzes, and exams; having office hours for students, tutoring students. Recommended preparation: Ph.D. student in EECS department.

EECS 401. Digital Signal Processing (3)  

EECS 405. Data Structures and File Management (5)  
Fundamental concepts: sequential allocation, linked allocation, lists, trees, graphs, internal sorting, external sorting, sequential, binary, interpolation search, hashing files, indexed files, multiple level index structures, trees, hashed files. Multiple attribute retrieval; inverted files, multi lists, multiple key hashing, b trees. Introduction to data bases. Data models. Recommended preparation: EECS 233 and MATH 304.

EECS 408. Introduction to Linear Systems (3)  

EECS 409. Discrete Event Systems (3)  
A broad range of system behavior can be described using a discrete event framework. These systems are playing an increasingly important role in modeling, analyzing, and designing manufacturing systems. Simulation, automata, and queuing theory have been the primary tools for studying the behavior of these logically complex systems; however, new methods and techniques as well as new modeling frameworks have been developed to represent and to explore discrete event system behavior. The class will begin by studying simulation, the theory of languages, and finite state automata, and queuing theory approaches and then progress to examining selected additional frameworks for modeling and analyzing these systems including Petri nets, perturbation analysis, and Min-Max algebras.

EECS 411. Introduction to Logic Programming (3)  

EECS 412. Electromagnetic Fields III (3)  
Maxwell’s equations, macroscopic versus microscopic fields, field interaction with materials in terms of polarization vectors P and M, Laplace’s and Poisson’s equations and solutions, scalar and vector potentials. Wave propagation in various types of media such as anisotropic and gyrotropic media. Phase and group velocities, signal velocity and dispersion. Boundary value problems associated with wave-guide and cavities. Wave solutions in cylindrical and spherical coordinates. Radiation and antennas.

EECS 413. Nonlinear Systems I (3)  
This course will provide an introduction to techniques used for the analysis of nonlinear dynamic systems. Topics will include existence and uniqueness of solutions, phase plane analysis of two dimensional systems including Poincare-Bendixon, describing functions for single-input single-output systems, averaging methods, bifurcation theory, stability, and an introduction to the study of complicated dynamics and chaos. Recommended preparation: Concurrent enrollment in EECS 408.

EECS 415. Integrated Circuit Technology I (3)  

EECS 416. Convex Optimization for Engineer- ing (3)  
This course will focus on the development of a working knowledge and skills to recognize, formulate, and solve convex optimization problems that are so prevalent in engineering. Applications in control systems; parameter and state estimation; signal processing; communications and networks; circuit design; data modeling and analysis; data mining including clustering and classification; and combinatorial and global optimization will be highlighted. New reliable and efficient methods, particular those based on interior-point methods and other special methods to solve convex optimization problems will be emphasized. Implementation issues will also be underscored. Recommended preparation: MATH 201 or equivalent.

EECS 417. Introduction to Stochastic Control (3)  
Analysis and design of controllers for discrete-time stochastic systems. Review of probability theory and stochastic processes, input-output analysis of linear stochastic systems, spectral factorization and Weiner filtering, minimum variance control, state-space models of stochastic systems, optimal control and dynamic programming, statistical estimation and filtering, the Kalman-Bucy theory, the linear
biological, optical, magnetic; 3) nanofabrication: quantum dots, nanoparticles, nanocomposites, structures: superlattices, nanowires, nanotubes, search. Lectures and class discussion on 1) nano-mended preparation: EECS 338.

EECS 421. Optimization of Dynamic Systems (3)

EECS 422. Solid State Electronics II (3)

EECS 423. Distributed Systems (3)
Introduction to distributed systems; system models; network architecture and protocols; interprocess communication; client-server model; group communication; TCP sockets; remote procedure calls; distributed objects and remote invocation; distributed file systems; file service architecture; name services; directory and discovery services; distributed synchronization and coordination; transactions and concurrency control; security; cryptography; replication; distributed multimedia systems. Recommended preparation: EECS 338.

EECS 424. Introduction to Nanotechnology (3)
An exploration of emerging nanotechnology research. Lectures and class discussion on 1) nanostructures: superlattices, nanowires, nanotubes, quantum dots, nanoparticles, nanocomposites, proteins, bacteria, DNA; 2) nanoscale physical phenomena: mechanical, electrical, chemical, thermal, biological, optical, magnetic; 3) nanofabrication: bottom up and top down methods; 4) characterization: microscopy, property measurement techniques; 5) devices/applications: electronics, sensors, actuators, biomedical, energy conversion. Topics will cover interdisciplinary aspects of the field. Offered as EECS 424 and EMSE 424.

EECS 425. Computer Networks I (3)

EECS 426. MOS Integrated Circuit Design (3)

EECS 427. MEMS for Sensing and Communication (3)
This course covers basic MEMS fabrication technologies and device operating principles of MEMS resonators and inertial sensors such as accelerometers and gyrosopes. Critical issues regarding sensing resolution and low noise interface electronics design will be discussed. MEMS applications such as low noise oscillators, filters, switches, etc. for wireless communications will also be covered.

EECS 428. Computer Communications Networks II (3)
Introduction to topics and methodology in computer networks and middleware research. Traffic characterization, stochastic models, and self-similarity. Congestion control ( Tahoe, Reno, Sack). Active Queue Management (RED, FQ) and explicit QoS. The Web: overview and components, HTTP, its interaction with TCP, caching, Overlay networks and CDN. Expected work includes a course-long project on network simulation, a final project, a paper presentation, midterm, and final test. Recommended preparation: EECS 425 or permission of instructor.

EECS 430. Object-Oriented Software Development (3)
Covers advanced methodology for the design of large software systems. Topics include: object-oriented analysis and design; encapsulation; inheritance; subtype and parametric polymorphism; object-oriented programming languages; design patterns; application frameworks; software architecture; user-interfaces; concurrent and distributed objects. Recommended preparation: EECS 337 or consent of instructor.

EECS 432. Compiler Construction (3)
Top-down and bottom-up recognizers for context-free grammars; LR(k) parsers, error recovery; semantic analysis, storage allocation for block structured languages, optimization, code generation. Homework involves writing a compiler for a block structured language. Recommended preparation: EECS 337.

EECS 433. Database Systems (3)

EECS 434. Microfabricated Silicon Electromechanical Systems (3)
Topics related to current research in microelectromechanical systems based upon silicon integrated circuit fabrication technology: fabrication, physics, devices, design, modeling, testing, and packaging. Bulk micromachining, surface micromachining, silicon to glass and silicon-silicon bonding, Principles of operation for microactuators and microcomponents. Testing and packaging issues. Recommended preparation: EECS 322 or EECS 415.

EECS 435. Data Mining (3)
Data Mining is the process of discovering interesting knowledge from large amounts of data stored either in databases, data warehouses, or other information repositories. Topics to be covered includes: Data Warehouse and OLAP technology for data mining, Data Preprocessing, Data Mining Primitives, Languages, and System Architectures, Mining Association Rules from Large Databases, Classification and Prediction, Cluster Analysis, Mining Complex Types of Data, and Applications and Trends in Data Mining. Recommended preparation: EECS 341 or equivalent.

EECS 436. Advances in Databases (3)
Advanced topics in databases will be covered in this course. Query optimization in object-oriented databases, temporal databases, issues in multimedia databases, databases and Web, graphical query interfaces. Basic knowledge in databases is required. Recommended preparation: EECS 433.

EECS 437. Advanced Topics in Data Mining and Bioinformatics (3)
This course will cover a large number of active data mining and bioinformatics research areas, which include but not limited to: text mining, sequence analysis, network/graph mining, microarray analysis, and mining mobile objects. Students are expected to understand various methods and approaches employed in these research areas and have critical thinking on the advantages and disadvantages of these approaches. In addition, students need to complete a course-long project which exhibits the independent research capability in these data mining and bioinformatics areas. Recommended preparation: EECS 434, EECS 435.

EECS 438. Biomedical Microdevices (3)
Recent advances in large scale molecular biology have created the technological need for miniaturized instrumentation that can interact with macro-molecules, cells, and tissue with high throughput and in many cases massively parallel formats. This course covers several applications of microfabrication.
cated devices to current problems in biology and medicine. The course material includes applications of miniaturization technologies for medical diagnostics and macromolecule assays, drug discovery, cellular activity monitoring and growth, and tissue engineering.

EECS 439. Web Data Mining (3)
Web crawling technology, web search and information extraction, unsupervised and semi-supervised learning techniques and their application to web data extraction, social network analysis, various pagerank algorithms, link analysis, web resource discovery, web, web description framework (RDF), XML, Web Ontology Language (OWL). Recommended preparation: EECS 338, EECS 341.

EECS 440. Machine Learning (3)
Machine learning is a subfield of Artificial Intelligence that is concerned with the design and analysis of algorithms that “learn” and improve with experience, while the broad aim behind research in this area is to build systems that can simulate or even improve on certain aspects of human intelligence, algorithms developed in this area have become very useful in analyzing and predicting the behavior of complex systems. Machine learning algorithms have been used to guide diagnostic systems in medicine, recommend interesting products to customers in e-commerce, play games at human championship levels, and solve many other very complex problems. This course is focused on algorithms for machine learning; their design, analysis and implementation.

We will study different learning settings, including supervised, semi-supervised and unsupervised learning. We will study different ways of representing the learning problem, using propositional, multiple-instance and relational representations. We will study the different algorithms that have been developed for these settings, such as decision trees, neural networks, support vector machines, k-means, harmonic functions and Bayesian methods. We will learn about the theoretical tradeoffs in the design of these algorithms, and how to evaluate their behavior in practice. At the end of the course, you should be able to:

* Recognize situations where machine learning algorithms are applicable
* Understand, represent and formulate the learning problem
* Apply the appropriate algorithm(s), or if necessary, design your own, with an understanding of the tradeoffs involved
* Correctly evaluate the behavior of the algorithm when solving the problem.

Coreq: EECS 391 or consent of instructor.

EECS 441. Internet Applications (3)
This course exposes students to research in building and scaling internet applications. Covered topics include Web services, scalable content delivery, applications of peer-to-peer networks, and performance analysis and measurements of Internet application platforms. The course is based on a collection of research papers and protocol specifications. Students are required to read the materials, present a paper in class, prepare short summaries of discussed papers, and do a course project (team projects are encouraged). Prereq: EECS 325 or EECS 425.

EECS 444. Computer Security (3)
General types of security attacks; approaches to prevention; secret key and public key cryptography; message authentication and hash functions; digital signatures and authentication protocols; information gathering; password cracking; spoofing; session hijacking; denial of service attacks; buffer overruns; viruses, worms, etc., principles of soft ware design, threat modeling; access control; least privilege; storing secrets; socket security; RPC security; security testing; secure software installation; operating system security; database security; web security; email security; firewalls; intrusions. Recommended preparation: EECS 337.

EECS 450. Operations and Systems Design (3)
Introduction to design, modeling, and optimization of operations and scheduling systems with applications to computer science and engineering problems. Topics include, forecasting and times series, strategic, tactical, and operational planning, life cycle analysis, learning curves, resources allocation, materials requirement and capacity planning, sequencing, scheduling, inventory control, project management and planning. Tools for analysis include: multi-objective optimization, queuing models, simulation, and artificial intelligence.

EECS 452. Random Signals (3)

EECS 454. Analysis of Algorithms (3)
This course presents and analyzes a number of efficient algorithms. Problems are selected from such problem domains as sorting, searching, set manipulation, graph algorithms, matrix operations, polynomial manipulation, and fast Fourier transforms. Through specific examples and general techniques, the course covers the design of efficient algorithms as well as the analysis of the efficiency of particular algorithms. Certain important problems for which no efficient algorithms are known (NP-complete problems) are discussed in order to illustrate the intrinsic difficulty which can sometimes preclude efficient algorithmic solutions. Recommended preparation for EECS 454: MATH 304 and (EECS 340 or EECS 405). Offered as EECS 454 and OPRE 454.

EECS 456. Microwave Engineering (3)

EECS 458. Introduction to Bioinformatics (3)

EECS 460. Manufacturing and Automated Systems (3)
Formulation, modeling, planning, and control of manufacturing and automated systems with applications to computer science and engineering problems. Topics include, design of products and processes, location/spatial problems, transportation and assignment, product and process layout, group technology and clustering, cellular and network flow layouts, computer control systems, reliability and maintenance, and statistical quality control. Tools and analysis include: multi-objective optimization, artificial intelligence, and heuristics for combinatorial problems. Offered as EECS 360 and EECS 460.

EECS 466. Computer Graphics (3)
Theory and practice of computer graphics: object and environment representation including coordinate transformations, image extraction including perspective, hidden surface, and shading algorithms; and interaction. Covers a wide range of graphic display devices and systems with emphasis in interactive shaded graphics. Laboratory. Recommended preparation: EECS 233.

EECS 470. Intelligent Networks and Systems (3)
This course covers the development of the next-generation intelligent networks. It involves an in-depth study of design, planning, optimization, and analysis for communications information networks. It will include design and optimization of telecommunication networks and protocols. The course provides applications of Artificial Intelligence methodologies including mathematical learning, neural networks, clustering, modeling and automating human decision making process, and mobile agents to the design of intelligent networks. There will be weekly homework/reading assignments, some presentations by students, and a large project. Offered as EECS 370 and EECS 470.

EECS 477. The Dynamics of Adaptive Behavior (3)
Introduction to embodied, situated, and dynamical approaches to the design and analysis of autonomous agents and animals. Topics include recurrent neural networks, coupled neural/body/environment systems, and evolution and analysis of neural circuits. Behavior studied include examples from motor control, perception, learning, and cognition. Recommended preparation: ENGR 131 and MATH 224. Offered as BIOL 477 and EECS 477.

EECS 478. Computational Neuroscience (3)
Computer simulations and mathematical analysis
of neurons and neural circuits, and the computational properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course introduces students to dynamical systems theory for the analysis of neurons and neural learning, models of brain systems, and their relationship to artificial and neural networks. Term project required. Students enrolled in MATH 478 will make arrangements with the instructor to attend additional lectures and complete additional assignments addressing mathematical topics related to the course. Recommended preparation: MATH 223 and MATH 224 or BIOL 300 and BIOL 306. Offered as BIOL 378, COGS 378, MATH 378, BIOL 478, EBM E 478, EEC S 478, MATH 478 and NEUR 478.

EECS 479. Seminar in Computational Neuroscience (3) Readings and discussion in the recent literature on computational neuroscience, adaptive behavior, and other current topics. Offered as BIOL 479, EBM E 479, EEC S 479, and NEUR 479.

EECS 483. Data Acquisition and Control (3) Data acquisition (theory and practice), digital control of sampled data systems, stability tests, system simulation digital filter structure, finite word length effects, limit cycles, state-variable feedback and state estimation. Laboratory includes control algorithm programming done in assembly language.

EECS 484. Computational Intelligence I: Basic Principles (3) This course is concerned with learning the fundamental aspects of a number of computational methodologies which are used in adaptive parallel distributed information processing. Such methodologies include neural net computing, evolutionary programming, genetic algorithms, fuzzy set theory, and “artificial life.” These computational paradigms complement and supplement the traditional practices of pattern recognition and artificial intelligence. Functionality covered include self-organization, learning a model or supervised learning, optimization, and memorization.

EECS 485. VLSI Systems (3) Basic MOSFET models, inverters, steering logic, the silicon gate, nMOS process, design rules, basic design structures (e.g., NAND and NOR gates, PLA, ROM, RAM), design methodology and tools (spice, N.mpc, Caesar, mkpla), VLSI technology and system architecture. Requires project and student presentation, laboratory.

EECS 486. Research in VLSI Design Automation (3) Research topics related to VLSI design automation such as hardware description languages, computer-aided design tools, algorithms and methodologies for VLSI design for a wide range of levels of design abstraction, design validation and test. Requires term project and class presentation.

EECS 488. Embedded Systems Design (3) Objective: to introduce and expose the student to methodologies for systematic design of embedded system. The topics include, but are not limited to, system specification, architecture modeling, component partitioning, estimation metrics, hardware software codesign, diagnostics.


EECS 490. Digital Image Processing (3) Digital images are introduced as two-dimensional sampled arrays of data. The course begins with one-to-one operations such as image addition and subtraction and image descriptors such as the histogram. Basic filters such as the gradient and Laplacian in the spatial domain are used to enhance images. The 2-D Fourier transform is introduced and frequency domain operations such as high and low-pass filtering are developed. It is shown how filtering techniques can be used to remove noise and other image degradation. The different methods of representing color images are described and fundamental concepts of color image transformations and color image processing are developed. One or more advanced topics such as wavelets, image compression, and pattern recognition will be covered as time permits. Programming assignments using software such as MATLAB will illustrate the application and implementation of digital image processing.


EECS 492. VLSI Digital Signal Processing Systems (3) Digital signal processing (DSP) can be found in numerous applications, such as wireless communication, audio/video compression, cable modems, multimedia, global positioning systems and biomedical signal processing. This course fills the gap between DSP algorithms and their efficient VLSI implementations. The design of a digital system is restricted by the requirements of applications, such as speed, area and power consumption. This course introduces methodologies and tools which can be used to design VLSI architectures with different speed-area tradeoffs for DSP algorithms. In addition, the design of efficient VLSI architectures for commonly used DSP blocks is presented in this class. Recommended preparation: EEC S 485.

EECS 493. Software Engineering (3) Topics: Introduction to software engineering; software lifecycle models; development team organization and project management; requirements analysis and specification techniques; software design techniques; programming practices; software validation techniques; software maintenance practices; software engineering ethics. Undergraduates work in teams to complete a significant software development project. Graduate students are required to complete a research project. Recommended preparation for EEC S 493: EEC S 377. Offered as EEE C S 393 and EEE C S 493.

EECS 495. Nanometer VLSI Design (3) Semiconductor industry has evolved rapidly over the past four decades to meet the increasing demand on computing power by continuous miniaturization of devices. Now we are in the nanometer technology regime with the device dimensions scaled below 100nm. VLSI design using nanometer technologies involves some major challenges. This course will explain all the major challenges associated with nanoscale VLSI design such as dynamic and leakage power, parameter variations, reliability and robustness. The course will present modeling and analysis techniques for timing, power and noise in nanometer era. Finally, the course will cover the circuit/architecture level design solutions for low power, high-performance, testable and robust VLSI system. The techniques will be applicable to design of microprocessor, digital signal processor (DSP) as well as application specific integrated circuits (ASIC). The course includes a project which requires the student to work on a nanometer design issue. Recommended preparation: EEC S 426 or EEC S 485.

EECS 500. EECS Colloquium (0) Seminars on current topics in Electrical Engineering and Computer Science.

EECS 500T. Graduate Teaching II (0) This course will provide the Ph.D. candidate with experience in teaching undergraduate or graduate students. The experience is expected to involve direct student contact but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience for the student. Students in this course may be expected to perform one or more of the following teaching related activities: grading homeworks, quizzes, and exams, having office hours for students, running recitation sessions, providing laboratory assistance. Recommended preparation: Ph.D. student in EEC S department.

EECS 516. Large Scale Optimization (3) Concepts and techniques for dealing with large optimization problems encountered in designing large engineering structure, control of interconnected systems, pattern recognition, and planning and operations of complex systems; partitioning, relaxation, restriction, decomposition, approximation, and other problem simplification devices; specific algorithms; potential use of parallel and symbolic computation; student seminars and projects. Recommended preparation: EEC S 416.

EECS 518. Nonlinear Systems: Analysis and Control (3) Mathematical preliminaries: differential equations...
and dynamical systems, differential geometry and manifolds. Dynamical systems and feedback sys-
tems, existence and uniqueness of solutions. Com-

EECS 519. Differential Geometric Nonlinear Control (3)
This advanced course focuses on the analysis and design of nonlinear control systems, with special emphasis on the differential geometric approach. Differential geometry has proved to be an extremely powerful tool for the analysis and design of nonlinear systems, similar to the role of the Laplace transformation and linear algebra in linear systems.

The objective of the course is to present the major methods and results of nonlinear systems and provide a mathematical foundation, which will enable students to follow the recent developments in the constantly expanding literature. This course will also benefit those students from Electrical, Mechanical, Chemical and Biomedical Engineering, who are doing research in the fields that involve nonlinear control problems. Recommended preparation: EECS 408 or equivalent.

EECS 520. Robust Control (3)
One of the most important problems in modern control theory is that of controlling the output of a system so as to achieve asymptotic tracking of prescribed signals and/or asymptotic rejection of undesired disturbances. The problem can be solved by the so-called regulator theory and H-infinity control theory. This course presents a self-contained introduction to these two important design methods.

The intention of this course is to present ideas and methods on such a level that the beginning graduate student will be able to follow current research. Both linear and nonlinear results will be covered. Recommended preparation: EECS 408.

EECS 523. Advanced Neural Microsystems (3)
This course will cover the latest advances in neuroengineering with specific attention to integrated microsystems targeting wired/wireless multichannel interfacing with the nervous system at the cellular level in biological hosts. The aim is to provide students familiar with microfabrication and integrated circuit design with an application-driven, system-level overview of sensors and microelectronics in microsystems format for neural engineering. Recommended preparation: EECS 426.

EECS 526. Integrated Mixed-Signal Systems (3)
Mixed-signal (analog/digital) integrated circuit design, D-to-A and A-to-D conversion, applications in mixed-signal VLSI, low-noise and low-power techniques, and communication sub-circuits. System simulation at the transistor and behavioral levels using SPICE. Class will design a mixed-signal CMOS IC for fabrication by MOSIS. Recommended preparation: EECS 426.

EECS 527. Advanced Sensors Theory and Techniques (3)
Sensor technology with a primary focus on semiconductor-based devices. Physical principles of energy conversion devices (sensors) with a review of relevant fundamentals: elasticity theory, fluid mechanics, silicon fabrication and micromachining technology, semiconductor device physics. Classification and terminology of sensors, defining and measuring sensor characteristics and performance, effects of the environment on sensors, predicting and controlling sensor error. Mechanical, acoustic, magnetic, thermal, radiation, chemical and biological sensors will be examined. Sensor packaging and sensor interface circuitry.

EECS 531. Computer Vision (3)
Geometric optics, ray matrices, calibration of monocular and stereo imaging systems. Adaptive camera thresholding and image segmentation, morphological and convolutional image processing. Selected topics including edge estimation and industrial inspection, optimal filtering, model matching, CAD-based vision and range image processing. Neural-net image processing. Model-based computer vision for scene interpretation and autonomous systems. Recommended preparation: EECS 490 or equivalent.

EECS 589. Robotics II (3)
Survey of research issues in robotics. Force control, visual servoing, robot autonomy, on-line planning, high-speed control, man/machine interfaces, robot learning, sensory processing for real-time control. Primarily a project-based lab course in which students design real-time software executing on multi-processors to control an industrial robot. Recommended preparation: EECS 489.

EECS 591. Advanced Artificial Intelligence (3)
An advanced course surveying topics in artificial intelligence, machine learning, and intelligent control. Topics will move toward state-of-research in areas including fuzzy logic, genetic algorithms, stochastic search, task-level learning, reinforcement learning, and approximate dynamic programming. Reading of primary literature. Project required.

EECS 600. Special Topics (1 - 18)
EECS 600F. Graduate Teaching III (0)
This course will provide Ph.D. candidate with experience in teaching undergraduate or graduate students. The experience is expected to involve direct student contact but will be based upon the specific departmental needs and teaching obligations. This teaching experience will be conducted under the supervision of the faculty member who is responsible for the course, but the academic advisor will assess the educational plan to ensure that it provides an educational experience for the student. Students in this course may be expected to perform one or more of the following teaching-related activities running recitation sessions, providing laboratory assistance, developing teaching or lecture materials presenting lectures. Recommended preparation: Ph.D. student in EECS department.

EECS 601. Independent Study (1 - 18)
EECS 602. Advanced Projects Laboratory (1 - 18)
EECS 620. Special Topics (1 - 18)
EECS 621. Special Projects (1 - 18)
EECS 649. Project M.S. (1 - 9)
EECS 651. Thesis M.S. (1 - 18)
EECS 701. Dissertation Ph.D. (1 - 18)
Prior requisites: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Electrical Engineering
First Year Class-Lab-Credit Hours
Fall
SAGES First Year Seminar (4-0-4)
CHEM 111 Chemistry I (4-0-4)
MATH 121 Calculus I (4-0-4)
ENGR 131 Elementary Computer Programming (3-0-5)
Open elective (2-0-2)
PHED 101 Physical Education (0-3-0)
Total (17-3-17)

Spring
SAGES University Seminar (3-0-3)
ENGR 145 Chemistry of Materials (4-0-4)
PHYS 121 Physics I: Mechanics (3-0-4)
MATH 122 Calculus II (4-0-4)
PHED 102 Physical Education (0-3-0)
Total (15-3-15)

Second Year
Fall
PHYS 122 Physics II Electricity & Magnetism (4-0-4)
MATH 223 Calculus III (3-0-3)
ENGR 210 Circuits and Instrumentation (3-2-4)
EECS 281 Computer Organization, Logic Design (3-2-4)
Total (13-4-15)

Spring
SAGES University Seminar (3-0-3)
ENGR 225 Thermo, Fluids, Transport (4-0-4)
MATH 224 Differential Equations (3-0-3)
EECS 245 Electronic Circuits (3-2-4)
EECS 309 Electromagnetic Fields I (3-0-3)
Total (16-2-17)

Third Year Class-Lab-Credit Hours
Fall
HM/SS elective (3-0-3)
STAT 332 Statistics of Signal Processing (3-0-3)
ENGR 200 Statics & Strength of Materials (3-0-3)
EECS 246 Signals & Systems (3-2-4)
Approved technical elective (3-0-3)
Total (15-2-16)

Spring
HM/SS elective (3-0-3)
EECS 321 Semiconductor Elect. Devices (3-2-4)
Applied Statistics Req. (3-0-3)
Approved technical elective (3-0-3)
Total (15-2-16)

Fourth Year
Fall
HM/SS elective (3-0-3)
EECS 398 Engineering Projects I (0-8-4)
ENGL 398 Professional Communications (2-0-2)
ENGR 398 Professional Communications (1-0-1)
Approved technical elective 2 (3-0-3)
Open elective (3-0-3)
Total (12-8-16)

Spring
HM/SS elective (3-0-3)
EECS 399 Engineering Projects II (0-8-4)
Approved technical elective 2 (3-0-3)
Approved technical elective 2 (3-0-3)
Approved technical elective 2 (3-0-3)
Total (12-8-16)

Hours Required for Graduation: 128
a. Although not required, students may elect to take ENGR 101 Freshman Engineering Service Project as their open elective in the freshman year.
b. Selected students may be invited to take PHYS 123 and 124 in place of PHYS 121 and PHYS 122.
c. Students may replace STAT 332 with STAT 333 Uncertainty in Engineering and Science if approved by their advisor.
d. Technical electives will be chosen to fulfill the depth requirement and otherwise increase the student's understanding of electrical engineering. Courses used to satisfy the depth requirement must come from the department's list of depth areas and related courses. Technical electives not used to satisfy the depth requirement are more generally defined as any course related to the principles and practice of electrical engineering. This includes all EECS courses at the 200 level and above, and can include courses from other programs. All non-EECS technical electives must be approved by the student's advisor.
e. This applied statistics requirement must utilize statistics in electrical engineering applications and is typically selected from EECS 351 Communications and Signal Analysis or EECS 313 Signal Processing. Other courses are possible with approval of advisor.
f. CO-OP students may obtain design credit for one semester of Engineering Projects if their co-op assignment included significant design responsibility; however, the student is still responsible for such course obligations as reports, presentations, and ethics assignments. Design credit and fulfillment of remaining course responsibilities are arranged through the course instructor.
g. B.S./M.S. students may also utilize EECS 651 M.S. Thesis to fulfill eight credits of EECS 398/399 provided their thesis has adequate design content to meet the requirements of EECS 398/399. B.S./M.S. students should see their M.S. thesis advisor for details.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Systems and Control Engineering
First Year Class-Lab-Credit Hours
Fall
SAGES First Year Seminar (4-0-4)
CHEM 111 Chemistry I (4-0-4)
MATH 121 Calculus I (4-0-4)
ENGR 131 Elementary Computer Programming (3-0-3)
Open elective (3-0-3)
PHED 101 Physical Education (0-3-0)
Total (18-3-18)

Spring
SAGES University Seminar (3-0-3)
PHYS 121 Physics I: Mechanics 4 (4-0-4)
MATH 122 Calculus II (4-0-4)
ENGR 145 Chemistry of Materials (4-0-4)
PHED 102 Physical Education (0-3-0)
Total (15-3-15)

Second Year
Fall
PHYS 122 Physics II: Electricity & Magnetism 4 (4-0-4)
MATH 223 Calculus III (3-0-3)
ENGR 210 Circuits and Instrumentation (3-2-4)
EECS 281 Computer Organization (3-2-4)
Total (13-4-15)

Spring
SAGES University Seminar (3-0-3)
MATH 224 Differential Equations (3-0-3)
STAT xxx Statistical Methods Course 3 (3-0-3)
ENGR 200 Statics & Strength of Materials (3-0-3)
ENGR 225 Fluid and Thermodynamics (4-0-4)
Total (16-0-16)

Third Year Class-Lab-Credit Hours
Fall
HM/SS elective (3-0-3)
EECS 246 Signals and Systems (3-2-4)
EECS 324 Simulation Methods (3-0-3)
EECS 342 Introduction to Global Systems (3-0-3)
Approved technical elective (3-0-3)
Total (15-2-16)

Spring
HM/SS elective (3-0-3)
EECS 304 Control Engineering I (3-0-3)
EECS 305 Control Lab I (0-2-1)
EECS 346 Engineering Optimization (3-0-3)
Approved technical elective 2 (3-0-3)
Open elective (3-0-3)
Total (15-2-16)

Fourth Year
Fall
HM/SS elective (3-0-3)
ENGL 398 Professional Communications (2-0-2)
ENGR 398 Professional Communications (1-0-1)
EECS 352 Eng. Econ. & Dec. Analysis (3-0-3)
EECS 398 Engineering Projects I (0-8-4)
Approved technical elective 2 (3-0-3)
Total (12-8-16)

Spring
HM/SS elective (3-0-3)
EECS 399 Engineering Projects II (0-8-4)
Approved technical elective 2 (3-0-3)
Approved technical elective 2 (3-0-3)
Approved technical elective 2 (3-0-3)
Total (12-8-16)

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Computer Engineering
First Year Class-Lab-Credit Hours
Fall
SAGES First Year Seminar (3-0-3)
CHEM 111 Chemistry I (4-0-4)
MATH 121 Calculus I (4-0-4)
ENGR 131 Elementary Computer Programming (3-0-3)
Open elective (3-0-3)
PHED 101 Physical Education (0-3-0)
Total (18-3-18)

Spring
SAGES University Seminar (3-0-3)
PHYS 121 Physics I: Mechanics 4 (4-0-4)
PHYS 122 Physics II: Electricity & Magnetism 4 (4-0-4)
MATH 122 Calculus II (4-0-4)
ENGR 145 Chemistry of Materials (4-0-4)
PHED 102 Physical Education (0-3-0)
Total (15-3-15)

Second Year
Fall
SAGES University Seminar (3-0-3)
MATH 224 Differential Equations (3-0-3)
STAT xxx Statistical Methods Course 3 (3-0-3)
ENGR 200 Statics & Strength of Materials (3-0-3)
ENGR 225 Fluid and Thermodynamics (4-0-4)
Total (16-0-16)
**BACHELOR OF SCIENCE DEGREE**

**Major in Computer Science**

**First Year Class-Lab-Credit Hours**

**Fall**
- SAGES First Year Seminar (4-0-4)
- MATH 121 Calculus I (4-0-4)
- ENGR 145 Chemistry of Materials (4-0-4)

**Total (15-3-15)**

**Spring**
- SAGES University Seminar (3-0-3)
- PHYS 121 Physics I: Mechanics (4-0-4)
- MATH 122 Calculus II (4-0-4)
- ENGR 154 Chemistry of Materials (4-0-4)
- PHED 102 Physical Education (0-3-0)

**Total (17-3-17)**

**Second Year**

**Fall**
- SAGES University Seminar (3-0-3)
- PHYS 122 Physics II Electricity & Magnetism (4-0-4)
- MATH 223 Calculus III (3-0-3)
- EECS 281 Comp. Organization Logic Design (3-2-4)

**Total (16-2-17)**

**Spring**
- MATH 224 Differential Equations (3-0-3)
- EECS 302 Discrete Mathematics (3-0-3)
- EECS 233 Intro Data Structures (3-2-4)
- Technical elective \(' (3-0-3)

**Total (15-2-16)**

**Third Year Class-Lab-Credit Hours**

**Fall**
- HM/SS elective (3-0-3)
- EECS 318 VLSI/CAD \(\times\) (3-2-4)
- Open elective (3-0-3)

**Total (15-2-16)**

**Spring**
- ENGL 398 Professional Communication (2-0-2)
- CHEM 111 Chemistry I (4-0-4)
- ENGR 398 Professional Communication (1-0-1)
- Technical elective \(' (3-0-3)

**Total (15-0-15)**

**Fourth Year**

**Fall**
- EECS 337 Compiler Design (3-2-4)
- EECS 340 Algorithms and Data Structures (3-0-3)
- HM/SS elective (3-0-3)

**Total (15-2-16)**

**Spring**
- ENGL 398 Professional Communication (2-0-2)
- EECS 314 Computer Architecture (3-0-3)
- EECS 302 Intro to Operating Systems (3-0-3)
- EECS 341 Intro. to Database Systems (3-0-3)

**Total (15-2-16)**

**BACHELOR OF ARTS DEGREE**

**Computer Science**

**First Year Class-Lab-Credit Hours**

**Fall**
- SAGES First Year Seminar (4-0-4)
- MATH 125 Mathematics I (4-0-4)
- ENGR 131 Elementary Computer Programming (3-0-3)

**Total (15-0-15)**

**Spring**
- SAGES University Seminar (3-0-3)
- PHYS 121 Physics I: Mechanics (4-0-4)
- MATH 122 Calculus II (4-0-4)
- ENGR 154 Chemistry of Materials (4-0-4)
- PHED 102 Physical Education (0-3-0)

**Total (15-3-15)**

**Second Year**

**Fall**
- SAGES University Seminar (3-0-3)
- PHYS 122 Physics II Electricity & Magnetism (4-0-4)
- MATH 223 Calculus III (3-0-3)
- EECS 281 Comp. Organization Logic Design (3-2-4)

**Total (16-2-17)**

**Spring**
- MATH 224 Differential Equations (3-0-3)
- EECS 302 Discrete Mathematics (3-0-3)
- EECS 233 Intro Data Structures (3-2-4)

**Total (15-2-16)**

**Third Year Class-Lab-Credit Hours**

**Fall**
- EECS 337 Compiler Design (3-2-4)

**Total (15-2-16)**

**Spring**
- ENGL 398 Professional Communication (2-0-2)

**Total (15-0-15)**

**Hours Required for Graduation: 129**

**BACHELOR OF ARTS DEGREE**

**Computer Science**

**First Year Class-Lab-Credit Hours**

**Fall**
- SAGES First Year Seminar (4-0-4)
- MATH 125 Mathematics I (4-0-4)
- ENGR 131 Elementary Computer Programming (3-0-3)
- HM/SS elective (3-0-3)

**Total (15-0-15)**

**Spring**
- SAGES University Seminar (3-0-3)
- PHYS 121 Physics I: Mechanics (4-0-4)

**Total (15-3-15)**

**Hours Required for Graduation: 130**

**a.** Technical electives are more generally defined as any course related to the principles and practice of computer engineering. This includes all EECS courses at the 200 level and above, and can include courses from other programs. All non-EECS technical electives must be approved by the student’s advisor.
for careers in fields that address such problems, the Undesignated Engineering program allows students to acquire some engineering background, and combine it with a minor in such programs as management, history of technology and science, or economics. This is not an ABET, Inc. accredited program.

UNDERGRADUATE PROGRAM

A student electing an undesignated degree must submit a clear statement of career goals supported by a proposed course schedule with written justification for the selections. These documents are to be submitted to the office of the associate dean in the Case School of Engineering. The program must be approved by the dean in the Case School of Engineering or designate in consultation with representatives of the major and minor departments. A total of at least 129 semester credits are required for graduation.

Since each student’s program is unique, no typical curriculum can be shown. Every program must fulfill the requirements described below.

1. Engineering Core
2. A minimum of two engineering electives courses selected from two of the following four groups
   a. Thermodynamics or Physical Chemistry (EMAE 152, EMAC 351 and 352, CHEM 301 and 302, ECHE 363)
   b. Signals, systems or control (EECS 212, EECS 304, EBME 308, ECHE 367)
   c. Materials science (EMSE 201, EMAC 270, EMSE 314, EBME 306, or EECS 321)
   d. Economics, production systems or decision theory (EECS 350, EECS 352, OPRE 345)

Major

The major must contain a minimum of 24 semester credit hours of work in one of the following engineering fields

- Biomedical engineering
- Chemical engineering
- Civil engineering
- Computer engineering
- Electrical engineering
- Engineering Physics
- Materials science and engineering
- Polymer science and engineering
- Systems and control engineering

This work includes a senior projects laboratory (3 credits) and usually a course with a physical measurements laboratory.

Minor

The minor program requires a minimum of 15 semester credit hours. Minors are available with approval of the Office of Undergraduate Studies. Minors must be approved by the department offering the minor. Final approval of the minor resides with the Office of Undergraduate Studies. For more information, contact Patrick E Crago, associate dean at cseinfo@case.edu.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Engineering (Undesignated)

First Year Class-Lab-Credit Hours

Fall
- Open elective or Humanities/Social Science * (3-0-3)
- CHEM 111 Principles of Chemistry for Engineers (4-0-4)
- ENGR 131 Elementary Computer Programming (2-2-3)
- 0-3)
- Spring
- Open elective or Humanities/Social Science (3-0-3)
- ENGR 131 Elementary Computer Programming (2-2-3)
- PHED 101 Physical Education Activities (0-3-0)
- Total (16-5-17)

Second Year

Fall
- USXX SAGES University Seminar (3-0-3)
- ENGR 200 Statics and Strength of Materials (3-0-3)
- MATH 223 Calculus for Science and Engineering II (3-0-3)
- ECES 251 Numerical Methods (2-2-3)
- PHYS 122 General Physics II (4-0-4)
- Total (15-3-15)

Spring
- USXX SAGES University Seminar (3-0-3)
- ENGR 225 Thermodynamics, Fluid Mechanics, Heat and Mass Transfer (4-0-4)
- ENGR 210 Introduction to Circuits and Instrumentation (3-2-4)
- MATH 224 Elementary Differential Equations (3-0-3)
- PHYS 221 General Physics III, Modern Physics (3-0-3)
- Total (16-2-17)
**Third Year Class-Lab-Credit Hours**

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**Fourth Year Class-Lab-Credit Hours**

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<tr>
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<td>ENGL 398N Professional Communications</td>
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</table>

**Hours required for graduation: 129**

- One of these courses must be a humanities/social science course.

---

**ENGINEERING PHYSICS**

Rockefeller Building (7079)
Phone 216-368-4617; Fax 216-368-4671
Kenneth D. Singer
e-mail:kds4@po.cwru.edu

The Engineering Physics major allows students with strong interests in both physics and engineering to concentrate their studies in the common areas of these disciplines. The Engineering Physics major prepares students to pursue careers in industry, either directly after undergraduate studies, or following graduate study in engineering or physics. Many employers value the unique problem solving approach of physics, especially in industrial research and development.

Students majoring in engineering physics complete the Engineering Core as well as a rigorous course of study in physics. Students select a concentration area from an engineering discipline, and must complete a sequence of at least four courses in this discipline. In addition, a senior research project under the guidance of a faculty member is required. The project includes a written report and participation in the senior seminar and symposium.

**Mission and Program Objectives**

The mission of the Engineering Physics program is to prepare students for careers in engineering where physics principles can be applied to the advancement of technology. This education at the intersection of engineering and physics will enable students to seek employment in engineering upon graduation while providing a firm foundation for the pursuit of graduate studies in engineering or physics. The Engineering Physics program will develop sufficient depth in both engineering and physics skills to produce engineers who can relate fundamental physics to practical engineering problems, and will possess the versatility to address new problems in our rapidly changing technological base. The program will provide a curriculum and environment to develop interdisciplinary collaboration, ethical and professional outlooks, communication skills, and the tools and desire for lifelong learning. In order to realize this mission, the Engineering Physics Program will pursue the following objectives:

- **Program Objective 1:** Graduates of the Engineering Physics program will apply their strong problem solving skills as physicists along with an understanding of the approach, methods, and requirements of engineering and engineering design for a successful career in advancing technology.

- **Program Objective 2:** Graduates of the Engineering Physics program will use their strong skills in problem solving, research experience and knowledge in physics and engineering as successful graduate students and researchers in highly ranked graduate programs.

The Bachelor of Science degree program is accredited by the Engineering Accreditation Commission (EAC) of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD, 21202-4012; telephone: 410-347-7700.

**BACHELOR OF SCIENCE IN ENGINEERING DEGREE**

**Major in Engineering Physics**

**First Year Class-Lab-Credit Hours**

<table>
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<tr>
<th>Semester</th>
<th>Course</th>
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<tr>
<td>Fall</td>
<td>CHEM 111 Principles of Chemistry for Engineers</td>
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<tr>
<td>Fall</td>
<td>MATH 121 Calculus for Science and Engineering</td>
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<tr>
<td>Fall</td>
<td>PHYS 121 General Physics I</td>
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<tr>
<td>Fall</td>
<td>SAGES First Seminar</td>
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**Second Year Class-Lab-Credit Hours**

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<td>MATH 122 Calculus for Science and Engineering</td>
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<tr>
<td>Fall</td>
<td>PHYS 122 General Physics II</td>
<td>4-3-4</td>
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<tr>
<td>Fall</td>
<td>ENGR 131 Elementary Computer Programming</td>
<td>2-2-3</td>
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<tr>
<td>Fall</td>
<td>ENGR 145 Chemistry of Materials</td>
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<td>SAGES University Seminar</td>
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**Third Year Class-Lab-Credit Hours**

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<td>MATH 223 Calculus for Science &amp; Engineering III</td>
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<td>Fall</td>
<td>PHYS 221 General Physics III – Modern Physics</td>
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<tr>
<td>Fall</td>
<td>ENGR 200 Statics and Strength of Materials</td>
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<tr>
<td>Fall</td>
<td>ENGR 210 Circuits &amp; Instrumentation</td>
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**Spring**

<table>
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<th>Semester</th>
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<tr>
<td>Spring</td>
<td>MATH 224 Differential Equations</td>
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<tr>
<td>Spring</td>
<td>PHYS 208 Instrumentation and Signal Analysis Lab</td>
<td>2-4-4</td>
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<tr>
<td>Spring</td>
<td>PHYS 250 Mathematics, Physics and Computing</td>
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<td>Spring</td>
<td>PHYS 310 Classical Mechanics</td>
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<tr>
<td>Spring</td>
<td>ENGR 225 Thermodynamics, Fluids, Heat &amp; Mass Transfer</td>
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**Fourth Year Class-Lab-Credit Hours**

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<tr>
<td>Fall</td>
<td>ENGR 225 Thermodynamics, Fluids, Heat &amp; Mass Transfer</td>
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<tr>
<td>Fall</td>
<td>ENGR 303 Advanced Physics Laboratory Seminar</td>
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<td>Fall</td>
<td>ENGR 331 Introduction to Quantum Mechanics</td>
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**Spring**

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<td>Spring</td>
<td>PHYS 318 Engineering Physics Lab II</td>
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<td>Spring</td>
<td>PHYS 324 Electricity and Magnetism</td>
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<td>Spring</td>
<td>ENGL 398N Professional Communications</td>
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**Fourth Year**

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<tr>
<td>Fall</td>
<td>PHYS 315 Introduction to Solid State Physics</td>
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<td>Fall</td>
<td>PHYS 325 Electricity and Magnetism II</td>
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<td>Fall</td>
<td>PHYS 352 Senior Physics Project Seminar</td>
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<td>PHYS 353 Senior Engineering Physics Project</td>
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<td>Total</td>
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</table>
In addition, most biological systems are composed of macromolecules—proteins (e.g., silk, wool, tendon), carbohydrates (e.g., cellulose) and nucleic acids (RNA and DNA) are polymers and are studied by the same methods that are applied to synthetic polymers.

Production of polymers and their components is central to the chemical industry, and statistics show that over 75 percent of all chemists and chemical engineers in industry are involved with some aspect of polymers. Despite this, formal education in this area is offered by only a few universities in this country, resulting in a continued strong demand for our graduates upon completion of their B.S., M.S., or Ph.D. degrees.

FACULTY

Gary Wnek, Ph.D.
(University of Massachusetts, Amherst)
The Joseph F. Tout, Jr., Professor and Chair
Faculty Director, The Institute for Management and Engineering (TiME)

Polymers with unusual electrical or optical properties; biomaterials for tissue engineering and regenerative medicine; electric field-mediated processing (electrospinning of nano- and micro fibers and morphology modulation in polymer blends); polymer-based microfluidic platforms; polymer product design

Eric Baer, D. Eng.
(Johns Hopkins University)
Leonard Case Jr. Professor

Irreversible microdeformation mechanisms; pressure effects on morphology and mechanical properties; relationships between hierarchical structure and mechanical function; mechanical properties of soft connective tissue; polymer composites and blends; polymerization and crystallization on crystalline surfaces; viscoelastic properties of polymer melts; damage and fracture analysis of polymers and their composites. Structure-property relationships in biological systems

John Blackwell, Ph.D.
(University of Leeds, England)

Determination of the solid state structure and morphology of polymers. X-ray analysis of the structure of thermotropic copolymers; co-polymides, polyurethanes, polysaccharides; supramolecular assemblies, fluoropolymers; molecular modeling of semi-crystalline and liquid crystalline polymers; rheological properties of polysaccharides and glycoproteins

Elena Dormidontova, Ph.D.

CASE SCHOOL OF ENGINEERING

(Moscow State University)
Clima Associate Professor for the Case School of Engineering

Statistical physics of macromolecules, phase behavior (phase stability and thermodynamic ordering) and properties of complex polymer and biopolymer systems: biocompatible and water-soluble polymers (their properties and applications for biomimetics and drug delivery), hydrogen bonded and associating polymers (reversibly associated living polymers), polymer/surfactant systems, polymer micelles (at thermodynamic equilibrium and micellization kinetics), polyelectrolytes and block copolymers

Anne Hiltner, Ph.D.
(Oregon State University)
The Herbert Henry Dow Professor

Structure-property relationships; irreversible deformation, crack propagation and fracture of polymers, blends and composites; microlayer processing of polymers; structure-function relationships in collagenous tissues; biostability of biomaterials

Hatsuo Ishida, Ph.D.
(Case Western Reserve University)
Professor

Processing of polymers and composite materials; structural analysis of surfaces and interfaces; molecular spectroscopy of synthetic polymers

Alexander M. Jamieson, D. Phil.
(Oxford University, England)
Professor

Laser light scattering; rheology and transport of macromolecules in solution and bulk and biopolymers; positron annihilation lifetime studies of free volume in polymers; electrorheological fluids; drag reduction of polymer solutions; polymer-surfactant interactions

LaShanda T. Korley, Ph.D.
(Massachusetts Institute of Technology)
Assistant Professor

Structure-function relationships; toughening mechanisms in segmented copolymers; spatial confinement of self-assembled materials, including biomaterials; hierarchical microstructures

Ica Manas-Zloczower, D.Sc.
(Israel Institute of Technology)
Professor and Associate Dean of Faculty Development

Structure and micromechanics of fine particle clusters; interfacial engineering strategies for advanced materials processing; dispersive mixing mechanisms and modeling; design
and mixing optimization studies for polymer processing equipment through flow simulations

Stuart Rowan, Ph.D.
(University of Glasgow, UK)
Professor
Organic chemistry, synthesis, supramolecular chemistry, conducting polymers, interlocked macromolecules (polyyrotaxanes and polycatenanes), peptide nucleic acids, supramolecular polymerization, reversible ‘dynamic’ chemistry and combinatorial libraries

David Schiraldi, Ph.D.
(University of Oregon)
Associate Professor
Monomer and polymer synthesis, structure-property relationships, nanocomposites, polymerization catalysis, combinatorial synthesis and testing of polymers, synthetic fibers, barrier packaging materials

Christoph Weder, Ph.D.
(ETH Zurich, Switzerland)
F. Alex Nason Professor
Design, synthesis, structure-property relationship and application of novel functional polymer systems; advanced optical applications of polymers; anisotropic polymer systems; novel polymers for thin film and fiber applications

Emeriti Faculty
Jack L. Koenig, Ph.D.
(University of Nebraska, Lincoln)
The Donnell Institute Professor Emeritus
Polymer structure-property relationships using infrared, Raman, NMR spectroscopy and spectroscopic imaging techniques

Jerome B. Lando, Ph.D.
(Polytechnic Institute of Brooklyn)
Professor Emeritus
Solid state polymerization; X-ray crystallography of polymers; electrical properties of polymers; ultra-thin polymer films

Morton Litt, Ph.D.
(Polytechnic Institute of Brooklyn)
Professor Emeritus
Kinetics and mechanisms of free radical and ionic polymerization; mechanical properties of polymers; fluorocarbon chemistry; synthesis of novel monomers and polymers; polymer electrical properties; cross-linked liquid crystalline polymers

Charles E. Rogers, Ph.D.
(Syracuse University and State University of New York)
Professor Emeritus
Transport and mechanical properties of polymers; synthesis and properties of multicomponent systems; environmental effect on polymers; adhesion, adhesives, and coatings

Secondary Faculty
James M. Anderson, Ph.D.
(Oregon State University), M.D.
(Case Western Reserve University)
Professor of Macromolecular Science, Pathology, and Biomedical Engineering
Development of polymers for medical and dental applications

Donald Feke, Ph.D.
(Princeton University)
Professor of Chemical Engineering, and Macromolecular Science
Fine-particle processing; colloidal phenomena; dispersive mixing; acoustic separation methods

J. Adin Mann Jr., Ph.D.
(Iowa State University)
Professor of Chemical Engineering
Surface phenomena; interfacial dynamics; light scattering; stochastic processes of adsorption and molecular rearrangement at interfaces

Roger Marchant, Ph.D.
(Case Western Reserve University)
Professor of Biomedical Engineering
Biopolymers; polymer surface coatings; properties and characterization of polymer surfaces on implants and sensors

John Protasiewicz, Ph.D.
(Cornell University)
Professor of Chemistry
Inorganic, Organic, Main Group, Materials, Polymer, Catalysis, Organometallic Chemistry, and X-ray Crystallography

Syed Qutubuddin, Ph.D.
(Carnegie-Mellon University)
Professor of Chemical Engineering
Colloids; polymers and interfacial phenomena; laser light scattering; enhanced oil recovery

Charles Rosenblatt, Ph.D.
(Harvard University)
Professor of Physics
Experimental condensed matter physics; liquid crystal physics

Kenneth Singer, Ph.D.
(University of Pennsylvania)
Professor of Physics
Nonlinear optical properties of polymers; contributions of molecular order to the nonlinear optical response in polymers; optical probes of polymer relaxation; formation of and propagation of light in polymer waveguides

Philip Taylor, Ph.D.
(Cambridge University, England)
Perkins Professor of Physics
Phase transitions and equations of state for crystalline polymers; piezoelectricity and pyroelectricity

Horst von Recum, Ph.D.
(University of Utah, Salt Lake City)
Assistant Professor of Biomedical Engineering
Novel platforms for the delivery of molecules and cells and the use of novel stimuli-responsive polymers for use in gene and drug delivery

Thomas Zawadowski, Ph.D.
(SUNY, Buffalo)
F. Alex Nason Professor of Engineering
Fuel cells, transport and electrochemistry in energy conversion and storage devices, NMR spectroscopy and imaging, transport/structure property relationships in polymer electrolytes, and self-assembly chemistry

Adjunct Faculty
Patrick Mather, Ph.D.
(University of California, Santa Barbara)
Adjunct Professor
Synthesis, processing, and characterization of biomedically relevant polymers, nanocomposites, new functional polymers, mechanisms, and devices based on shape-memory effect, liquid crystalline materials for structural and optical applications, synthesis, processing, and characterization of polymers for PEM fuel cells, and high-performance thermosets

Scott E. Rickert, Ph.D.
(Case Western Reserve University)
Adjunct Professor
Conducting polymers; microdevices; polymer electrodes; polymer adsorption

Angel Romo-Urbe, Ph.D.
(University of Cambridge, UK)
Adjunct Faculty
Physical characterization and fundamental and applied research of soft condensed matter

Alan Riga, Ph.D.
(Case Western Reserve University)
Adjunct Faculty
Extensive industrial and forensic science experience in laboratory testing and characterization of materials, pharmaceuticals, excipients, proteins, metals, alloys, polymers, biopoly-
mbers, elastomers, organic chemicals, monomers, resins, thermosets, and thermoplastics

UNDERGRADUATE PROGRAM

In 1970, the department introduced a program leading to the Bachelor of Science in Engineering degree with a major in polymer science, which is designed to prepare the student both for employment in polymer-based industry and for graduate education in polymer science. The Bachelor of Science program is accredited by the Engineering Accreditation Commission (EAC) of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 – telephone: 410-347-7700.

The Case School of Engineering is proud that this was the first such undergraduate program in the country to receive accreditation from the Engineering Council for Professional Development. The curriculum combines courses dealing with all aspects of polymer science and engineering with basic courses in chemistry, physics, mathematics, and biology, depending on the needs and interests of the student. The student chooses a sequence of technical electives, in consultation with a faculty advisor, allowing a degree of specialization in one particular area of interest, e.g., biomaterials, chemical engineering, biochemistry, or physics. In addition to required formal laboratory courses, students are encouraged to participate in the research activities of the department, both through part-time employment as student laboratory technicians and through the senior project requirement-a one-or two-semester project that involves the planning and performance of a research project.

Polymer science undergraduates are also strongly encouraged to seek summer employment in industrial laboratories during at least one of their three years with the department. In addition to the general undergraduate curriculum in macromolecular science, the department offers three specialized programs which lead to the B.S. with a macromolecular science major. The cooperative program contains all the course work required for full-time resident students plus one or two six-month cooperative sessions in polymer-based industry. The company is selected by the student in consultation with his or her advisor, depending on the available opportunities. The dual-degree program allows students to work simultaneously on two baccalaureate level degrees within the university. It generally takes five years to complete the course requirements for each department for the degree. The B.S./M.S. program leads to the simultaneous completion of requirements for both the master's and bachelor's degrees. Students with a minimum G.P.A. of 3.0 may apply for admission to this program in their junior year.

Mission Statement

To educate students who will excel and lead in the development of polymeric materials and the application of structure-property relationships. The department seeks to prepare students for either professional employment or advanced education, particularly in this or related science or engineering disciplines, but also in professional schools of business, law or medicine. Undergraduate students are offered opportunities for significant research experience, capitalizing on the strength of our graduate program.

Specifically, the undergraduate program provides the following educational objectives:

Program Educational Objectives

Our program will produce graduates who:

1. Are competent, creative, and highly valued professionals in industry, academia, or government.
2. Are flexible and adaptable in the workplace, possess the capacity to embrace new opportunities of emerging technologies, and embrace leadership and teamwork opportunities, all affording sustainable engineering careers.
3. Continue their professional development by obtaining advanced degrees in Polymer Science and Engineering or other professional fields, as well as medicine, law, management, finance or public policy.
4. Act with global, ethical, societal, ecological, and commercial awareness expected of practicing engineering professionals.

Program Outcomes

Graduates receiving the Bachelor of Science degree in Engineering (major field: Polymer Science and Engineering) at Case Western Reserve University are expected to have attained:

(a) an ability to apply knowledge of mathematics, science, and engineering;
(b) an ability to design and conduct experiments, as well as to analyze and interpret data;
(c) an ability to design a system, component, or process to meet desired needs;
(d) an ability to function in multi-disciplinary teams;
(e) an ability to identify, formulate, and solve engineering problems;
(f) an understanding of professional and ethical responsibility;
(g) an ability to communicate effectively;
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context;
(i) a recognition of the need for, and an ability to engage in life-long learning;
(j) a knowledge of contemporary issues; and
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

GRADUATE PROGRAM

Courses leading to the Master of Science and Doctor of Philosophy degrees in macromolecular science are offered within the Case School of Engineering. They are designed to increase the student's knowledge of macromolecular science and of his own basic area of scientific interest, with application to specific polymer research problems. Research programs derive particular benefit from close cooperation with graduate programs in chemistry, physics, materials science, chemical engineering, biological sciences, and other engineering areas. The interdisciplinary academic structure allows the faculty to fit the individual program to the student's background and career plans. Basic and advanced courses are offered in polymer synthesis, physical chemistry, physics, biopolymers, and applied polymer science and engineering. A laboratory course in polymer characterization instructs students in the use of modern experimental techniques and equipment. Graduate students are also encouraged to take advanced course work in polymer solid state physics, physical chemistry, synthesis, rheology, and polymer processing. The department also offers, in conjunction with the School of Medicine, a six- to seven-year M.D./Ph.D. program for students interested in the application of polymers and plastics to medicine, as well as for students interested in a molecular structural basis of medicine, particularly related to connective tissues, biomechanics, aging, pharmaceuticals, and blood behavior. Initiated in 1977, it is the only program of its kind in the nation.

FACILITIES

The Kent Hale Smith Science and Engineering Building houses the Department of Macromolecular Science. The building was built in 1993, and specifically designed to meet the specific needs of polymer research. The facil-
ity consists of five floors, plus a basement. The laboratories for chemical synthesis are located principally on the top floor, the molecular and materials characterization laboratories on the middle floors, and the major engineering equipment on the ground floor, while the NMR instrumentation is located in the basement. Electronic classrooms are installed on the ground floor. Instrumentation available includes Small and Wide-Angle X-ray diffractometers; scanning electron microscopy; a complete range of molecular spectroscopic equipment including FTIR, laser Raman, and high resolution solution and solid-state NMR (including imaging), as well as Raman and FTIR microscopes; and dynamic light scattering equipment. There are also facilities for polymer characterization (molecular weight distribution), optical microscopy, solution and bulk rheology, scanning calorimetry, and for testing and evaluating the mechanical properties of materials. The C. Richard Newpher polymer processing laboratory includes a high temperature Rheometrics RMS-800 dynamic mechanical spectrometer, a Bomem DA-3 FTIR with FT-Raman capabilities, a compression molding machine, a Brabender plasticorder, a high speed Instron testing machine, and a vibrating sample magnetometer. The Charles E. Reed ’34 Laboratory is concerned with the mechanical analysis of polymeric materials. The major testing is done by Instron Universal testing instruments including an Instron model 1123 with numerous accessories such as an environmental chamber for high or low temperature experiments. There is also a Bruckner KARO IV biaxial stretching unit, which allows controlled biaxial stretching of polymer films. The laboratory also has an Atomic Force Microscope which probes the morphological and mechanical properties of materials at the nanoscale. The EPIC Molecular Modeling Center contains high-end and low-end Silicon Graphics Computers and various software packages for molecular modeling of polymers.

RESEARCH

The research activities of the department span the entire scope of macromolecular science and polymer technology.

Synthesis

New types of macromolecules are being made in the department’s synthesis laboratories. The emphasis is on creating polymers with novel functional properties such as photocconductivity, selective permeation, and biocompatibility.

Physical Characterization

This is the broad area of polymer analysis, which seeks to relate the structure of the polymer at the molecular level to the bulk properties that determine its actual or potential applications. This includes characterization of polymers by infrared, Raman, and NMR spectroscopy, thermal and rheological analysis, determination of structure and morphology by x-ray diffraction, electron microscopy, and atomic force microscopy, and investigation of molecular weights and conformations by light scattering.

Mechanical Behavior and Analysis

Polymeric materials are known for their unusual mechanical capabilities, usually exploited as components of structural systems. Analysis includes the study of viscoelastic behavior, yielding and fracture phenomena and a variety of novel irreversible deformation processes.

Processing

A major concern of industry is the efficient and large scale production of polymer materials for commercial applications. Research in this area is focusing on reactive processing, multi-layer processing and polymer mixing, i.e., compounding and blends.

Materials Development and Design

Often, newly conceived products require the development of polymeric materials with certain specific properties or design characteristics. Materials can be tailor-made by designing synthesis and processing conditions to yield the best performance under specified conditions. Examples might be the design of photoluminescent and semi-conducting polymers for use in optoelectronic devices, polymers that are stable at high temperatures for fire-retardant construction materials, high temperature polymer electrolytes for use in advanced fuel cells, low density thermal insulating polymer composite materials and biocompatible polymers for use in prosthetic implants and drug-delivery vehicles.

Biopolymers

Living systems are composed primarily of macromolecules, and research is in progress on several projects of medical relevance. The department has a long-standing interest in the hierarchical structure and properties of the components of connective tissues (e.g., skin, cartilage, and bone). The department is also engaged in the development of new biocompatible polymers for application as biomaterials.

MACROMOLECULAR SCIENCE AND ENGINEERING (EMAC)

Course Descriptions

EMAC C100. Co-op Seminar I for Macromolecular Science and Engineering (1)

Professional development activities for students returning from cooperative education assignments. Recommended preparation: COOP 001.

EMAC C200. Co-op Seminar II for Macromolecular Science and Engineering (2)

Professional development activities for students returning from cooperative education assignments. Recommended preparation: COOP 002 and EMAC C100.

EMAC 125. Freshman Research on Polymers (1)

Freshman research in polymer chemistry, engineering, and physics. Students will be placed in active research groups and will participate in real research projects under the supervision of graduate students and faculty mentors.

EMAC 270. Introduction to Polymer Science and Engineering (3)


EMAC 276. Polymer Properties and Design (3)

The course reviews chemical and physical structures of a wide range of applications for synthetic and natural polymers, and addresses “Which polymer do we choose for a specific application and why?” We examine the polymer properties, the way that these depend on the chemical and physical structures, and reviews how they are processed. We aim to understand the advantages and disadvantages of the different chemical options and why the actual polymers that are used commercially are the best available in terms of properties, processibility and cost. The course is taught in seminar format. The requirements include two written assignments and one oral presentation. Recommended preparation: ENGR 145. SAGES Dept Seminar

EMAC 303. Structure of Biological Materials (3)
Structure of proteins, nucleic acids, connective tissue and bone from molecular to microscopic levels. Principles and applications of instruments for imaging, identification, and measurement of biological materials. Recommended preparation: EBME 202. Offered as EBME 303 and EMAC 303.

EMAC 325. Undergraduate Research in Polymer Science (1-3)
Undergraduate laboratory research in polymer chemistry/physics/engineering. Students will undertake an independent research project, working under the mentoring of both a graduate student and a faculty member. A mid-term written progress report is required. A written report and oral presentation will be made at the end of the semester. Can be taken for 1-3 credits per semester, up to a total of 6 credit hours. Students are expected to spend approximately 5 hours/week in the laboratory per credit registered each semester. Recommended preparation: Sophomore/Junior standing and consent of instructor.

EMAC 351. Physical Chemistry for Engineering (3)
Principles of physical chemistry and their application to systems involving physical and chemical transformations. The nature of physical chemistry, properties of gases, overview of the laws of thermodynamics, thermochimistry, solutions, phases and chemical equilibria, kinetics of chemical reaction, solutions of electrolytes and introduction to quantum mechanics, atomic structure and molecular statistics. Recommended preparation: ENGR 225, PHYS 122.

EMAC 355. Polymer Analysis Laboratory (3)
Experimental techniques in polymer synthesis and characterization. Synthesis by a variety of polymerization mechanisms. Quantitative investigation of polymer structure by spectroscopy, diffraction and microscopy. Molecular weight determination. Physical properties. Recommended preparation: EMAC 270 or MATH 224 or MATH 234.

EMAC 370. Polymer Chemistry and Industry (3)
The nature of polymer chemistry ranging from the fundamentals of organic chemistry of polymer synthesis to the industrial chemistry of polymer production. Physical chemistry as it pertains to the characterization of polymers will also be discussed. Recommended preparation: EMAC 270, CHEM 223, CHEM 224.

EMAC 372. Polymer Processing and Testing Laboratory (3)
Basic techniques for the rheological characterization of thermoplastic and thermostet resins; “hands-on” experience with the equipment used in polymer processing methods such as extrusion, injection molding, compression molding; techniques for mechanical characterization and basic principles of statistical quality control. Recommended preparation: EMAC 377.

EMAC 375. Introduction to Rheology (3)
This course will involve study of rheology from several perspectives; rheological property measurements, phenomenological and molecular models, and applicability to polymer processing. Students will be introduced to experimental methods of rheology with quantitative descriptions of associated flows and data analyses. Application of models, both phenomenological and molecular, to prediction of rheological behavior and extraction of model parameters from real data sets will be examined. The relevance of rheological behavior of different systems to practical processing schemes will be discussed, particularly with respect to plastics manufacturing. Recommended preparation: ENGR 225. Offered as EMAC 375 and EMAC 475.

EMAC 376. Polymer Engineering (3)
Mechanical properties of polymer materials as related to polymer structure and composition. Visco-elastic behavior, yielding and fracture behavior including irreversible deformation processes. Recommended preparation: EMAC 276 and ENGR 200. Offered as EMAC 376 and EMAC 476.

EMAC 377. Polymer Processing (3)
Application of the principles of fluid mechanics, heat transfer and mass transfer to problems in polymer processing; elementary steps in polymer processing (handling of particulate solids, melting, pressurization and pumping, mixing); principles and procedures for extrusion, injection molding, reaction injection molding, secondary shaping. Recommended preparation: ENGR 225.

EMAC 378. Polymer Engineer Design Product (3)
Uses material taught in previous and concurrent courses in an integrated fashion to solve polymer product design problems. Practicality, external requirements, economics, thermal/mechanical properties, processing and fabrication issues, decision making with uncertainty, and proposal and report preparation are all stressed. Several small exercises and one comprehensive process design project will be carried out by class members. Offered as EMAC 378 and EMAC 478. SAGES Senior Cap

EMAC 396. Special Topics (1-18)
(Credit as arranged.)

EMAC 397. Special Topics (1-18)
(Credit as arranged.)

EMAC 398. Polymer Science and Engineering Project I (1-9)
(Senior project.) Research under the guidance of faculty. Requirements include periodic reporting of progress, plus a final oral presentation and written report. Repeatable up to 3 credit hours. When taken for 3 credits it may be spread over two successive semesters. Recommended preparation: Senior standing, SAGES Senior Cap

EMAC 399. Polymer Science and Engineering Project II (1-9)
(Senior project.) Research under the guidance of staff, culminating in thesis. Recommended preparation: Majors only and senior standing.

EMAC 400T. Graduate Teaching I (0)
This course will engage the Ph.D. students in teaching experiences that will include non-contact (such as preparation and grading of homework and tests) and direct contact (leading recitations and monitoring laboratory works, lectures and office hours) activities. The teaching experience will be conducted under the supervision of the faculty. All Ph.D. students will be expected to perform direct contact teaching during the course sequence. The proposed teaching experiences for EMAC Ph.D. students are outlined below in association with undergraduate classes. The individual assignments will depend on the specialization of the students. The activities include grading, recitation, lab supervision and guest lecturing. Recommended preparation: Ph.D. student in Macromolecular Science.

EMAC 401. Polymer Foundation Course I: Organic Chemistry (3)
The class is an introduction to the synthesis and organic chemistry of macromolecules. The course introduces the most important polymerization reactions, focusing on their reaction mechanisms and kinetic aspects. Topics include free radical and ionic chain polymerization, condensation (step-growth) polymerization, ring-opening, insertion and controlled addition polymerization. The lecture portion of this course (2 credit hours) is integrated with a laboratory or term paper component (1 credit hour). There is no limit on the number of students for the class as a whole. However, there is a limit of 12 students
on the laboratory component (other students will do term papers).

EMAC 402. Polymer Foundation Course II: Physical Chemistry (3)
This class is an introduction to the physical chemistry of polymers in solution. Topics include: polymer statistics (microstructure, chain conformation, and chain dimensions), thermodynamics and transport properties of polymers in solution, methods for molecular weight determination, physical chemistry of water-soluble polymers, and characterization of polymer microstructure (IR and NMR). The lecture portion of this course (2 credit hours) is integrated with a laboratory or term paper component (1 credit hour). There is no limit on the number of students for the class as a whole. However, there is a limit of 12 students on the laboratory component (other students will do term papers).

EMAC 403. Polymer Foundation Course III: Physics (3)
This class is an introduction to the physics of polymers in the bulk amorphous and crystalline states. Topics include: structural and morphological analysis using X-ray diffraction, electron microscopy and atomic force microscopy, characterization of thermal transitions, viscoelastic behavior and rubber elasticity, and dynamic mechanical analysis. The lecture portion of this course (2 credit hours) is integrated with a laboratory or term paper component (1 credit hour). There is no limit on the number of students for the class as a whole. However, there is a limit of 12 students on the laboratory component (other students will do term papers).

EMAC 404. Polymer Foundation Course IV: Engineering (3)
This class is an introduction to the engineering and technology of polymeric materials. Topics include: additives, blends and composites, natural polymers and fibers, thermoplastics, elastomers, and thermostets, polymer degradation and stability, polymers in the environment, polymer rheology and polymer processing, and polymers for advanced technologies (membrane science, biomedical engineering, applications in electronics, photonic polymers). The lecture portion of this course (2 credit hours) is integrated with a laboratory or term paper component (1 credit hour). There is no limit on the number of students for the class as a whole. However, there is a limit of 12 students on the laboratory component (other students will do term papers).

EMAC 410. Polymers Plus Self-Assembly and Nanomaterials (2)
The course focuses on the concepts of supramolecular chemistry and self-assembly specifically as it applies to nano-polymeric systems. After dealing with many of the fundamental aspects of supramolecular chemistry the focus of the class deals with how to access/utilize nano-scale features using such processes, namely the ‘bottom-up’ approach to nanomaterials/systems. Areas which will be addressed include block copolymers, DNA assemblies, nanotubes and dendrimers. Prereq: EMAC 401 or EMAC 370.

EMAC 412. Polymers Plus Inorganic/Coordination Chemistry (2)
The course focuses on the concepts of inorganic and coordination chemistry specifically as they apply to polymeric systems. The fundamental aspects of coordination chemistry, including coordinative saturation, kinetics and mechanism will be presented and used as a vehicle to describe coordination polymerizations and supramolecular coordination phenomena. The chemistry and physics of nanoscale inorganic modification of polymers by clays, silsesquioxanes, metal oxides and metal particles will also be discussed. Prereq: EMAC 401 or EMAC 370 or EMAC 470.

EMAC 420. Polymers Plus Advanced Physical Chemistry (2)
The course focuses on the principles of physical chemistry that are most relevant to macromolecular science. Prereq: EMAC 402, EMAC 403.

EMAC 421. Polymer Plus Hierarchical Structures and Properties (2)
Discuss the hierarchical solid state structure of synthetic and naturally occurring polymeric systems and relate these structures to their properties. Particular emphasis will be on natural systems containing collagen(s) and carbohydrate(s), and on synthetic crystalline, liquid crystalline, and reinforced composite polymeric materials. In order to prepare students for application of these concepts we will determine how mechanical, transport and optical (photonic) behavior can be controlled by structure manipulation. Prereq: EMAC 403 and EMAC 404 or EMAC 474 or EMAC 476.

EMAC 422. Polymers Plus X-ray and Microscopy (2)
This course focuses on the theory and application of X-ray and microscopy techniques to the analysis of the microstructure of polymeric materials. The X-ray section covers theoretical and experimental aspects for semicrystalline and amorphous polymers and includes small-angle scattering and neutron & electron diffraction. Techniques, such as atomic force microscopy, transmission and scanning electron microscopy, and optical microscopy, will also be discussed. Practical aspects of these techniques will be applied to a variety of systems, including block copolymers, nanocomposites, LC polymers, and multi-layered films. Prereq: EMAC 403 or EMAC 474.

EMAC 423. Polymers Plus Adhesives, Sealants and Coatings (2)

EMAC 444. Polymers Plus Optoelectronics (2)
The course focuses on the design, synthesis and structure-property relationship of polymers with unusual optic and electronic properties and the application of these advanced materials in emerging technologies. Topics include (1) introduction to the interaction of polymers with electromagnetic radiation, (2) Conjugated Polymers: Chemistry & Physics, (3) Intrinsically Conducting Polymers, (4) Ionically Conducting Polymers, (5) Light Emitting Polymers, (6) Polymer Field Effect Transistors and other Semiconductor Devices, (7) Optoelectronic Polymers in Sensors, (8) Nonlinear Optical Polymers, and (9) Latest Developments. Prereq: EMAC 401 or EMAC 370.

EMAC 450. The Business of Polymers (2)
This course will link polymer technology to business and management issues that need to be considered for successful technology commercialization. Topics include project management, finance, opportunity assessment, the voice of the customer, and protection of intellectual property. Case studies from both large and small companies will be used to illustrate key concepts. Recommended preparation: EMAC 270, EMAC 276.

EMAC 451. Polymer Product Design (2)
This course introduces the fundamentals of successful product design and development with specific attention to products based on polymeric materials. Topics covered include the voice of the customer, idea generation and screening, concept selection, prototyping, manufacturing, marketing, and launch. The importance of good design beyond simple
form and function will be stressed. Each student will complete a product design portfolio that considers all of these issues. Recommended preparation: EMAC 270, EMAC 276, EMAC 450.

**EMAC 471. Polymers in Medicine (3)**
This course covers the important fundamentals and applications of polymers in medicine, and consists of three major components: (i) the blood and soft-tissue reactions to polymer implants; (ii) the structure, characterization and modification of biomedical polymers; and (iii) the application of polymers in a broad range of cardiovascular and extravascular devices. The chemical and physical characteristics of biomedical polymers and the properties required to meet the needs of the intended biological function will be presented. Clinical evaluation, including recent advances and current problems associated with different polymer implants. Recommended preparation: EMAC 306 or equivalent. Offered as EBME 406 or EMAC 471.

**EMAC 475. Introduction to Rheology (3)**
This course will involve study of rheology from several perspectives: rheological property measurements, phenomenological and molecular models, and applicability to polymer processing. Students will be introduced to experimental methods of rheology with quantitative descriptions of associated flows and data analyses. Application of models, both phenomenological and molecular, to prediction of rheological behavior and extraction of model parameters from real data sets will be examined. The relevance of rheological behavior of different systems to practical processing schemes will be discussed, particularly with respect to plastics manufacturing. Recommended preparation: ENGR 225. Offered as EMAC 375 and EMAC 475.

**EMAC 477. Elementary Steps in Polymer Processing (2)**
This course is an application of principles of fluid mechanics and heat transfer to problems in polymer processing. In the first part of the course, basic principles of transport phenomena will be reviewed. In the second part, the elementary steps in polymer processing will be described and analyzed with application to a single screw extruder.

**EMAC 478. Polymer Engineer Design Product (3)**
Uses material taught in previous and concurrent courses in an integrated fashion to solve polymer product design problems. Practicality, external requirements, economics, thermal/mechanical properties, processing and fabrication issues, decision making with uncertainty, and proposal and report preparation are all stressed. Several small exercises and one comprehensive process design project will be carried out by class members. Offered as EMAC 378 and EMAC 478.

**EMAC 490. Polymers Plus Professional Development (1)**
This course focuses on graduate student professional development. The course involves weekly meetings and oral presentations with attention on the content and style of the presentation materials (PowerPoint, posters, etc.), oral presentation style and project management skills. This course can be taken for the total of 3 credits over three different semesters.

**EMAC 491. Polymers Plus Literature Review (1)**
This course involves weekly presentations of the current polymer literature. It involves at least one presentation by the enrolled student and participation in all literature reviews (at least 10/semester). The course will focus on presentation skills (both oral and written), scientific interpretation, and development of peer-review skills. This course can be taken for a total of 3 credits over three different semesters.

**EMAC 500T. Graduate Teaching II (0)**
This course will engage the Ph.D. students in teaching experiences that will include non-contact (such as preparation and grading of homework and tests) and direct contact (leading recitations and monitoring laboratory works, lectures and office hours) activities. The teaching experience will be conducted under the supervision of the faculty. All Ph.D. students will be expected to perform direct contact teaching during the course sequence. The proposed teaching experiences for EMAC Ph.D. students are outlined below in association with graduate classes. The individual assignments will depend on the specialization of the students. The activities include grading, recitation, lab supervision and guest lecturing. Recommended preparation: Ph.D. student in Macromolecular Science.

**EMAC 600T. Graduate Teaching III (0)**
This course will engage the Ph.D. students in teaching experiences that will include non-contact and direct contact activities. The teaching experience will be conducted under the supervision of the faculty. The proposed teaching experiences for EMAC Ph.D. student in this course involve instruction in the operation of major instrumentation and equipment used in the daily research activities. The individual assignments will depend on the specialization of the students. Recommended preparation: Ph.D. student in Macromolecular Science.

**EMAC 601. Independent Study (1 - 18)**
(Credit as arranged.)

**EMAC 651. Thesis M.S. (1 - 18)**
(Credit as arranged.)

**EMAC 673. Selected Topics in Polymer Engineering (2 - 3)**
Timely issues in polymer engineering are presented at the advanced graduate level. Content varies, but may include: mechanisms of irreversible deformation: failure, fatigue and fracture of polymers and their composites; processing structure-property relationships; and hierarchical design of polymeric systems. Recommended preparation: EMAC 376 or EMAC 476.

**EMAC 677. Colloquium in Macromolecular Science and Engineering (0 - 1)**
Lectures by invited speakers on subjects of current interest in polymer science and engineering. This course can be taken for 3 credits over three different semesters.

**EMAC 690. Special Topics in Macromolecular Science (1 - 18)**

**EMAC 701. Dissertation Ph.D. (1 - 18)**
(Credit as arranged.) Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

**BACHELOR OF SCIENCE IN ENGINEERING DEGREE**

**Major in Polymer Science and Engineering (standard track)**

**First Year Class-Lab-Credit Hours**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>PHED 101 Physical Education Activities (0-3-0)</td>
<td>PHED 102 Physical Education Activities (0-3-0)</td>
</tr>
<tr>
<td>ENGR 145 Chemistry of Materials (4-0-4)</td>
<td>ENGR 140 Chemistry of Materials (4-0-4)</td>
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<tr>
<td>CHEM 111 Principles of Chemistry for Engineers (4-0-4)</td>
<td>CHEM 111 Principles of Chemistry for Engineers (4-0-4)</td>
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<tr>
<td>MATH 121 Calculus for Science and Engineering (4-0-4)</td>
<td>MATH 121 Calculus for Science and Engineering (4-0-4)</td>
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<tr>
<td>FSCC 100 Sages First Seminar (4-0-4)</td>
<td>SAGES University Seminar I (3-0-3)</td>
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<tr>
<td>EMAC 125 Freshman Research on Polymers (1-0-1)</td>
<td>EMAC 125 Freshman Research on Polymers (1-0-1)</td>
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<tr>
<td>PHED 102 Physical Education Activities (0-3-0)</td>
<td>PHED 102 Physical Education Activities (0-3-0)</td>
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<td>Total (17-5-18)</td>
<td>Total (17-5-18)</td>
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**Second Year Class-Lab-Credit Hours**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>EMAC 270 Freshman Research on Polymers (1-0-1)</td>
<td>EMAC 276 Freshman Research on Polymers (1-0-1)</td>
</tr>
<tr>
<td>ENGR 225 Introduction to Engineering Thermodynamics (4-0-4)</td>
<td>ENGR 225 Introduction to Engineering Thermodynamics (4-0-4)</td>
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<tr>
<td>MATH 122 Calculus for Science and Engineering II (4-0-4)</td>
<td>MATH 122 Calculus for Science and Engineering II (4-0-4)</td>
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<tr>
<td>MATH 123 Calculus for Science and Engineering III (4-0-4)</td>
<td>MATH 123 Calculus for Science and Engineering III (4-0-4)</td>
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<tr>
<td>EMAC 275 Introduction to Polymer Science (4-0-4)</td>
<td>EMAC 275 Introduction to Polymer Science (4-0-4)</td>
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<tr>
<td>EMAC 376 Introduction to Rheology (4-0-4)</td>
<td>EMAC 376 Introduction to Rheology (4-0-4)</td>
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<td>Total (17-5-18)</td>
<td>Total (17-5-18)</td>
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**Third Year Class-Lab-Credit Hours**

<table>
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<tr>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>EMAC 375 Introduction to Polymer Science (4-0-4)</td>
<td>EMAC 375 Introduction to Polymer Science (4-0-4)</td>
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<tr>
<td>EMAC 376 Introduction to Rheology (4-0-4)</td>
<td>EMAC 376 Introduction to Rheology (4-0-4)</td>
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<tr>
<td>EMAC 475 Introduction to Rheology (4-0-4)</td>
<td>EMAC 475 Introduction to Rheology (4-0-4)</td>
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<tr>
<td>BIOL 350 Macromolecular Biology (4-0-4)</td>
<td>BIOL 350 Macromolecular Biology (4-0-4)</td>
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<td>Total (17-5-18)</td>
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**Fourth Year Class-Lab-Credit Hours**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>EMAC 477 Elementary Steps in Polymer Processing (2-0-2)</td>
<td>EMAC 477 Elementary Steps in Polymer Processing (2-0-2)</td>
</tr>
<tr>
<td>EMAC 478 Polymer Engineer Design Product (3-0-3)</td>
<td>EMAC 478 Polymer Engineer Design Product (3-0-3)</td>
</tr>
<tr>
<td>EMAC 479 Polymers Plus Professional Development (1)</td>
<td>EMAC 479 Polymers Plus Professional Development (1)</td>
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<tr>
<td>EMAC 490 Polymers Plus Professional Development (1-0-1)</td>
<td>EMAC 490 Polymers Plus Professional Development (1-0-1)</td>
</tr>
<tr>
<td>EMAC 500T Graduate Teaching II (0)</td>
<td>EMAC 500T Graduate Teaching II (0)</td>
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<tr>
<td>EMAC 501T Graduate Teaching III (0)</td>
<td>EMAC 501T Graduate Teaching III (0)</td>
</tr>
<tr>
<td>Total (17-5-18)</td>
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</tbody>
</table>

**Electives**

- Additional courses as needed to meet major and general education requirements.
- A minimum of 18 credits in upper-level electives in Polymer Science and Engineering.
- A total of 120 credits to complete the degree.

**Other Requirements**

- Completion of a senior design project.
- Completion of a capstone course in Polymer Science and Engineering.
- A minimum of 48 credits in the major.
- A minimum of 30 credits in the College of Engineering.
- A minimum of 40 credits in the College of Arts and Sciences.
- A minimum of 120 credits to complete the degree.

**Honors Program**

- Admittance to the Honors Program is by permission of the Chair, Department of Polymer Science and Engineering.
- A minimum of 12 credits in upper-level courses in Polymer Science and Engineering, with a grade of B or better.
- A minimum of 3.5 GPA in Polymer Science and Engineering courses.
- A minimum of 3.5 GPA in all courses.
- A total of 120 credits to complete the degree.

**Minor in Polymer Science and Engineering**

- A minimum of 18 credits in upper-level courses in Polymer Science and Engineering, with a grade of B or better.
- A minimum of 90 credits in the major.
- A minimum of 120 credits to complete the degree.

**Internship Program**

- A minimum of 3 credits in upper-level courses in Polymer Science and Engineering, with a grade of B or better.
- A minimum of 120 credits to complete the degree.

**Study Abroad Program**

- A minimum of 18 credits in upper-level courses in Polymer Science and Engineering, with a grade of B or better.
- A minimum of 120 credits to complete the degree.
**CASE SCHOOL OF ENGINEERING**

Total (16-3-16)

**Second Year**

**Fall**
- SAGES University Seminar II 0 (3-0-3)
- CHEM 223 Organic Chemistry I (3-0-3)
- EMAC 270 Introduction to Polymer Science and Engineering 0 (3-0-3)
- MATH 223 Calculus for Science and Engineering III 0 (3-0-3)
- PHYS 122 General Physics II 0 (4-0-4)
Total (16-0-16)

**Spring**
- Humanities or Social Science (3-0-3)
- CHEM 224 Organic Chemistry II (3-0-3)
- EMAC 276 Polymer Properties and Design (SAGES Departmental Seminar) (3-0-3)
- MATH 224 Elementary Differential Equations (3-0-3)
  or MATH 234 Introduction to Dynamic Systems 0 (3-0-3)
- ENGR 225 Thermodynamics, Fluid Mechanics, and Heat and Mass Transfer (4-0-4)
Total (16-0-16)

**Third Year Class-Lab-Credit Hours**

**Fall**
- Humanities or Social Sciences (3-0-3)
- Natural Science elective 0 (3-0-3)
- CHEM 290 Chemistry Laboratory Methods for Engineers (1-5-3)
  or CHEM 321 (1-5-3)
- EMAC 351 Physical Chemistry for Engineers I (3-0-3)
- ENGR 200 Statics and Strength of Materials 0 (3-0-3)
  or EMAC 372 Polymer Processing (3-0-3)
- EMAC 377 Polymer Processing (3-0-3)
- Total (15-5-17)

**Spring**
- Humanities or Social Sciences (3-0-3)
- EMAC 355 Polymer Analysis Laboratory (2-4-3)
- EMAC 376 Polymer Engineering (3-0-3)
- ENGL 398N Professional Communication (3-0-3)
- Technical elective II 0 (3-0-3)
Total (14-4-15)

**Fourth Year**

**Fall**
- ENGR 210 Introduction to Circuits & Instrumentation 0 (4-0-4)
- EMAC 370 Polymer Chemistry and Industry (3-0-3)
- EMAC 377 Polymer Processing (3-0-3)
  or EMAC 372 Polymer Processing Laboratory 0 (3-0-3)
- Total (16-0-16)

**Spring**
- EMAC 378 Polymer Production and Technology (3-0-3)
- EMAC 398 Polymer Science & Engineering Project (SAGES Capstone Course) 0 (3-0-3)
- ENGL 398N Professional Communication 0 (3-0-3)
- Technical elective III 0 (3-0-3)
Total (15-0-15)

**BACHELOR OF SCIENCE IN ENGINEERING DEGREE**

**Major in Polymer Science and Engineering (biomaterials track)**

**First Year**

**Fall**
- Humanities or Social Sciences 0 (3-0-3)
- CHEM 111 Principles of Chemistry for Engineers 0 (4-0-4)
- ENGR 131 Elementary Computer Programming 0 (2-2-3)
- FSCC 100 Sages First Seminar 0 (3-0-3)
- Total (15-3-15)

**Spring**
- SAGES University Seminar I 0 (3-0-3)
- ENGR 145 Chemistry of Materials 0 (4-0-4)
- MATH 121 Calculus for Science and Engineering II 0 (4-0-4)
- EMAC 276 Polymer Properties and Design (SAGES Departmental Seminar) 0 (3-0-3)
- Technical elective III 0 (3-0-3)
Total (13-9-16)

**Second Year**

**Fall**
- SAGES University Seminar II 0 (3-0-3)
- EBMIE 201 Physiology - Biophysics I (3-0-3)
- EMAC 270 Introduction to Polymer Science and Engineering II 0 (3-0-3)
- MATH 223 Calculus for Science and Engineering III 0 (3-0-3)
- PHYS 122 General Physics II 0 (4-0-4)
Total (16-0-16)

**Spring**
- Humanities or Social Sciences II 0 (3-0-3)
- EBMIE 202 Physiology - Biophysics II 0 (3-0-3)
- EMAC 276 Polymer Properties and Design (SAGES Departmental Seminar) 0 (3-0-3)
- MATH 224 Elementary Differential Equations (3-0-3)

**Hours required for graduation: 129**

a. Engineering Core Courses.

b. Choice of USNA, USSO, or USSY course focused on thinking about the natural, social, or symbolic “world.”

c. Approved Natural Science electives: PHYS 221 or 223, General Physics III; BIOL 210, Molecular Cell Biology; BIOL 205, Chemical Biology; STAT 312, Basic Statistics for Eng. & Soc.; PHYS 349, Methods of Mathematical Physics; BIOC 307, General Biochemistry.

d. EMAC 325 may be taken as a technical elective.

e. Technical sequence must be approved by department advisor.

f. Preparation for the polymer science project should commence in the previous semester.

**Third Year Class-Lab-Credit Hours**

**Fall**
- Humanities or Social Sciences 0 (3-0-3)
- CHEM 223 Organic Chemistry I 0 (3-0-3)
- CHEM 290 Chemistry Laboratory Methods for Engineers (1-5-3)
  or CHEM 321 (1-5-3)
- EMAC 351 Physical Chemistry for Engineers I (3-0-3)
- ENGR 200 Statics and Strength of Materials 0 (3-0-3)
- Total (16-5-18)

**Spring**
- Natural Science elective 0 (3-0-3)
- CHEM 224 Organic Chemistry II 0 (3-0-3)
- EMAC 376 Polymer Engineering (3-0-3)
- EMAC 303 Structure of Biological Materials (3-0-3)
- EMAC 351 Physical Chemistry for Engineers II (3-0-3)
- Total (15-0-15)

**Fourth Year**

**Fall**
- Humanities or Social Sciences 0 (3-0-3)
- EMAC 370 Introduction to Circuits & Instrumentation 0 (4-0-4)
- EMAC 377 Polymer Processing (3-0-3)
  or EMAC 372 Polymer Processing Laboratory 0 (3-0-3)
- Total (16-0-16)

**Spring**
- EMAC 378 Polymer Production and Technology (3-0-3)
- EMAC 398 Polymer Science & Engineering Project (SAGES Capstone Course) 0 (3-0-3)
- ENGL 398N Professional Communication 0 (3-0-3)
- Technical elective III 0 (3-0-3)
Total (15-0-15)

**Hours required for graduation: 129**

a. Engineering Core Courses.

b. Choice of USNA, USSO, or USSY course focused on thinking about the natural, social, or symbolic “world.”

c. Approved Natural Science electives: BIOL 214, Genes and Evolution (d); BIOL 215, Cells and Proteins (d); BIOC 307, General Biochemistry (d); BIOL 362, Developmental Biology.

d. Suggested for pre-med students.

e. Students are required to take either EMAC 355 or EMAC 372.
The three technical electives have to be taken from: EBME 315, Applied Tissue Engineering; EBME 316, Introduction to Drug Delivery; EBME 325, Introduction to Tissue Engineering; EBME 350, Quantitative Molecular Bioengineering; EBME 405, Materials for Prosthetics and Orthotics; EBME 408, Tissue and Cell Engineering; EBME 426, Gene and Drug Delivery; EMAC 471 / EBME 406, Polymers in Medicine; a three-credit research sequence of EMAC 125 and/or EMAC 325.

Preparation for the polymer science project should commence in the previous semester.

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James D. McGuffin-Cawley, Chair
e-mail: cawley@case.edu
http://dmseg5.case.edu

Materials science and engineering is a discipline that extends from the basic science of materials structure and properties to the design and evaluation of materials in engineering systems. Most engineers—mechanical, civil, chemical, and electrical—work with materials on the job, and many become well acquainted with the properties of the materials they use most often. The role of a materials engineer is to understand why materials behave as they do under various conditions; to recognize the limits of performance that particular materials can attain; and to know what can be done during the manufacture of materials to meet the demands of a given application.

The Department of Materials Science and Engineering of the Case School of Engineering offers programs leading to the Bachelor of Science in Engineering, Master of Science, and Doctor of Philosophy degrees. The department conducts academic and research activities with metals, ceramics, composites, and electronic materials. Increasingly, the demands for new materials, and for improved materials in existing applications, transcend the traditional categories. The technological challenges that materials engineers face will continue to demand a breadth of knowledge across the spectrum of engineering materials.

While an engineering discipline, the field brings basic science tools to bear on the technological challenges related to materials products and their manufacture. Materials science draws on chemistry in its concern for bonding, synthesis, and composition of engineering materials and their chemical interactions with the environment. Physics provides a basis for understanding the mechanical, thermal, and electrical properties of materials, as well as the tools needed to ascertain the structure and properties of materials. Mathematics is used throughout materials manufacture and analysis.

FACULTY
James D. McGuffin-Cawley, Ph.D., Chair
(Case Western Reserve University)
Arthur S. Holden Professor of Engineering

Great Lakes Professor of Ceramic Processing

Powder processing of ceramics; aggregation phenomena; oxidation, diffusion, and solid state reactions; silicate and active metal brazing of ceramics; joining of materials; ceramic matrix composites

William A. "Bud" Baeslack III, Ph.D.
(Rensselaer Polytechnic Institute)
Provost & Executive Vice President

Welding, joining of materials, and titanium & aluminum metallurgy

Mark R. DeGuire, Ph.D.
(Massachusetts Institute of Technology)

Associate Professor

Low-temperature synthesis of ceramic thin films. Synthesis and properties of electrical ceramics in bulk and thin-film form, including dielectrics, fuel cell materials, semiconductors, and ferrites. High-temperature phase equilibria. Defect chemistry

Frank Ernst, Ph.D.
(University of Göttingen)

Leonard Case Jr. Professor of Engineering

Microstructure and microcharacterization of materials; defects in crystalline materials; interface and stress-related phenomena; semiconductor heterostructures, plated metallization layers; photovoltaic materials; surface hardening of alloys, quantitative methods of transmission electron microscopy

Arthur H. Heuer, Ph.D., D.Sc.
(University of Leeds, England)

University Professor, Kyocera Professor of Ceramics, and Director-Swagelok Center for Surface Analysis of Materials

Transformation toughening and plastic deformation of ceramics; phase transformations in ceramics; biological ceramics; interphase interfaces in advanced structural composites; high resolution and analytical electron microscopy; Materials Science of MEMS, thermal barrier coatings, solid oxide fuel cells.

CASE SCHOOL OF ENGINEERING

Surface Hardening of Metals

Harold Kahn
(Massachusetts Institute of Technology)
Research Associate Professor

Microelectromechanical systems involving design, fabrication, fatigue and fracture mechanics testing of surface-micromachined polysilicon and SiC devices and bulk-micromachined microfluidic devices using TiNi shape memory actuators

Peter Lagerlof, Ph.D.
(Case Western Reserve University)

Associate Professor

Electron microscopy; high temperature mechanical properties of single crystal and polycrystal oxide ceramics; oxygen diffusion in oxide ceramics; deformation twinning of metals and ceramics; oxide interfaces

John J. Lewandowski, Ph.D.
(Carnegie-Mellon University)

Leonard Case Jr. Professor of Engineering and Director - Center for Mechanical Characterization of Materials

Mechanical behavior of materials; fracture and fatigue; micromechanisms of deformation and fracture; composite materials; bulk metallic glasses and composites; refractory metals; toughening of brittle materials; high-pressure deformation and fracture studies; hydrostatic extrusion; deformation processing

David H. Matthiesen, Ph.D.
(Massachusetts Institute of Technology)

Associate Professor

Crystal growth; electronic materials; materials processing in microgravity; effect of growth conditions on the microstructures and electrical properties of semiconductors; fluid dynamics and heat, mass, and momentum transport

Gary M. Michal, Ph.D.
(Stanford University)

LTV Steel Professor of Metallurgy and Co-Director - Swagelok Center for Surface Analysis of Materials

Physical metallurgy; rapid solidification technology; application of rapid annealing to nonequilibrium precipitation reactions; transmission electron microscopy; surface science; composite materials; interfacial phenomena

Joe H. Payer, Ph.D.
(Ohio State University)

Professor

Electrochemistry and corrosion; reliability and life prediction; hydrogen storage, fuel cells, corrosion monitoring and sensors; poly-
CASE SCHOOL OF ENGINEERING

Gary Ruff, Adjunct Professor
Ruff Associates, Rochester Hills, Michigan

UNDERGRADUATE PROGRAMS

The undergraduate curriculum leading to the degree of Bachelor of Science in materials science and engineering consists of the “Engineering Core”—basic courses in mathematics, physics, chemistry, and engineering, with electives in social sciences and humanities—plus materials courses, technical electives, and open electives. A total of 129 credit hours is required. Please see the table for the recommended semester-by-semester listing of courses.

The Bachelor of Science program is accredited by the Engineering Accreditation Commission (EAC) of ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202-4012—telephone: 410-347-7700.

The broad objectives of the undergraduate program at the Department of Materials Science and Engineering are to provide the students a strong background in mathematics, physics and chemistry, a link between the sciences and the practice of materials engineering through the departmental courses during the sophomore, junior, and senior years, and a comprehensive design experience in materials engineering through a combination of graded course work distributed throughout the curriculum in addition to the Senior Project.

The primary means of accomplishing this mission is our undergraduate curriculum and associated activities, through their emphasis on:

1. The interrelationships among the processing, structure, properties, and performance of engineering materials
2. The mutual reinforcement of education and professional development throughout one’s career.

To meet these broad objectives, the specific program objectives are as follows:

The undergraduate experience in Materials Science and Engineering at Case Western Reserve is marked by a high degree of hands-on experience and many opportunities for professional development before graduation. Lab courses, senior projects, and plant tours ensure that every student sees the field first-hand in current research and industrial settings.

The educational objectives of the undergraduate program are as follows:

1. Graduates will understand the interrelationships among processing, structure, and properties of a wide range of engineering materials, and how these factors together control the materials performance.
2. Graduates will be able to carry out laboratory experiments, analyze data, and interpret the significance of their results, especially with respect to the processing of engineering materials and characterization of their engineering properties.
3. Graduates will be proficient in the oral, written, and electronic communication of their ideas.
4. Graduates will be proficient in the use of computer technology and computer-based information systems.
5. Graduates will be able to function effectively in groups of peers and independently.
6. Graduates will be informed of the impact of engineering on society and of the professional, ethical, safety, and environmental responsibilities that that entails.
7. Graduates will regard professional development and education as processes that should continue hand-in-hand throughout their academic and professional careers.

In addition, many of our undergraduate students participate in co-operative education, summer jobs, and professional societies that expose them to the larger world of materials science beyond the classroom.

MINOR IN MATERIALS SCIENCE AND ENGINEERING

In addition to the Bachelor of Science degree program in materials science and engineering, the department also offers a minor in materials science and engineering. This sequence is intended primarily for a student majoring in science or engineering; but it is open to any student with a sound background in introductory calculus, chemistry, and physics. This program requires the completion of 5 courses with a minimum of 15 credit hours, of which a maximum of 6 hours can be counted toward the student’s major. All students will be required to take EMSE 201 (3) and four of the following courses:

EMSE 202, Phase Diagrams and Phase Transformations (3)
EMSE 203, Applied Thermodynamics (3)
EMSE 360, Transport Phenomena (3)
EMSE 301, Fundamentals of Materials Processing (3)
EMSE 303, Mechanical Behavior of Materials (3)
• EMSE 307, Foundry Metallurgy (3)
• EMSE 313, Engineering Applications of Materials (3)
• EMSE 314, Electrical, Magnetic, and Optical Properties (3)
• EMSE 316, Applications of Ceramics (3)
• EMSE 312, Diffraction Principles (3)

Prof. Mark DeGuire (506 White: x-4221) is the academic advisor for this program and will assist students with their course selection.

COOPERATIVE EDUCATION IN MATERIALS SCIENCE AND ENGINEERING

The Cooperative Education program at Case Western Reserve began in the Materials Science and Engineering Department and the department’s faculty continues to strongly support student participation. Over the past ten years approximately three-quarters of the department’s undergraduates have participated in completed at least one cooperative education. A wide range of opportunities exist for materials majors including heavy industry, mid-size and small firms, and government and corporate research centers. Many opportunities are local to Northern Ohio, but a wide range of possibilities around the country, and, occasionally, international opportunities arise.

The cooperative education experience is monitored to ensure that students progress in job responsibilities during the course of an assignment. It is common for students to assume positions of responsibility, including employee supervision or decision-making on behalf of the company.

FIVE-YEAR COMBINED B.S. /M.S. PROGRAM

This program offers outstanding undergraduate students the opportunity to obtain an M.S. degree, with a thesis, in one additional year of study beyond the B.S. degree. (Normally, it takes 2 years beyond the B.S. to earn an M.S. degree.) In this program, an undergraduate student can take up to 9 credit hours that simultaneously satisfy undergraduate and graduate requirements. Typically, students in this program start their research leading to the M.S. thesis in the fall semester of the senior year. The department endeavors to support such students through the following summer and academic year at the normal stipend for entering graduate students. The B.S. degree is awarded at the completion of the senior year.

Application for admission to the five year B.S. /M.S. program is made after completion of five semesters of course work. Minimum requirements are a 3.2 grade point average and the recommendation of a faculty member of the department. Interested students should contact Professor Peter Lagerlof.

GRADUATE PROGRAMS

The department offers programs leading to the Master of Science and Doctor of Philosophy degrees. The theory, properties, and engineering behavior of metals, ceramics, electronic materials, and composite materials is encompassed in the academic courses and research within the department. The primary areas of specialization are in materials processing, mechanical properties, surface and microstructural characterization, environmental effects, and electronic materials.

M.S. Degree Requirements

The M.S. degree in materials science and engineering is awarded through either Plan A (master’s thesis) or Plan B (master’s comprehensive). Plan A involves a thesis based on individual research and a final oral thesis defense; this plan is appropriate for full-time graduate students. Plan B involves a major project and a comprehensive oral exam; it is typically pursued by part-time graduate students.

Plan A requires successful completion of 6 courses (18 credit hours) and at least 9 credit hours of M.S. research project (EMSE 651). Plan B requires the successful completion of eight courses (24 credit hours) as well as 3 credit hours of a Special Projects course (EMSE 649). The six courses for Plan A and the 8 courses for Plan B may include a maximum of 2 courses from an engineering or science curriculum outside the department. No more than 2 courses at the 3xx level can be included; all other courses must be at a higher level. Transfer of credit from another university is limited to 6 credit hours of graduate level courses (with grade B or better) taken in excess of B.S. degree requirements at the other university. A Planned Program of Study must be submitted by the end of the first semester for Plan A students, and by the end of 2 courses for Plan B students. A cumulative G.P.A. of 2.75 or higher is required.

Plan A students must prepare a written thesis and successfully defend the thesis in a final oral exam. Plan B students must prepare a written report on his/her special project and satisfactorily pass a comprehensive oral exam. The thesis exam for Plan A and the oral exam for Plan B must be conducted by an examining committee consisting of 3 faculty members of the department.

Ph.D. Degree Requirements

Students entering the graduate program for a Ph.D. will need to submit the Planned Program of Study within the first semester.

Candidates for a Ph.D. degree in materials science and engineering must meet the following requirements to prove their competency for doctoral study and to be accepted into the doctoral program:

1. Submit an approved Planned Program of Study form and a Supplementary Information form specifying the Breadth and Basic Science requirements.

2. Pass a comprehensive written General Exam within 6 months following their being awarded an M.S. degree (12 months for students with an M.S. degree from a different science or engineering discipline).

3. Pass a Thesis Proposal Exam (written and oral) during the semester immediately following the successful completion of the written General Exam. These requirements are explained in detail below. At the completion of these requirements, the student must fill out the second part of the Ph.D. Student Permanent Record” form.

Upon successful completion of all requirements and research, the Ph.D. candidate must submit a written dissertation as evidence for his/her ability to conduct independent research at an advanced level. The Ph.D. candidate must pass a final oral exam in defense of the dissertation. The Dissertation Committee must consist of at least three faculty members of the department and one non-departmental member. The candidate must provide each committee member with a copy of the completed dissertation at least 10 days before the exam, so that the committee members may have an opportunity to read and discuss it in advance.

The student must provide two (2) unbound copies of the final approved version of the thesis for the university, and two (2) bound copies of the thesis, one for the department and one for the student’s faculty advisor.

1. Ph.D. Program of STUDY
(Course Requirements)
A Ph.D. student must take a minimum of 18 credit hours of EMSE 701 and must continue registration each succeeding regular semester (fall and spring) until the dissertation is complete, unless granted a leave of absence. The time limit for the Ph.D. program is 5 years, starting with the first semester of EMSE 701 registration.

The minimum course requirement for a Ph.D. degree is 12 courses (36 credit hours) beyond the B.S. level, out of which at least six courses (18 credit hours), must be taken at Case Western Reserve University. Of these 12 courses, six courses must satisfy the Breadth Requirement and 2 courses must satisfy the Basic Science Requirement for the department as outlined below. In the case of a student entering with an M.S. degree from another discipline, additional courses may be required as decided by the Graduate Studies Committee of the department. A G.P.A. of 3.0 is required for Graduate Assistants.

BREADTH REQUIREMENTS
A broad knowledge of the field of materials science and engineering includes a minimum level of understanding of the following six areas:
- Mechanical Behavior
- Structure
- Physical Properties
- Processing
- Thermodynamics and Kinetics
- Phase Transformations

The Breadth Requirement for the Ph.D. can be fulfilled by taking a total of 6 courses (18 credit hours); these 6 courses must include at least one course from each area a, b, c, and d and 2 courses from areas e and f combined. The department maintains a list of approved courses for each of these areas.

BASIC SCIENCE REQUIREMENTS
A minimum depth in basic science of two courses (6 credit hours) is required for a Ph.D. degree. This requirement can be fulfilled by taking 2 courses selected from physics, chemistry, mathematics and/or statistics, and/or certain engineering curricula. The department maintains a current list of approved courses for the Basic Science Requirements.

The Planned Program of Study, a list of the courses the student will take to fulfill the Ph.D. requirements, will be discussed and approved at the time of the Thesis Proposal Exam. This form and the associated Supplementary Information form must be approved by the student’s Dissertation Committee (excluding the non-departmental member) and the chair of the department and submitted to the dean of graduate studies within one semester of passing the General Exam.

(2) Ph.D. General Exam
The written General Exam is offered twice a year, typically in January and in June, provided at least three students are registered to take the exam. The Exam is comprehensive and consists of two parts:

1. Thermodynamics and Kinetics; Materials Processing: covering such topics as phase equilibria, phase transformations, diffusion, defect chemistry, synthesis, fabrication, microstructural development, and thermomechanical processing.
2. Structure; Properties, Performance, and Reliability: covering crystallography and symmetry, analytical techniques (diffraction, imaging, and spectroscopy), line defects, surfaces and interfaces, microstructural analysis, mechanical, thermal, chemical (environmental), and electrical, optical, and magnetic properties, individually and in combination.

The emphasis in both parts of this General Exam will be on inorganic materials: metals, ceramics, semiconductors, and composites.

Each part of the exam will last for three hours; the morning session is devoted to part 1 and the afternoon session covers part 2. Each part of the Exam is divided into two sections:
- Part 1 (morning)
  - Section 1 Thermodynamics and Kinetics
  - Section 2 Processing
- Part 2 (afternoon)
  - Section 3 Structure
  - Section 4 Properties, Performance, and Reliability

The exam is closed book. Each section of the exam will contain a minimum of 4 questions. Students must answer 5 questions from part 1 and 5 questions from part 2, with at least 2 questions being answered from each section.

In order to pass the written General Exam, the criteria are as follows—6 out of ten questions in the exam require a 70% passing grade as well as a 75% average for the whole exam. Students who fail the exam (or the Thesis Proposal Exam described below) may elect to take the exam a second time.

(3) Thesis Proposal Exam
The Thesis Proposal Exam tests the more specific knowledge of the Ph.D. candidate concerning the science underlying the proposed research and to his or her intellectual maturity. It is composed of a written and an oral part, both dealing with the candidate’s proposed research project. The written document should be given to each member of the student’s Dissertation Advisory Committee (excluding the non-departmental member) during the semester immediately following the successful completion of the General Exam. It should include a literature search, analysis of the research problem, suggested research procedures, and the general results to be expected. The document should be written by the student and not his/her thesis advisor, and will be examined by the student’s Dissertation Advisory Committee for this purpose.

The oral part of the Thesis Proposal Exam should last approximately two hours and must be given before the student’s Dissertation Advisory Committee within one week of submitting the above written document to the Committee. Both parts of the Thesis Proposal Exam will be graded Pass/Fail.

At the time of this Exam, the student will also have his/her Planned Program of Study examined and approved by the Dissertation Advisory Committee.

RESEARCH AREAS

Deformation and Fracture
Determination of the relationships between structure and mechanical behavior of traditional and advanced materials—metals, ceramics, intermetallics, composites, and biological materials. State-of-the-art facilities are available for testing over a range of strain rates, test temperatures, stress states, and size scales for both monotonic and cyclic conditions.

Materials Processing
Ceramic and metal powder synthesis and processing, manufacturing of laminated materials, metals casting, crystal growth, thin film deposition, deformation processing of metals.

Environmental Effects

Surfaces and Interfaces
Free surfaces, grain boundaries, metal/ceramic, polymer/metal composite interfaces. Major facilities for transmission electron microscopy, scanning electron microscopy, and surface spectroscopies.

Electronic, Magnetic and Optical Materials
Electronic materials—silicon, germanium, gallium arsenide, silicon carbide; gallium nitride; thin film dielectric, optical, and magnetic ceramics; synthesis and characterization of multi-component electromagnetic filters, transparent semiconductors, ceramics, such as materials for sensors, catalysts, and fuel cells.

FACILITIES
Materials Processing
The department's processing laboratories include facilities which permit materials processing from the liquid state (casting) as well as in the solid state (powder processing). The department has its own foundry that houses mold making capabilities (green and bonded sand, permanent mold, and investment casting), induction melting furnaces of various capabilities for air melting of up to 1500 pounds of steel, electrical resistance furnaces for melting and casting up to 800 pounds of aluminum, and 500 pounds of magnesium under protective atmosphere, a dual chamber vacuum induction melting unit with a capacity of up to 30 pounds of superalloys, a 350 ton squeeze casting press, and state-of-the-art thermal fatigue testing and characterization equipment. The Crystal Growth Laboratory has facilities for production of high purity electronic single crystals using a variety of furnaces with the additional capability of solidifying under large magnetic fields. In addition, a CVD and MOCVD reactor has been set up to do research on the growth of SiC and GaN on Si, sapphire, and other substrates. Secondary processing and working can be accomplished using a high-speed hot and cold rolling mill, swaging units, and a state-of-the-art hydrostatic extrusion press. The department has heat treatment capabilities including numerous box, tube, and vacuum furnaces. For the processing of powder metals or ceramics the department possesses a 300,000 pound press, a vacuum hot press (with capabilities of up to 7 ksi and 2300 C), a hot isostatic press (2000 C and 30 ksi), a 60 ksi wet base isostatic press, and glove boxes. Sintering can be performed in a variety of controlled atmospheres while a microcomputer-controlled precision dilometer is available for sintering studies. Several ball mills, shaker mills, and a laboratory model attritor are also available for powder processing. In addition, facilities are available for sol-gel processing, glass melting, diamond machining; a spray dryer is available for powder granulation.

A Deformation Processing Laboratory has recently been commissioned that contains two dual hydraulic MTS presses. The first press is designed to evaluate the stretching and drawing properties of materials in sheet form. Its maximum punch and hold down forces are 150,000 each. Its maximum punch velocity is 11.8 inch/sec. The second press is designed to evaluate the plastic flow behavior of materials in an environment that simulates modern manufacturing processing. The press can deliver up to five consecutive impacts to a material in less than five seconds with a punch velocity as high as 110 inch/sec. The maximum punch force is 110,000 pounds.

Mechanical Testing Facility
The Center for Mechanical Characterization of Materials Mechanical Testing Facility permits the determination of mechanical behavior of materials over loading rates ranging from static to impact, with the capability of testing under a variety of stress states under either monotonic or cyclic conditions. A variety of furnaces and environmental chambers are available to enable testing at temperatures ranging from -196 C to 1800 C. The facility is operated under the direction of a faculty member and under the guidance of a full-time engineer. The facility contains one of the few laboratories in the world for high-pressure deformation and processing, enabling experimentation under a variety of stress states and temperatures. The equipment in this state-of-the-art facility includes:

High Pressure Deformation Apparatus: These units enable tension or compression testing to be conducted under conditions of high hydrostatic pressure. Each apparatus consists of a pressure vessel and diagnostics for measurement of load and strain on deforming specimens, as well as instantaneous pressure in the vessel. Pressures up to 1.0 GPa loads up to 10kN, and displacements of up to 25 mm are possible. The oil based apparatus is operated at temperatures up to 300 C room temperature while a gas (i.e. Ar) based apparatus is used at room temperature.

Hydrostatic Extrusion Apparatus: Hydrostatic extrusion (e.g. pressure-to-air, pressure-to-pressure) can be conducted at temperatures up to 300 C on manually operated equipment interfaced with a computer data acquisition package. Pressures up to 2.0 GPa are possible, with reduction ratios up to 6 to 1, while various diagnostics provide real time monitoring of extrusion pressure and ram displacement.

Advanced Forging Simulation Rig: A multi-actuator; MTS machine based on a 330 kip, four post frame, enables sub-scale forging simulations over industrially relevant strain rates. A 110 kip forging actuator is powered by five nitrogen accumulators enabling loading rates up to 120 inches/sec on large specimens. A 220 kip indexing actuator provides precise deformation sequences for either single, or multiple, deformation sequences. Date acquisition at rates sufficient for analysis is available. Testing with heated dies is possible.

Advanced Metal Forming Rig: A four post frame with separate control of punch actuator speed and blank hold down pressure enables determination of forming limit diagrams. Dynamic control of blank hold down pressure is possible, with maximum punch actuator speeds of 11.8 inches/sec. A variety of die sets are available.

The remainder of the equipment in the Mechanical Testing Facility is summarized below:

Servo-hydraulic Machines: Four MTS Model 810 computer-controlled machines with load capacities of 3 kip, 20 kip, 50 kip, and 50 kip, permit tension, compression, and fatigue studies to be conducted under load-, strain-, or stroke control. Fatigue crack growth may be monitored via a dc potential drop technique as well as via KRAK gages applied to the specimen surfaces. Fatigue studies may be conducted at frequencies up to 30 Hz. In addition, an Instron Model 1331 20 kip Servo-hydraulic machine are available for both quasi-state and cyclic testing.

Universal Testing Machines: Three INSTRON screw-driven machines, including two INSTRON Model 1125 units permit tension, compression and torsion testing.

Electromechanical Testing Machine: A computer-controlled INSTRON Model 1361 can be operated under load-, strain-, or stroke control. Stroke rates as slow as 1 micrometer/hour are possible.

Fatigue Testing Machines: Three Sonntag fatigue machines and two R. R. Moore rotating-bending fatigue machines are available for
producing fatigue-life (S-N) data. The Sonntag machines may be operated at frequencies up to 60 Hz.

Creep Testing Machines: Three constant load frames with temperature capabilities up to 800 °C permit creep testing, while recently modified creep frames permit thermal cycling up to 800 °C. Permits creep testing, while recently modified creep frames permit thermal cycling as well as slow cyclic creep experiments.

Impact Testing Machines: Two Charpy impact machines with capacities ranging from 20 ft-lbs to 240 ft-lbs are available. Accessories include a Dynatup instrumentation package interfaced with an IBM PC, which enables recording of load vs. time traces on bend specimens as well as on tension specimens tested under impact conditions.

Instrumented Microhardness Tester: A Nikon Model QM High-Temperature Microhardness Tester permits indentation studies on specimens tested at temperatures ranging from -196 °C to 1600 °C under vacuum and inert gas atmospheres. This unit is complemented by a Zwick Model 3212 Microhardness Tester as well as a variety of Rockwell Hardness and Brinell Hardness Testing Machines.

Environmental Stress Laboratories
These facilities include equipment for corrosion, oxidation, and adhesion and wear studies. A wide range of environments can be simulated and controlled a) Aqueous corrosion: atmospheric, immersion and high pressure/high temperature in autoclaves and b) Oxidation: single and mixed gases over a range of temperatures and pressures. Special items include: electrochemical test equipment, environmental cracking test equipment, vacuum equipment for permeation studies, high sensitivity Cahn electro balances for thermogrammetric studies and polymer/metal adhesion test fixtures.

The Swagelok Center for Surface Analysis of Materials (SCSAM)
Operated by the Department of Materials Science and Engineering (DMSE), the Swagelok Center for Surface Analysis of Materials (SCSAM) is a multi-user analytical facility providing instrumentation for microstructural characterization of materials as well as surface and near-surface chemical analysis. The facilities in SCSAM are available to all users on campus at a federally approved use charge. The equipment described here is maintained by four full-time engineers, administered through DMSE. The following is a list of SCSAM’s present instruments and their main applications:

5. A Dual-Beam (Focused Ion / Scanning Electron Beam) System FEI XT Nova Nanolab 200.
6. An Environmental Dual-Beam System FEI Quanta 200 3D (to be installed in 2009).
7. A Variable-Temperature UHV Scanning Probe Microscope RHK UHV 7500 VT.
12. Tandem Pelletron Ion Accelerator NEC 5SDH.

Transmission Electron Microscope Laboratory
Two transmission electron microscopes are available that provide virtually all conventional and advanced microscopy techniques required for state-of-the-art materials research and involve an installed capacity worth $3,000,000. The microscopes available are (i) an FEI Tecnai F30 300kV field-emission gun energy-filtering high-resolution analytical scanning transmission electron microscope with an information resolution limit better than 0.14nm, equipped with an EDAX system with a high-energy resolution Si-Li detector for X-ray energy-dispersive spectrometry (XEDS), a Gatan GIF2002 imaging energy filter including a 2k by 2k slow-scan CCD camera, and a high-angle annular dark-field detector for scanning transmission electron microscopy (STEM), and (ii) a Philips CM20 200kV analytical transmission electron microscope equipped with a Tracor Northern high-purity Ge X-ray energy-dispersive spectroscopy detector, a Gatan parallel electron energy-loss spectrometer (PEELS), and a STEM unit.

Conventional TEM techniques, such as bright-field and dark-field imaging, electron diffraction, or weak-beam dark-field imaging (WBDIF) are used routinely to analyze line defects (dislocations) and planar defects (interfaces, grain boundaries, stacking faults) in crystalline materials. Advanced TEM techniques include (i) high-resolution TEM, which enables assessing the atomic structure of crystal defects such as heterophase interfaces, grain boundaries, or dislocations, (ii) convergent-beam electron diffraction, which can be used, for example, to obtain crystallographic information (space group) and to determine orientation relationships between small (even nanoscopic) crystallites, and (iii) energy-filtering TEM, which includes zero-loss filtering for improved image contrast and resolution in conventional imaging and diffraction as well as electron spectroscopic imaging (ESI), a technique that enables rapid elemental mapping with high spatial resolution based on element-characteristic energy losses of the primary electrons in the specimen. Specimen preparation facilities for transmission electron microscopy consist of two dimple-grinders, two electropolishing units, three ultra-microtomes, and two conventional ion-beam mills, and two state-of-the-art precision ion polishing systems (PIPS, by Gatan).

Scanning Electron Microscopy Laboratory
Scanning electron microscopy (SEM) and spectrochemical analysis provide valuable specimen investigation with great depth of field and realistic three-dimensional imaging at resolutions up to 500,000X. Determination of the topography of nearly any solid surface is possible. Spectrochemical studies are possible with the use of energy dispersive systems capable of detecting elements from boron to uranium. The laboratory houses two instruments. The first is an Hitachi S-4500, a field emission electron microscope with two secondary electron detectors, a backscattered electron detector, and an infrared chamber scope. In addition, it has a Noran energy dispersive x-ray detection system. The microscope is capable of operating at a spatial resolution of less than 1.5 nm at 15 kV. It also performs well at reduced beam energies (1 kV), facilitating the observation of highly insulating materials. The second instrument is a Philips XL-30 ESEM with a large chamber that can
be used as a conventional SEM, or in the environmental mode, can be used to examine wet, oily, gassy or non-conducting samples. It has a camera for crystallographic orientation imaging, a deformation stage capable of 1000 lbs force, hot stages capable of temperatures up to 1500 C, and a cooling stage that goes down to -20 C. An attached Noran X-ray system permits qualitative and quantitative EDX spectroscopy, X-ray mapping and line scans.

Surface Science Laboratories
The Center for Surface Analysis of Materials (CSAM) enjoys state-of-the-art characterization of metal, alloy, ceramic, and polymer surfaces. These tools include a PHI 680 Scanning Auger Microprobe (SAM) for elemental analysis of surfaces and mapping, and PHI 3600 Secondary Ion Mass Spectrometry (SIMS), which provides surface sensitivities for species in the part per billion range. A PHI model 5600 instrument provides X-ray Photoelectron Spectroscopy (XPS or ESCA) capability, which produces information concerning chemical states. The latter two instruments are particularly useful for ceramic and polymer surfaces. With specimen heating, cooling, and depth profiling capabilities directly incorporated in these devices, subsurface regions and interfaces in composite structures, as well as thin film substrate interfacial regions, can be examined and fully characterized. The ion beam facility for the analysis of materials consists of a NEC 5SDH 1.7 MV tandem peltretron accelerator for the production of 3.4 MeV protons, 5.1 MeV alpha particles, and N ions with energies in excess of 7.0 MeV. Sample analysis takes place in a molecular pumped high vacuum chamber. The chamber is equipped with a computer-controlled 5 axis manipulator and provisions for maintaining sample temperatures from 77 K to 1000 K. A Si surface barrier detector, NaI(Tl) scintillator, and a liquid nitrogen-cooled Si(Li) detector are used to detect scattered ions, characteristic gamma rays and characteristic X-rays, respectively. This instrumentation can non-destructively provide composition and structure information in the near-surface region of materials using techniques such as Rutherford backscattering spectroscopy (RBS), ion channeling, particle-induced X-ray analysis (PIXE), and nuclear reaction analysis (NRA). As with other analytic techniques, sensitivity, sampling depth, and depth resolution are sample dependent. However, sensitivities of 1 atomic percent, accuracies of 5%, and a depth resolution of 20 nm are usually easily achieved.

The typical specimen is a solid, vacuum-compatible material with lateral dimensions between 0.5 cm x 0.5 cm and 5 cm x 5 cm. However, PIXE and NRA can also be performed on non-vacuum compatible specimens such as liquids and irrepealable artifacts of interest to museum curators and archaeologists.

A recently acquired FEI Nova Focused Ion Beam (FIB) system used to machine thin foils suitable for TEM directly out of the surface of a specimen is available. The Nova FIB includes an SEM, a computer interface enabling entirely automated milling and an internal “lift out” system for transferring thin films onto support grids. To investigate the character of surfaces at the nanometer scale the laboratory has a Digital Instruments Dimension 3000 Scanning Probe Microscope which operates as an AFM and contains a Hysitron Nanoindenter.

Electronic Properties Laboratory
CRystal Growth and Analysis Laboratory
The Crystal Growth and Analysis Laboratory is equipped for research studies and characterization of bulk semiconductor and photonic materials. The growth facilities include a high pressure Czochralski system, low pressure Czochralski system, and a Vertical Bridgman system with magnetic field stabilization. The characterization facilities include capabilities for sample preparation, a Hall effect system, Infra-red microscope, and an Inductively Coupled Plasma-Mass Spectrometer (ICP-MS).

X-ray Laboratory
The X-ray laboratory contains diffraction equipment for study of the structures of ceramics, metals, polymers, minerals, and single crystals of organic and inorganic compounds. A new Scintag diffractometer system includes a theta/theta wide angle goniometer, a 4.0 kW x-ray generator with copper tube, a third axis stress attachment, a thermoelctrcally cooled Peltier germanium detector, a thin film analysis system, a dedicated PC for data acquisition, and a turbomolecular-pumped furnace attachment permitting sample temperatures up to 2000 degrees C.

Fuel Cell Testing Laboratory
The department houses a lab for testing of solid oxide fuel cells (SOFC). Facilities include:

- 2 test stands for 4” cells and small stacks (Fuel Cell Technologies): test temperatures to 1000°C; professional turnkey LabView interface for system control and data acquisition
- 2 test stands for 1” cells; test temperatures to 1000°C; LabView interface for complete system control and data acquisition; Omega mass flow controllers; Keithley and Amrel electronics; AutoLab Electrochemical Analyzer for I-V, galvanostatic or amperometric testing and AC impedance spectroscopy
- All test stands contained in dedicated 20’ x 8’ enclosure rated for use with hydrogen, hydrogen sulfide, and carbon monoxide with ventilation system, leak detection, tank pressure monitors, alarm system
- Dedicated furnaces and ovens for preparing cells for testing

MATERIALS SCIENCE AND ENGINEERING (ESME)

Course Descriptions
EMSE 102. Materials Seminar (1)
Topical lectures by faculty on current areas of materials research serving to complement the concepts introduced in EMSE 201. General discussion of overall curriculum and educational objectives. Recommended preparation: EMSE 201 or concurrent enrollment.

EMSE 103. Materials in Sports (3)
The relationships between optimizing sports activities and the performance requirements of sports equipment are developed. The inherent properties of materials are shown to be the controlling factors in the design of almost all types of sports equipment. Properties of the major classes of materials used to manufacture sports equipment are examined. Materials discussed include advanced composites, foams, metals, ceramics, and natural composites, e.g. wood and leather. The absorption, storage, and release of energy by equipment during sports activities are shown to relate to the basic structure of the materials from which it is made. Demonstration experiments are conducted periodically throughout the course.

EMSE 201. Introduction to Materials Science and Engineering (3)
Introductory treatment of crystallography, phase equilibria, and materials kinetics. Application of these principles to examples in metals, ceramics, semiconductors, and polymers, illustrating the control of structure through processing to obtain desired mechanical and physical properties. Design content includes examples and problems in materials selection and design of materials for particular performance requirements. Recommended preparation: ENGR 145 and PHYS 121 and MATH 121.

EMSE 202. Phase Diagrams and Transformations (3)
Diffusion processes, equilibrium diagrams of al-

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EMSE 270. Materials Laboratory I (2)
Introduction to processing, microstructure and property relationships of metal alloys, ceramics and glass. Solidification of a binary alloy and metallurgy by optical and scanning electron microscopy. Synthesis of ceramics powders, thermal analysis using TGA and DTA, powder consolidation, sintering and grain growth kinetics. Processing and coloring of glass and glass-ceramics.

EMSE 280. Materials Laboratory II (2)
Synthesis and processing. Experiments designed to demonstrate and evaluate different ways to process different types of materials. Solidification of melts. Crystallization kinetics, processing using electrochemistry, oxidation and oxidized microstructures. Laboratory teams are selected for all experiments.

EMSE 290. Materials Laboratory III (2)
Experiments designed to characterize and evaluate different microstructural designs produced by variations in processing. Fracture of brittle materials, fractography, thermal shock resistance, hardenability of steels, TTT and CT diagrams, composites, solidification of metals, solution annealing of alloys. Recommended preparation: EMSE 201.

EMSE 301. Fundamentals of Materials Processing (3)
Introduction to materials processing technology with an emphasis on the relation of basic concepts to the processes by which materials are made into engineering components. Includes casting, welding, forging, cold-forming, powder processing of metals and ceramics, and polymer and composite processing. Recommended preparation: EMSE 201 and EMSE 202 and EMSE 203.

EMSE 302. Fundamentals of Materials Processing Laboratory (1)
Demonstration of basic processes of materials fabrication. Includes visits to commercial materials processing plants for tours and demonstrations. Graded pass/fail.

EMSE 303. Mechanical Behavior of Materials (3)

EMSE 307. Foundry Metallurgy (3)
Introduction to solid-liquid phase transformations and their application to foundry and metal casting processes. Includes application of nucleation and growth to microstructural development, application of thermodynamics to molten metal reactions, application of the principles of fluid flow and heat transfer to gating and risering techniques, and introduction to basic foundry and metal casting technology. Recommended preparation: EMSE 202 and EMSE 203 and ENGR 225.

EMSE 310. Applications of Diffraction Principles (1)
A lab sequence in conjunction with EMSE 312. Diffraction Principles, involving experiments on crystallography, optical diffraction, Laue backscattering on single crystals, powder diffraction of unknown compounds, electron diffraction and imaging, and chemical analysis using energy dispersive x-ray spectroscopy. Recommended preparation: EMSE 312 or consent of instructor.

EMSE 312. Diffraction Principles (3)

EMSE 313. Engineering Applications of Materials (3)
Optimum use of materials taking into account not only the basic engineering characteristics and properties of the materials, but also necessary constraints of component design, manufacturing (including machining), abuse allowance (safety factors), and cost. Interrelations among parameters based on total system design concepts. Case history studies. Systems of failure analysis. Recommended preparation: EMSE 202 and ENGR 200.

EMSE 314. Electrical, Magnetic, and Optical Properties of Materials (3)

EMSE 316. Applications of Ceramic Materials (3)

EMSE 360. Transport Phenomena in Materials Science (3)
Review of momentum, mass, and heat transport from a unified point of view. Application of these principles to various phenomena in materials science and engineering with an emphasis on materials processing. Both analytical and numerical methodologies applied in the solution of problems. Recommended preparation: ENGR 225 and MATH 224 or equivalent.

EMSE 396. Special Project or Thesis (1 - 18)
Special research projects or undergraduate thesis in selected material areas.

EMSE 398. Senior Project in Materials I (1)
Independent Research project. Projects selected from those suggested by faculty; usually entail original research. The EMSE 398 and 399 sequence form an approved SAGES capstone. SAGES Senior Cap.

EMSE 399. Senior Project in Materials II (2)
Independent Research project. Projects selected from those suggested by faculty; usually entail original research. Requirements include periodic reporting of progress, plus a final oral presentation and written report. Recommended preparation: EMSE 398 or concurrent enrollment. SAGES Senior Cap.

EMSE 400T. Graduate Teaching I (0)
To provide teaching experience for all Ph.D.-bound graduate students. This will include preparing exams/quizses, homework, leading recitation sessions, tutoring, providing laboratory assistance, and developing teaching aids that include both web-based and classroom materials. Graduate students will meet with supervising faculty member throughout the semester. Grading is pass/fail. Students must receive three passing grades and up to two assignments may be taken concurrently. Recommended preparation: Ph.D. student in Materials Science and Engineering.

EMSE 401. Transformations in Materials (3)

EMSE 403. Modern Ceramic Processing (3)
Fundamental science and technology of modern ceramic powder processing and fabrication techniques. Powder synthesis techniques. Physical chemistry of aqueous and nonaqueous colloidal suspensions of solids. Shape forming techniques: extrusion; injec-
tion molding; slip and tape casting; dry, isostatic, and hot isostatic pressing. Recommended preparation: EMSE 316 or concurrent enrollment.

EMSE 404. Diffusion Processes in Solids and Melts (3)

EMSE 405. Dielectric, Optical and Magnetic Properties of Materials (3)
Electrical properties of nonmetallic: ionic conductors, dielectrics, ferroelectrics, and piezo-electrics. Magnetic phenomena and properties of metals and oxides, including superconductors. Mechanisms of optical absorption in dielectrics. Optoelectronics. Applications in devices such as oxygen sensors, properties by techniques involving structure properties of materials as affected by structure; control of and ceramics; mechanical and chemical properties. Thermodynamic relations in multi-component systems; kinks and dislocation motion; jogs and dislocation interactions, dislocation dissociation and stacking faults; dislocation multiplication, applications to yield phenomena, work hardening and other mechanical properties.

EMSE 407. Solidification (3)
Fundamental science of solid-liquid phase transformations and the application of these basic to the solidification processing of materials. Recommended preparation: EMSE 303.

EMSE 409. Deformation Processing (3)
Flow stress as a function of material and processing parameters; yielding criteria; stress states in elastic-plastic deformation; forming methods: forging, rolling, extrusion, drawing, stretch forming, composite forming. Recommended preparation: EMSE 303.

EMSE 411. Environmental Effects on Materials Behavior (3)
Aquatic corrosion: principles and fundamental concepts; recognition of modes; monitoring and testing: methods to control and prediction. Applications of engineering problems: design, and economics. Mixed potential theory, principles of protection, hydrogen effects, and behavior in metal systems.

EMSE 412. Materials Science and Engineering Seminar (0)

EMSE 413. Fundamentals of Materials Engineering and Science (3)
Provides a background in materials for graduate students with undergraduate majors in other branches of engineering and science; reviews basic bonding relations, structure, and defects in crystals. Lattice dynamics; thermodynamic relations in multi-component systems; microstructural control in metals and ceramics; mechanical and chemical properties of materials as affected by structure; control of properties by techniques involving structure property relations; basic electrical, magnetic and optical properties.

EMSE 417. Properties of Materials at High Temperatures (3)

Fracture mechanisms. Refractory metals, superalloys, intermetallic compounds, carbon, ceramic materials. Protective coatings.

EMSE 418. Oxidation of Materials (3)
Experimental techniques; thermodynamics of oxidation reactions; defects and diffusion in oxides; oxidation rate laws. Effects of alloying, surface treatment and stress on oxidation. High-temperature corrosion.

EMSE 419. Phase Equilibria and Microstructures of Materials (3)
The multi-component nature of most material systems require understanding of phase equilibria and descriptions of microstructure. Attention will be given to phase equilibria in multi-component (ternary and higher) systems, and the stereological description of the microstructure of multiphase systems.

EMSE 421. Fracture of Materials (3)

EMSE 426. Semiconductor Thin Film Science and Technology (3)

EMSE 427. Dislocations in Solids (3)
Elasticity and dislocation theory; dislocation slip systems; kinks and dislocation motion; jogs and dislocation interactions, dislocation dissociation and stacking faults; dislocation multiplication, applications to yield phenomena, work hardening and other mechanical properties.

EMSE 429. Crystallography and Crystal Chemistry (3)
Crystal symmetries, point groups, translation symmetries, space lattices, crystal classes, space groups, crystal chemistry, crystal structures and physical properties.

EMSE 500T. Graduate Teaching II (0)
To provide teaching experience for all Ph.D.-bound graduate students. This will include preparing exams/quizzes/homework, leading recitation sessions, tutoring, providing laboratory assistance, and developing teaching aids that include both web-based and classroom materials. Graduate students will meet with supervising faculty member throughout the semester. Grading is pass/fail. Students must receive three passing grades and up to two assignments may be taken concurrently. Recommended preparation: Ph.D. student in Materials Science and Engineering.

EMSE 502. Mechanical Properties of Metals and Composites (3)
Microstructural effects on strength and toughness of advanced metals and composites. Review of dispersion hardening and composite strengthening mechanisms. Toughening of brittle materials via composite approaches such as fiber reinforcement, ductile phases, and combinations of approaches. Recommended preparation: ENGR 200 and EMSE 303 or EMSE 421; or consent.

EMSE 504. Thermodynamics of Solids (3)

EMSE 509. Conventional Transmission Electron Microscopy (3)
Introduction to transmission electron microscopy-theoretical background and practical work. Lectures and laboratory experiments cover the technical construction and operation of transmission electron microscopes, specimen preparation, electron diffraction by crystals, electron diffraction techniques of STEM, conventional TEM imaging, and scanning TEM. Examples from various fields of materials research illustrate the application and significance of these techniques. Recommended preparation: Consent of instructor.

EMSE 511. Failure Analysis (3)
Methods and procedures for determining the basic causes of failures in structures and components. Recognition of fractures and excessive deformations in terms of their nature and origin. Development and full characterization of fractures. Legal, ethical, and professional aspects of failures from service. Recommended preparation: EMSE 201 and EMSE 303 and ENGR 200; or consent.

EMSE 512. Advanced Techniques of Transmission Electron Microscopy (3)
Theory and laboratory experiments to learn advanced techniques of transmission electron microscopy, including high-resolution transmission electron microscopy (HRTEM), convergent-beam electron diffraction (CBED), microanalysis using X-ray energy-dispersive spectroscopy (XEDS) and electron energy-loss spectroscopy (EELS), and electron-spectroscopic imaging (ESI) for elemental mapping. Recommended preparation: EMSE 509.

EMSE 514. Defects in Semiconductors (3)
Presentation of the main crystallographic defects in semiconductors; point defects (e.g., vacancies, interstitials, substitutional and interstitial impurities), line defects (e.g., dislocations), planar defects (e.g., grain boundaries). Structural, electrical and optical properties of various defects. Interpretation of the properties from the perspective of semiconductor physics and materials science and correlation of these defects to physical properties of the material. Experimental techniques including TEM, EBIC, CL, DLTS, etc. Recommended preparation: EMSE 426.

EMSE 515. Analytical Methods in Materials Science (3)
Microcharacterization techniques of materials science and engineering: SPM (scanning probe mi-
EMSE 516. Analytical Methods in Materials Science (3)
A laboratory course designed to achieve proficiency in TEM, SEM, SIMS, SAM and ESCA.

EMSE 600T. Graduate Teaching III (0)
To provide teaching experience for all Ph.D.-bound graduate students. This will include preparing exam/ quizzes/homework, leading recitation sessions, tutoring, providing laboratory assistance, and developing teaching aids that include both web-based and classroom materials. Graduate students will meet with supervising faculty member throughout the semester. Grading is pass/fail. Students must receive three passing grades and up to two assignments may be taken concurrently. Recommended preparation: Ph.D. student in Materials Science and Engineering.

EMSE 601. Independent Study (1 - 18)

EMSE 633. Special Topics (1 - 18)

EMSE 649. Special Projects (1 - 18)

EMSE 651. Thesis M.S. (1 - 18)
Required for Ph.D. degree. A research problem in metallurgy, ceramics, electronic materials, biomaterials or archeological and art historical materials, culminating in the writing of a thesis.

EMSE 701. Dissertation Ph.D. (1 - 18)
Required for Ph.D. degree. A research problem in metallurgy, ceramics, electronic materials, biomaterials or archeological and art historical materials, culminating in the writing of a thesis. Prereq: Pre-doctoral research consent or advanced to Ph.D. candidacy milestone.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Materials Science and Engineering (pending approval by CSE USC)

First Year Class/Lab/Credit Hours

Fall
CHEM 111 Principles of Chemistry for Engineers (4-0-4)
ENGR 131 Elementary Computer Programming (3-0-3)
SAGES First year Seminar (4-0-4)
MATH 121 Calculus for Science and Engineering I (4-0-4)
PHED 1xx Physical Education Activities (0-3-0)
Open elective or Humanities/Social Science Elective (3-0-3)
Total (18-3-18)

Spring
ENGR 145 Chemistry of Materials (4-0-4)
MATH 122 Calculus for Science and Engineering II (4-0-4)
PHYS 121 General Physics I - Mechanics 1 (3-1-4)
PHED 1xx Physical Education Activities (0-3-0)
SAGES University Seminar 2 (3-0-3)
Total (14-4-15)

Second Year

Fall
CHEM 301 Introduction to Physical Chemistry 4 (3-0-3)
EMSE 102 Materials Science Seminar (1-0-1)
EMSE 201 Introduction to Materials Science & Engng. (3-0-3)
MATH 223 Calculus for Science and Engineering III (3-0-3)
PHYS 122 General Physics II - Electricity & Magnetism (3-1-4)
SAGES University Seminar 2 (3-0-3)
Total (16-1-17)

Spring
EMAE 250 Computers in Mechanical Engineering 3 (3-0-3)
EMSE 202 Phase Diagrams & Phase Transformations (3-0-3)
EMSE 270 Materials Laboratory I (0-3-2)
MATH 224 Elementary Differential Equations 5 (3-0-3)
ENGR 200 Statics and Strength of Materials (3-0-3)
Humanities/Social Science elective (3-0-3)
Total (15-3-17)

Third Year Class/Lab/Credit Hours

Fall
EMSE 280 Materials Laboratory II (0-3-2)
ENGR 210 Introduction to Circuits and Instrumentation (3-2-4)
EMSE 203 Applied Thermodynamics (3-0-3)
EMSE 314 Electronic, Magnetic, and Optical Properties of Materials (3-0-3)
Humanities/Social Science elective (3-0-3)
Total (12-5-15)

Spring
EMSE 290 Materials Laboratory III (0-3-2)
ENGR 398 Professional Communication 6 (1-0-1)
ENGL 398 Professional Communication for Engineers 6 (2-0-2)
EMSE 303 Mechanical Behavior of Materials (3-0-3)
ENGR 225 Thermodynamics, Fluid Mechanics & Heat & Mass Transport (4-0-4)
Open elective or Humanities/Social Science elective (3-0-3)
Technical elective (3-0-3)
Total (16-3-18)

Fourth Year

Fall
EMSE 301 Fundamentals of Materials Processing (3-0-3)
EMSE 302 Fundamentals of Materials Processing Lab. (0-3-1)
EMSE 310 Applications of Diffraction Principles (0-2-1)
EMSE 312 Diffraction Principles (3-0-3)
EMSE 398 Senior Project in EMSE I (Capstone) (0-2-1)

EMSE 399 Senior Project in EMSE II (Capstone) (0-4-2)

Technical elective (3-0-3)
Open elective (3-0-3)
Open elective (3-0-3)
Total (12-4-14)

Hours required for graduation: 129
1. Selected students may be invited to take PHYS 123-124; General Physics I-II Honors, in place of PHYS 121-122.
2. The two SAGES University Seminars must be chosen from a different thematic group of USNA (Natural World), USSO (Social World) or USSY (Symbolic World).
3. One of these must be in the humanities or social sciences.
4. Satisfies the Math, Natural Sciences, or Statistics requirement of the Engineering Core.
5. Or PHYS 250.
6. Or MATH 234.
7. Designated as SAGES Departmental Seminar.

APPROVED TECHNICAL ELECTIVES

The following courses are approved technical electives in Materials Science and Engineering. A student is encouraged to discuss with their class advisor a sequence of technical elective courses, which takes into account the biannual nature of some offerings. Students may request approval of other elective courses by submitting a written petition justifying their choices to the department’s Undergraduate Studies Committee.

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Title</th>
<th>Fall</th>
<th>Spring</th>
<th>Offered</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECIV 210</td>
<td>Strength of Material</td>
<td>X</td>
<td>Annual</td>
<td></td>
</tr>
<tr>
<td>ECIV 420</td>
<td>Finite Element Structural Analysis</td>
<td>X</td>
<td>Annual</td>
<td></td>
</tr>
<tr>
<td>EECS 245</td>
<td>Electronic Circuits</td>
<td>X</td>
<td>Annual</td>
<td></td>
</tr>
<tr>
<td>EECS 246</td>
<td>Signals and Systems</td>
<td>X</td>
<td>Annual</td>
<td></td>
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</tbody>
</table>
CASE SCHOOL OF ENGINEERING

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING

418 Glennan Building (7222)
Phone: 216-368-6442; Fax: 216-368-6445
Clare M. Rimnac, Wilbert J. Austin Professor of Engineering and Chair
e-mail: clare.rimnac@case.edu
http://www.mae.case.edu/

The Department of Mechanical and Aerospace Engineering of the Case School of Engineering offers programs leading to Bachelor’s, master’s, and doctoral degrees. The department administers the programs leading to the degrees of Bachelor of Science in Mechanical Engineering with a major in aerospace engineering and Bachelor of Science in Engineering with a major in mechanical engineering. Both curricula are based on four-year programs of preparation for productive engineering careers or further academic training. The department of Mechanical Engineering and the degree of Bachelor of Science in Aerospace Engineering at Case Western Reserve University are accredited by the Engineering Accreditation Commission (EAC) of ABET, Inc. 111 Market Place, Suite 1050, Baltimore, MD 21202-4012, telephone: 410-347-7700.

Objective 1 - Graduates of the Aerospace Engineering Program will enter and successfully engage in careers in aerospace engineering and other professions enabled by their knowledge and skills in aerospace engineering.

Objective 2 - Graduates of the Mechanical Engineering Program will advance in responsibility and leadership in their chosen professions.

Objective 3 - Graduates of the Mechanical Engineering Program will engage in continued learning through post-baccalaureate education and/or professional development in engineering or other professional fields.

The program objectives for the program in Aerospace Engineering reflect the missions of the Case School of Engineering and the Department of Mechanical and Aerospace Engineering. The following statements also reflect the emphases of the Department on successful professional practice in their field, the assumption of leadership roles, and a commitment to life-long learning by our graduates.

Objective 1 - Graduates of the Aerospace Engineering Program will enter and successfully engage in careers in aerospace engineering and the Department of Mechanical and Aerospace Engineering. The following statements also reflect the emphases of the Department on preparing our graduates for successful professional practice in their field, the assumption of leadership roles, and a commitment to life-long learning.

Objective 2 - Graduates of the Aerospace Engineering Program will advance in responsibility and leadership in their chosen professions.

Objective 3 - Graduates of the Aerospace Engineering Program will engage in continued learning through post-baccalaureate education and/or professional development in engineering or other professional fields.

Departmental Mission

The mission of the Mechanical and Aerospace Engineering Department is to educate and prepare students at both the undergraduate and graduate levels for leadership roles in the fields of Mechanical Engineering and Aerospace Engineering and to conduct research for the benefit of society.

Program Educational Objectives

Consistent with the mission of the Department and the mission of Case Western Reserve University, the stated objectives of the Case School of Engineering are summarized in terms of graduates with five attributes: (a) mastery of fundamentals, (b) creativity, (c) social awareness, (d) leadership skills, and (e) professionalism as described below.

The program objectives for the program in Mechanical Engineering reflect the missions of the Case School of Engineering and the Department of Mechanical and Aerospace Engineering. The following statements also reflect the emphases of the Department on successful professional practice in their field, the assumption of leadership roles, and a commitment to life-long learning by our graduates.

Objective 1 - Graduates of the Aerospace Engineering Program will enter and successfully engage in careers in aerospace engineering, and other professions enabled by their knowledge and skills in aerospace engineering.

Objective 2 - Graduates of the Mechanical Engineering Program will advance in responsibility and leadership in their chosen professions.

Objective 3 - Graduates of the Mechanical Engineering Program will engage in continued learning through post-baccalaureate education and/or professional development in engineering or other professional fields.
neering or other professional fields.

The undergraduate program emphasizes fundamental engineering science, analysis and experiments to insure that graduates will be strong contributors in their work environment, be prepared for advanced study at top graduate schools and be proficient lifelong learners. The graduate programs emphasize advanced methods of analysis, mathematical modeling, computational and experimental techniques applied to a variety of mechanical and aerospace engineering specialties including, applied mechanics, dynamic systems, robotics, biomechanics, fluid mechanics, heat transfer, propulsion and combustion. Leadership skills are developed by infusing the program with current engineering practice, design, and professionalism (including engineering ethics and the role of engineering in society) lead by concerned educators and researchers.

The academic and research activities of the department center on the roles of mechanics, thermodynamics, heat and mass transfer, and engineering design in a wide variety of applications such as aeronautics, astronautics, biomechanics and orthopedic engineering, biomimetics and biological inspired robotics, energy, environment, machinery dynamics, mechanics of advanced materials, nanotechnology and tribology. Many of these activities involve strong collaborations with the Departments of Biology, Electrical Engineering and Computer Science, Materials Science and Engineering and Orthopaedics of the School of Medicine.

The significant constituencies of the Mechanical and Aerospace Engineering Department are the faculty, the students, the alumni and the external advisory boards. The educational program objectives are established and reviewed on an ongoing basis based on the feedback from the various constituencies as well as archival information about the program graduates. The faculty engages in continuing discussions of the academic programs in the regularly scheduled faculty meetings throughout the academic year. Periodic surveys of alumni provide data regarding the preparedness and success of the graduates as well as guidance in program development. Archival data include the placement information for graduating seniors, which provides direct information regarding the success of the graduates in finding employment or being admitted to graduate programs. Additional sources of feedback are listed in section 3 below under assessment.

Mastery of Fundamentals
- A strong background in the fundamentals of chemistry, physics and mathematics.
- Methods of mechanical engineering analysis, both numerical and mathematical, applied to mechanics, dynamic systems and control, thermodynamics, fluid mechanics and heat transfer.
- Methods of modern experimental engineering analysis and data acquisition.

Creativity
- Ability to identify, model, and solve mechanical and aerospace engineering design problems.
- Ability to design experiments to resolve mechanical and aerospace engineering issues.
- Ability to perform an individual senior project that demonstrates original research and/or design content.

Societal Awareness
- Issues of environmental impact, efficient use of energy and resources, benefits of recycling.
- An awareness of the multi-disciplinary nature of mechanical and aerospace engineering.
- Impact of economic, product liability and other legal issues on mechanical and aerospace engineering manufacturing and design.

Leadership Skills
- An ability to work in teams.
- Ethical considerations in engineering decisions.
- Proficiency in oral and written communications.
- Professionalism
- Students are encouraged to develop as professionals through participation in the student chapters of the American Society of Mechanical Engineers (ASME) and the American Institute of Aeronautics and Astronautics (AIAA).
- Students are encouraged to augment their classroom experiences with the cooperative education program and the strong graduate research program of the department.
- Students are encouraged to take the Fundamentals of Engineering Examination as the first step in the process of becoming a registered professional engineer.
- The bachelor's candidate must complete an independent design project with an oral and written final report.
- The master's candidate must demonstrate independent research resulting in a thesis or project suitable for publication and/or presentation in peer reviewed journals and/or conferences.
- The doctoral candidate must complete a rigorous independent thesis containing original research results appropriate for publication in archival journals and presentation at leading technical conferences.

FACULTY
Clare M. Rimnac, Ph.D.  
(Lehigh University)  
Professor and Chair  
Biomechanics; fatigue and fracture mechanics

Jaikrishnan R. Kadambi, Ph.D.  
(University of Pittsburgh)  
Professor and Associate Chair  
Experimental fluid mechanics; multiphase flows; laser diagnostics; bio-fluid mechanics; turbomachinery

Alexis R. Abramson, Ph.D.  
(UC Berkeley)  
Assistant Professor  
Micro/nanoscale heat transfer and energy transport, nanotechnology, biomimetics, nanoscale biomedical applications

Maurice L. Adams, Ph.D.  
(University of Pittsburgh)  
Professor  
Dynamics of rotating machinery; nonlinear dynamics; vibration; tribology; turbomachinery

J. Iwan D. Alexander, Ph.D.  
(Washington State University)  
Professor and Director of the National Center for Space Exploration Research  
Fluid dynamics; heat and mass transfer, low gravity fluid dynamics, interfacial transport capillary surface equilibria and dynamics, two-phase flow in porous media, vibrational convection

Christopher Hernandez, Ph.D.  
(Stanford University)  
Assistant Professor  
Musculoskeletal biomechanics, solid mechanics and medical device design

Yasuhiro Kamotani, Ph.D.  
(Case Western Reserve University)  
Professor  
Experimental fluid dynamics; heat transfer; microgravity fluid mechanics

Kiju Lee, Ph. D.
Combustion; propulsion, and fire research
Leonard Case Jr. Professor of Engineering
Princeton University

James S. Tien, Ph.D.
(Princeton University)

Associate Professor
Biomechanics; applied mechanics

Joseph M. Mansour, Ph.D.
(Rensselaer Polytechnic Institute)

Professor

Joseph M. Prahl, Ph.D.
(Harvard University), P.E.

Professor

Fluid dynamics; heat transfer; tribology

Vikas Prakash, Ph.D.
Brown University

Professor

Experimental and computational solid mechanics; dynamic deformation and failure; time resolved high-speed friction; ultra-high speed manufacturing processes; ballistic penetration of super alloys; engine fan-blade containment, nanomechanics

Roger D. Quinn, Ph.D.
Virginia Polytechnic Institute & State University

Arthur P. Armington Professor of Engineering

Biologically inspired robotics; agile manufacturing systems; structural dynamics, vibration and control

Chih-Jen Sung, Ph.D.
Princeton University

Professor

Combustion, propulsion, laser diagnostics

Melissa L. Knothe Tate, Ph.D.
Swiss Federal Institute of Technology, Zurich, CH

Associate Professor

Etiology and innovative treatment modalities for osteoporosis, fracture healing, osteolysis and osteonecrosis

James S. Tien, Ph.D.
Princeton University

Leonard Case Jr. Professor of Engineering

Combustion; propulsion, and fire research

Emeritus Faculty

Dwight T. Day, Ph.D.
University of Iowa, P.E.

Professor Emeritus

Musculo-skeletal biomechanics; applied mechanics

Isaac Greber, Ph.D.
Massachusetts Institute of Technology

Professor Emeritus

Fluid dynamics; molecular dynamics and kinetic theory; biological fluid mechanics; acoustics

Thomas P. Kicher, Ph.D.
Case Institute of Technology

Arthur P. Armington Professor Emeritus of Engineering

Elastic stability; plates and shells; composite materials; dynamics; design; failure analysis

Simon Ostrach, Ph.D.
Brown University, P.E.

Wilbert J. Austin Distinguished Professor
Emeritus of Engineering

Fluid mechanics; heat transfer; micro-gravity phenomena; materials processing; physico-chemical hydrodynamics

Eli Reshotko, Ph.D.
California Institute of Technology

Kent H. Smith Emeritus Professor of Engineering

Fluid Dynamics; heat transfer, propulsion; power generation

S. Stanford Manson, M.S.
University of Michigan

Emeritus Professor

Metal Fatigue, Creep Rupture, Thermal Stress, Plasticity, Fracture Mechanics

Research Faculty

R. Balasubramaniam, Ph.D.
Case Western Reserve University

Research Associate Professor

National Center for Space Exploration Research; Microgravity Fluid Mechanics

Uday Hegde, Ph.D.
Georgia Institute of Technology

Research Associate Professor

National Center for Space Exploration Research Combustion, turbulence and acoustics

Mohammad Kassemi, Ph.D.
University of Akron

Research Professor

National Center for Space Exploration Research Computational Fluid Mechanics

Julie Klienhenz, Ph.D.
Case Western Reserve University

Assistant Research Professor

National Center for Space Exploration Research Fire research, space exploration

Vedha Nayagam, Ph.D.
University of Kentucky

Research Associate Professor

National Center for Space Exploration Research Low gravity combustion and fluid physics

Fumiaki Takahashi, Ph.D.
Keio University

Research Associate Professor

National Center for Space Exploration Research Combustion, fire research, laser diagnostics

Associated Faculty

John Adamczyk, Ph.D.
University of Connecticut

Adjunct Professor

NASA Glenn Research Center Turbomachinery

Michael Adams, Ph.D.
Case Western Reserve University

Adjunct Instructor

Machinery Vibrations Institute

Christos C. Chamis, Ph.D.
Case Western Reserve University

Adjunct Professor

NASA Glenn Research Center Structural analysis; composite materials; probabilistic structural analysis; testing methods

Malcolm N. Cooke, Ph.D.
Case Western Reserve University

Adjunct Assistant Professor

University of Texas at San Antonio Advanced manufacturing systems; computer integrated manufacturing

James Drake, B.S.E
Case Western Reserve University

Adjunct Instructor

Mechanical and Aerospace Engineering Department

Robert V. Edwards, Ph.D.
The Johns Hopkins University

Professor of Chemical Engineering

Laser anemometry; mathematical modeling; data acquisition

Christophe Geuzaine
University of Liege, Belgium

Adjunct Professor of Mathematics

Numerical Analysis, Scientific Computing, Computational Electromagnetism

Mohammad Kassemi, Ph.D.
University of Akron

Adjunct Professor

National Center for Space Exploration Research Computational Fluid Mechanics

Kenneth Loparo, Ph.D.
Case Western Reserve University
resources and machines. The mechanical engineer’s function is to apply science and technology to the design, analysis, development, manufacture, and use of machines that convert and transmit energy, and to apply energy to the completion of useful operations. The top ten choices of the millennium committee of the National Academy of Engineering, asked to select the 20 top engineering accomplishments of the 20th century, was abundant with mechanical engineering accomplishments, electrification (large scale power generation and distribution), automobiles, air travel (development of aircraft and propulsion), mechanized agriculture, and refrigeration and air conditioning.

FIVE-YEAR PROGRAMS OF STUDY

The department curriculum offers a five-year cooperative (co-op) education program and five-year combined bachelor’s-master’s programs. Co-op weaves two 7-month industrial internships into the normal four-year program by combining a summer with either a fall or spring semester to form the 7-month industrial experiences. Students apply in the middle of the sophomore year and nominally begin the internship in the spring semester of the junior year. After completing the second internship, students return to campus in the spring or fall to complete their final year of study.

The 5-year combined bachelor’s-master’s program allows a student to double count 9 credit hours of graduate course work towards the Bachelor of Science degree in any one of the department’s two degree programs. By completing the remaining graduate credit hours and a thesis a student may earn a Master of Science degree in mechanical or aerospace engineering by the end of the fifth year. Application to this program is initiated in the spring of the junior year with the department’s graduate student programs office. A minimum grade point of 3.2 is required for consideration for this accelerated program.

Another option is the 5 year TimE Program taught in conjunction with the Weatherhead School of Management in which a student completes a B.S. in Aerospace or Mechanical Engineering and earns a Master of Engineering Management.

GRADUATE PROGRAMS

Master of Science Program

(Research or Project oriented)

For a research-oriented M.S., each candidate must complete a minimum of 27 hours of graduate-level credits, including at least 18 hours of graduate-level courses and 9 credit hours of M.S. thesis research.

For the project-oriented option students must complete 27 credit hours distributed in either of three ways: 21, 24, or 27 credit hours (7, 8, or 9 courses) of approved graduate course work and 0, 3, or 6 credit hours of project replacing the M.S. thesis.

(Course oriented)

Each M.S. candidate must complete 30 hours of graduate-level credits. The candidate has to pass a comprehensive examination upon completion of the course work.

Master of Engineering Program

The Department of Mechanical and Aerospace Engineering participates in the practice-oriented Master of Engineering Program offered by the Case School of Engineering. In this program, students complete a core program consisting of five courses, and select a four-course sequence in an area of interest.

Doctor of Philosophy Program

Students wishing to pursue the doctoral degree in mechanical and aerospace engineering must successfully pass the doctoral qualifying examination consisting of both written and oral components. Qualifying exams are offered on applied mechanics, dynamics and design or fluid and thermal engineering sciences. Students can choose to take it at the beginning of the fall or spring semesters. The minimum course requirements for the Ph.D. degree are as follows:

Depth Courses

All programs of study must include 6 graduate level mechanical courses in mechanical engineering or aerospace engineering. Usually these courses follow a logical development of a branch of mechanics, dynamics and design or fluid and thermal engineering science determined in conjunction with the student’s dissertation advisor to meet the objectives of the dissertation research topic.

Breadth and Basic Science Courses

A minimum of six graduate courses are required to fulfill the breadth and basic science courses. The basic science requirement is satisfied by taking two courses in one of the area of science and mathematics. Four additional courses are needed to provide the breadth outside the student’s area of research.
**Dissertation Research**

All doctoral programs must include a minimum of 18 credit hours of thesis research, EMAE 701.

**Residence and Teaching Requirements**

All doctoral programs must meet the residency requirements of the dean of graduate studies and the teaching requirements of the Case School of Engineering.

**FACILITIES**

The education and research philosophy of the Department of Mechanical and Aerospace Engineering for both the undergraduate and graduate programs is based on a balanced operation of analytical, experimental, and computational activities. All three of these tools are used in a fundamental approach to the professional activities of research, development, and design. Among the major assets of the department are the experimental facilities maintained and available for the faculty, students, and staff.

The introductory undergraduate courses are taught through the Robert M. Ward '41 Laboratory, the Bingham Student Workshop, the Reinberger Product and Process Development Laboratory, and the Reinberger Design Studio. The Ward Laboratory is modular in concept and available to the student at regularly scheduled class periods to conduct a variety of prepared experimental assignments. The lab is equipped with a variety of instruments ranging from classic analog devices to modern digital computer devices for the collection of data and the control of processes. Advanced facilities are available for more specialized experimental tasks in the various laboratories dedicated to each specific discipline. Most of these laboratories also house the research activities of the department, so students are exposed to the latest technology in their prospective professional practice. Finally, every undergraduate and graduate degree program involves a requirement, i.e., Project, Thesis or Dissertation, in which the student is exposed to a variety of facilities of the department.

The following is a listing of the major laboratory facilities used for the advanced courses and research of the department.

**Biorobotics Laboratory Facilities**

The Biorobotics Laboratory (http://birobots.cwru.edu/) consists of approximately 1080 square feet of laboratory and 460 square feet of office space. The lab includes two CNC machines for fabrication of smaller robot components. The lab’s relationship with CAISR (Center for Automation and Intelligent Systems Research) provides access to a fully equipped machine shop where larger components are fabricated. The laboratory hardware features several biologically inspired hexapod robots including two cockroach-like robots, Robot III and Robot IV. Both are based on the Blaberus cockroach and have 24 actuated revolute joints. They are 17 times larger than the insect (30 inches long). Robot IV is actuated with pneumatic artificial muscles. A compressed air facility has been installed to operate the robots. In addition, the lab contains structural dynamic testing equipment (sensors, DAQ boards, shakers) and an automated treadmill (5 feet by 6 feet) for developing walking robots. The Biorobotics Laboratory contains 20 PCs, and a dedicated LAN connected to the campus. Algor Finite Element Analysis software, Mechanical Desktop, and Pro/Engineer are installed for mechanical design and structural analysis. Also, the lab has developed dynamic simulation software for analyzing walking animals and designing walking robots.

**Case Low Speed Research Wind Tunnel**

The Case Low Speed Research Wind Tunnel provides very low free stream turbulence levels. The tunnel is completely modular, allowing a variety of different experimental configurations to be realized, greatly extending the tunnel’s functionality.

The tunnel, originally constructed in the late 1940’s, has undergone a rebuilding effort with the construction of a new test section, the replacement of the entire upstream half of the wind tunnel, the rebuild of the drive section, and installation of a new drive motor and motor controller. The new upstream portion provides the incoming flow treatment necessary to produce a low free stream turbulence level. The improved drive section and motor increase the tunnel’s maximum speed while reducing noise and vibration levels. With these improvements, the tunnel now supports research of the highest quality as well as graduate and undergraduate student experiments.

**Combustion Diagnostics Laboratory**

The combustion diagnostics laboratory is directed towards the experimental and computational investigation of combustion and propulsion phenomena to gain insights into efficient and environmentally-friendly combustion.

Research activities are conducted via state-of-the-art non-intrusive laser-based diagnostic techniques, computation with detailed chemistry and transport, and mathematical analysis of flame structure and dynamics, with strong coupling between the individual components. The laboratory is equipped to conduct laser diagnostics measurements, including Sustained Laser Induced Fluorescence, Planar Laser Induced Fluorescence, Raleigh Scattering, Coherent Anti-Stoke Raman Spectroscopy, and Particle Imaging Velocimetry.

Current projects include laser diagnostics of reacting and non-reacting flows, aerodynamics and chemical structure of flames, ignition and flame stabilization in supersonic flows, development of detailed and reduced chemistry, catalytic combustion, high-pressure and unsteady flame phenomena, soot and NOx formation, microgravity combustion, emission reduction in internal combustion engines, and advanced propulsion systems.

**Distributed Intelligence and Robotics Laboratory**

The Distributed Intelligence and Robotics Laboratory (DIRL) is a new laboratory in the Department of Mechanical and Aerospace Engineering that facilitates research activities on robotics and mechatronics. The primary research focuses on distributed intelligence, multi-agent systems, biologically-inspired robotics and medical applications. The laboratory is currently being constructed to house self-sufficient facilities and equipment for designing, testing and preliminary manufacturing. The DIRL also conduct theoretical research related to design methodology and control algorithms based on information theory, complexity analysis and group theory.

**Laser Flow Diagnostics Laboratory**

A laser diagnostics laboratory is directed toward investigation of complex two-phase flow fields involved in energy-related areas, bio-fluid mechanics of cardiovascular systems, slurry flow in pumps and thermacoustic power and refrigeration systems. The laboratory is equipped with state-of-the-art Particle Image Velocimetry (PIV) equipment, phase Doppler and laser Doppler anemometers and modern data acquisition and analysis equipment including PCs. The laboratory houses a clear centrifugal slurry flow pump loop and heart pump loop. Current research projects include...
investigation of flow through heart pumps, CSF flow in ventricles, investigation of solid-slurry flow in centrifugal pumps using ultrasound technique and PIV, thermo-acoustic refrigeration for space application.

Mechanics of Materials Experimental Facility
The major instructional as well as research facility for experimental methods in mechanics of materials is the Daniel K. Wright Jr. Laboratory. Presently, the facility houses a single-stage gas-gun along with tension/compression split Hopkinson bar and torsional Kolsky bar apparatus for carrying out fundamental studies in dynamic deformation and failure of advanced material systems. Hewlett Packard and Tektronix high speed, wide bandwidth digitizing oscilloscopes along with strain-gage conditioners and amplifiers are available for data recording and processing. The facility houses state-of-the-art laser interferometry equipment for making spatial and temporal measurements of deformation. High speed Hg-Cd-Te detector arrays are available for making time resolved multi-point non-contact temperature measurements.

A Schenck Pegasus digital servo-controlled hydraulic testing system with a 20Kip Universal testing load frame equipped with hydraulic grips and instrumentation is available for quasi-static mechanical testing under load or displacement control. A newly developed moiré microscope is available for studying large-scale inelastic deformation processes on micron size scales. CCD camera along with the appropriate hardware/software for image-acquisition, processing and analyzing of full field experimental data from optical interferometers such as moiré microscope, photo-elasticity, and other laser based spatial interferometers are available.

Rotating Machinery Dynamics and Tribology Laboratory
This laboratory focuses on rotating machinery monitoring and diagnostic methods relating chaos content of dynamic non-linearity and model-based observers’ statistical measures to wear and impending failure modes. A double-spool-shaft rotor dynamics test rig provides independent control over spin speed and frequency of an adjustable magnitude circular rotor vibration orbit for bearing and seal rotor-dynamic characterizations.

Simultaneous radial and axial time-varying loads on any type of bearing can be applied on a second test rig. Real time control of rotormass unbalance at two locations on the rotor while it is spinning up to 10,000 rpm, simultaneous with rotor rubbing and shaft crack propagation, can be tested on a third rig. Self-excited instability rotor vibrations can be investigated on a fourth test rig.

Musculoskeletal Mechanics and Materials Laboratories
These laboratories are a collaborative effort between the Mechanical and Aerospace Engineering Department of the Case School of Engineering and the Department of Orthopaedics of the School of Medicine that has been ongoing for more than 40 years. Research activities have ranged from basic studies of mechanics of skeletal tissues and skeletal structures, experimental investigation of prosthetic joints and implants, measurement of musculoskeletal motion and forces, and theoretical modeling of mechanics of musculoskeletal systems. Many studies are collaborative, combining the forces of engineering, biology, biochemistry, and surgery. The Biomechanics Test labs include Instron mechanical test machines with simultaneous axial and torsional loading capabilities, a non-contacting video extensometer for evaluation of biological materials and engineering polymers used in joint replacements, acoustic emission hardware and software, and specialized test apparatus for analysis of joint kinematics. The Bio-imaging Laboratory includes microscopes and three-dimensional imaging equipment for evaluating tissue microstructure and workstations for three-dimensional visualization, measurement and finite element modeling. An Orthopaedic Implant Retrieval Analysis lab has resources for characterization and analysis of hard tissues and engineering polymers, as well as resources to maintain a growing collection of retrieved total hip and total knee replacements that are available for the study of implant design. The Soft Tissue Biomechanics lab includes several standard and special test machines. Instrumentation and a Histology facilities support the activities within the Musculoskeletal Mechanics and Materials Laboratories.

National Center for Space Exploration Research
The National Center for Space Exploration Research (NCSER) is a collaborative effort between the Universities Space Research Association (USRA), Case Western Reserve University (CWRU), and NASA Glenn Research Center (GRC) that provides GRC with specialized research and technology development capabilities essential to sustaining its leadership role in NASA missions. Expertise resident at NCSER includes reduced gravity fluid mechanics, reduced gravity combustion processes; heat transfer, two-phase flow, micro-fluidics, and phase change processes; computational multiphase fluid dynamics, heat and mass transfer, computational simulation of physico-chemical fluid processes and human physiological systems. This expertise has been applied to:

- Cryogenic fluid management
- On orbit repair of electronics
- Spacecraft fire safety
- Exploration life support
- Energy storage
- Dust management
- Thermal management and control
- Environmental monitoring/control
- ISS experiment development
- Integrated system health monitoring
- Astronaut health
- Planetary Surface Mobility
- In situ resource utilization
- Materials synthesis
- Bio- fluid mechanics
- Biosystems modeling

nanoEngineering Laboratory
The nanoEngineering Laboratory focuses on research related to various nanotechnology applications with particular emphasis on energy conversion, generation and storage in nanostructured and bio-inspired materials. Synthesis of polymer-based nanocomposites, nanofluids and individual nanostructures is accomplished with tools available in the laboratory. Furthermore, the laboratory houses various pieces of equipment for thermal and electrical characterization of these materials. Research projects include investigation of nanocomposites for thermoelectric devices, molecular simulation of thermal transport across interfacial regions, characterization of nanomaterials for thermal management as well as thermal insulation applications, and biomimetic research on a protein-based shark gel.

Other Experimental Facilities
The department facilities also include several specialized laboratories.

The GM Engines Laboratory is a modern facility for measuring the dynamic performance of internal combustion engines while moni-
toring behavioral parameters such as pressures, temperatures and exhaust emissions. The test cells can be operated completely by remote control with all data collected by digital computers.

Engineering Services Fabrication Center offers complete support to assist projects from design inception to completion of fabrication. Knowledgeable staff is available to assist Faculty, Staff, Students, Researchers, and personnel associated with Case Western Reserve University.

The Harry A. Metcalf Computational Laboratory offers 28 Dell Pentium IV computers ranging from 2.5 to 3.4GHz, running Windows XP Professional attached to 3 Dell dual processor servers, running Windows NT 4.0 Server or Windows Server 2003, via local area network running at 1Gb/s. The computer lab also offers 29 UTP connections for Laptops running at 10/100 Mbps.

The Harry A. Metcalf Computational Laboratory provides access to a number of software packages. Some of these include SolidWorks 2008 SP4.0; Abaqus CAE 6.8 for FEA; Microsoft Visual C++; MatLab 2008A; Microsoft Office 2007 Professional; Mathematica 6.0.1; MathType 6.0; and LabView 8.5. All of the laboratory’s computers are directly linked to the campus network giving students access to a large variety of software on different libraries across campus. The lab is open for student use 24 hours a day 7 days a week via card access.

The Bingham Student Workshop, BSW, is a 2380 sq.ft. facility complete with machining, welding, metal fabrication, and woodworking equipment. This facility is available for the Case undergrads in Mechanical Engineering. Before gaining access to the shop all ME students are required to take the EMAE 172, Mechanical Manufacturing course. This course gives the student a foundation in basic machining, welding, sheet metal fabrication, and safety. Manual drafting, design, and computer-aided drafting is also included in the course. After completion the student can use the shop for other Mechanical Engineering courses requiring prototypes. The BSW, is also, used for senior projects and student organizations, such as, the SAE Baja and Formula Pittsburgh Supercomputing Center. Computing-intensive research projects can obtain an account on those supercomputers through their advisors. Research projects carried on in cooperation with the NASA Glenn Research Center can have access to NASA computing facilities. Sophisticated, extensive, and updated general and graphics software are available for applications in research and classroom assignments.

High Performance computing: For high performance computing the department uses the CWRU high performance computing cluster (HPCC). The HPCC consists of 112 compute nodes with Intel Pentium 4 Xeon EM64T processors. All nodes are interconnected with Gigabit Ethernet for MPI message passing and all nodes are interconnected by a separate Ethernet for the purpose of out-of-band cluster management. The MAE Department also has a direct access to all the Ohio Supercomputing Center and all NSF supercomputing centers, primarily to the Pittsburgh Supercomputing Center. Computing-intensive research projects can obtain an account on those supercomputers through their advisors. Research projects carried on in cooperation with the NASA Glenn Research Center can have access to NASA computing facilities. Sophisticated, extensive, and updated general and graphics software are available for applications in research and classroom assignments.

RESEARCH
The research in the department encompasses many areas of modern technology. Among them:

Aerospace Technology and Space Exploration
Flow in turbomachinery, molecular dynamics simulation of rarefied gas flow, two phase flow, supersonic combustion and propulsion, thermoacoustic refrigeration, in-situ resource utilization from space. Gravitational effects on transport phenomena, fluids and thermal processes in advance life support systems for long duration space travel, interfacial processes, g-jitter effects on microgravity flows, two phase flow in zero and reduced gravity.

Combustion and Energy
Synthetic and alternative fuels, chemical kinetic models and pollutant formation, hydrogen ignition and safety, catalytic combustion, coal combustion, Flame spread, fire research and protection, combustion in micro- and partial gravity, microgravity combustion.

Dynamics of Rotating Machinery
Forced and instability vibration of rotor/bearing/ seals systems, nonlinear rotor dynamics, torsional rotor vibration, rotor dynamic characteristics of bearings and seals (computational and experimental approach), control of rotor system dynamics, rub-impact studies on bearings and compressor/turbine blading systems. Advanced rotating machinery monitoring and diagnostics.

Engineering Design
Optimization and computer-aided design, feasibility studies of kinematic mechanisms, kinematics of rolling element-bearing geometries, mechanical control systems, experimental stress analysis, failure analysis, development of biologically inspired methodologies.

Manufacturing
Agile manufacturing work cells developed to facilitate quick change over from assembly of one object to assembly of other objects contains multiple robots, a conveyor system and flexible parts feeders.

Materials
Development of novel experimental techniques to investigate material response at elevated temperatures and high rates of deformation. Constitutive modeling of damage
evolution, shear localization and failure of advanced engineering materials. Fabrication of mechanical properties of composite materials; creep, rupture, and fatigue properties of engineering materials at elevated temperatures.

Microgravity Research
Combustion phenomena in microgravity, spacecraft fire safety.

Multiphase Flow Research

Nanotechnology
Research related to various nanotechnology applications with particular emphasis on energy conversion, generation and storage in nanostructured materials including the synthesis of polymer-based nanocomposites. Current research projects include investigation of nanocomposites for thermoelectric devices, molecular simulation of thermal transport across interfacial regions, and biomimetic research on protein-based shark gel.

Orthopaedic Engineering
Kinematics and mechanical joint dynamics of the knee, hip, ankle, and spine; dynamic stability of the human spine; mechanics of injuries; gait analysis; design and failure analysis of medical prostheses and material selection; biomechanical measurements, tools and instrumentation; mechanical properties of, and transport processes in, bone and soft tissue.

Robotics
Biologically inspired and biologically based design and control of legged robots. Dynamics, control and simulation of animals and robots.

Tribology and Seals
Time-resolved friction on nano- and micro-second time scale with applications to high speed machining and mechanics of armor penetration. Study of gas lubricated foil bearing systems with application to oil-free turbomachinery. Evaluation of advanced seal concepts and configurations for high temperature applications in gas turbine engines.

Turbomachinery
Vibration characteristics of seals and bearings and measurement of chaotic motion. Rub impact studies of blade tip/casing interactions, particle-blade/casing interactions in centrifugal pumps.

MECHANICAL AND AEROSPACE ENGINEERING (EMAE)

Course Descriptions

EMAE C100. Co-Op Seminar I for Mechanical Engineering (1)
Professional development activities for students returning from cooperative education assignments. Recommended preparation: COOP 001.

EMAE C200. Co-Op Seminar II for Mechanical Engineering (2)
Professional development activities for students returning from cooperative education assignments. Recommended preparation: COOP 002 and EMAE C100.

EMAE 172. Mechanical Manufacturing (4)
The course is taught in two sections (Graphics and Manufacturing Processes) through a series of lectures, laboratory sessions and weekly engineering workshop classes. The course aim is to provide a solid manufacturing engineering foundation. The course includes: manual and computer-aided drafting and design (CAD), primary and secondary engineering processes, engineering materials and a field trip to a local company. Laboratory sessions will provide hands-on experience using Pro/ENGINEER CAD software.

EMAE 181. Dynamics (3)
Elements of classical dynamics: particle kinematics and dynamics, including concepts of force, mass, acceleration, work, energy, impulse, momentum. Kinetics of systems of particles and of rigid bodies, including concepts of mass center, momentum, mass moment of inertia, dynamics equilibrium. Elementary vibrations. Recommended preparation: MATH 122 and PHYS 121 and ENGR 200.

EMAE 250. Computers in Mechanical Engineering (3)

EMAE 271. Kinematic Analysis and Synthesis (3)
Graphical, analytical, and computer techniques for analyzing displacements, velocities, and accelerations in mechanisms. Analysis and synthesis of linkages, cams, and gears. Laboratory projects include analysis, design, construction, and evaluation of students’ mechanisms. Recommended preparation: EMAE 181.

EMAE 282. Mechanical Engineering Laboratory I (2)
Techniques and devices used for experimental work in mechanical engineering and fluid and thermal science. Lectures on topics in the theory of experimentation. Laboratory includes typical experiments, measurements, analysis, and report writing. Recommended preparation: EMAE 181 and ENGR 225.

EMAE 283. Mechanical Engineering Laboratory II (2)
Application of techniques developed in EMAE 282 to solution of individual semester-long experimental projects, including complete report on results. Recommended preparation: EMAE 282.

EMAE 290. Computer-Aided Manufacturing (3)
A manufacturing engineering course covering a wide range of topics associated with the application of computers to the product design and manufacturing process. Topics include: Computer-aided design (CAD) using Pro/ENGINEER software, design methodology, the design/manufacturing interface, introduction to computer numerical control (CNC), manual part-programming for CNC milling and CNC turning machine tools. Significant time will be spent in both CAD and CNC laboratories. Recommended preparation: EMAE 172.

EMAE 325. Fluid and Thermal Engineering II (4)
The continuation of the development of the fundamental fluid and thermal engineering principles introduced in ENGR 225, Introduction to Fluid and Thermal Engineering. Applications to heat engines and refrigeration, chemical equilibrium, mass transport across semi-permeable membranes, mixtures and air conditioning, developing external and internal flows, boundary layer theory, hydrodynamic lubrication, the role of diffusion and convection in heat and mass transfer, radiative heat transfer and heat exchangers. Recommended preparation: ENGR 225.

EMAE 350. Mechanical Engineering Analysis (3)

EMAE 352. Thermodynamics in Energy Processes (3)
Thermodynamic properties of liquids, vapors and real gases, thermodynamic relations, non-reactive mixtures, psychometrics, combustion, thermodynamic cycles, compressible flow. Prereq: ENGR 225.

EMAE 355. Design of Fluid and Thermal Elements (3)

EMAE 356. Aerospace Design (3)
Interactive and interdisciplinary activities in areas of fluid mechanics, heat transfer, solid mechanics, thermodynamics, and systems analysis approach in design of aerospace vehicles. Projects involve devel-
oping (or improving) design of aerospace vehicles of current interest (e.g., hypersonic aircraft) starting from mission requirements to researching developments in relevant areas and using them to obtain conceptual design. Senior standing required.

EMAE 359. Aero/Gas Dynamics (3)
Review of conservation equations. Potential flow. Subsonic airfoil. Finite wing. Isentropic one-dimen-

EMAE 360. Engineering Design (3)
This is a capstone senior course focused on mechan-
ical engineering design, comprised of the following two major components, (a) advanced mechanical design analysis methods and tools, (b) a design-and-build semester team project. The advanced design analysis portion covers an introduction to elasticity theory with application to finite-element analyses, friction and wear design analysis methods, bearing and seal undertaken by teams of five persons, each team building and demonstrating its design. Prereq: ECV 310 and Senior standing required. SAGES Senior Cap

EMAE 370. Design of Mechanical Elements (3)

EMAE 372. Relation of Materials to Design (4)
The design of mechanical and structural elements considering static failure, elastic stability, residual stresses, stress concentration, impact, fatigue, creep and environmental conditions on the mechanical behavior of engineering materials. Rational approaches to materials selection for new and existing designs of structures. Laboratory experiments coordinated with the classroom lectures. Prereq: ECV 310.

EMAE 376. Aerostuctures (3)

EMAE 377. Biorobotics Team Research (3)
Many exciting research opportunities cross discipli-
mary lines. To participate in such projects, research-
ers must operate in multi-disciplinary teams. The Biorobotics Team Research course offers a unique capstone opportunity for undergraduate students to utilize skills they developed during their undergraduate experience while acquiring new teaming skills. A group of eight students form a research team under the direction of two faculty leaders. Team members are chosen from appropriate majors through interviews with the faculty. They will research a biological mechanism or principle and develop a robotic device that captures the actions of that mechanism. Although each student will cooperate on the team, they each have a specific role, and must develop a final paper that describes the research generated on their aspect of the project. Students meet once per week and two 2-hour lab periods. Initially students brainstorm ideas and identify the project to be pursued. They then acquire biological data and generate robotic designs. Both are further developed during team meetings and reports. Final oral reports and a demonstration of the robotic design occur in week 15. Offered as BIOL 377, EMAE 377, BIOL 477, and EMAE 477. SAGES Senior Cap

EMAE 378. Mechanics of Machinery I (3)
Comprehensive treatment of design analysis meth-
ods and computational tools for machine compo-
ents. Emphasis is on bearings, seals, gears, hy-
draulic drives and actuators, with applications to machine tools. Recommended preparation: EMAE 370. Offered as EMAE 378 and EMAE 478.

EMAE 379. Mechanics of Machinery II (3)
The focus of this course is Rotating Machinery Vi-
bilation, and it is comprised of four major compo-
ents: 1) modeling, 2) analyses, 3) measurement techniques, and 4) physical insights into rotor vibra-

EMAE 381. Flight and Orbital Mechanics (3)
Aircraft performance: take-off and landing, unaccel-

EMAE 382. Propulsion (3)
Energy sources of propulsion. Performance criteria. Review of one-dimensional gas dynamics. Introduc-

EMAE 387. Vibration Problems in Engineering (4)
Free and forced vibration problems in single and multi-degree of freedom damped and undamped linear systems. Vibration isolation and absorbers. Modal analysis and approximate solutions. Intro-
duction to vibration of continuous media. Noise problems. Laboratory projects to illustrate theo-
retical concepts and applications. Recommended preparation: MATH 224 and EMAE 181.

EMAE 390. Computer-Integrated Manufacturing (3)
The course is taught through a series of lectures, class discussions, student teams, and laboratory sessions. The course aim is to provide a solid understanding of the many aspects of the engineering processes and systems associated with the integration of product design through to manufacture. Laboratory sessions will provide hands-on experience using a number of Pro/ENGINEER modules to become aware of the integration of manufacturing issues. Recommended preparation: EMAE 290.

EMAE 396. Special Topics in Mechanical and Aerospace Engineering (1 - 18)
(Credit as arranged.)

EMAE 397. Independent Laboratory Research (1 - 3)
Independent research in a laboratory.

EMAE 398. Senior Project (3)
Individual or team design or experimental project under faculty supervisor. Requirements include periodic reporting of progress, plus a final oral presenta-
tion and written report. Recommended prepara-
tion: Senior standing, EMAE 360, and consent of instructor. SAGES Senior Cap

EMAE 399. Advanced Independent Laboratory Research/Design (1 - 3)
Students perform advanced independent research or an extended design project under the direct mentorship of the instructor. Typically performed as an extension to EMAE 397 or EMAE 398. Prereq: EMAE 397.

EMAE 400T. Graduate Teaching I (0)
This course will engage the Ph.D. candidate in a variety of teaching experiences that will include di-
rect contact (for example, teaching recitations and laboratories, guest lectures, office hours) as well non-contact preparation (exams, quizzes, demon-
strations) and grading activities. The teaching ex-
periences will be conducted under the supervision of the faculty member(s) responsible for coordinat-
ing student teaching activities. All Ph.D. candidates enrolled in this course sequence will be expected to perform direct contact teaching at some point in the sequence. Recommended preparation: Ph.D. student in Mechanical Engineering.

EMAE 401. Mechanics of Continuous Media (3)
Vector and tensor calculus. Stress and strain, fi-
nite strain and deformation tensors. Kinematics of continuous media, general conservation and balance laws. Material symmetry groups and observer transformation. Constitutive relations with applica-
tions to solid and fluid mechanics problems.

EMAE 402. Muscles, Biomechanics, and Control of Movement (4)
Quantitative and qualitative descriptions of the ac-
tion of muscles in relation to human movement. Introduction to rigid body dynamics and dynamics of multi-link systems using Newtonian and Lagran-
gian approaches. Muscle models with application to control of multi-joint movement. Forward and inverse dynamics of multi-joint, muscle driven systems. Dissection, observation and recitation in the anatomy laboratory with supplemental lectures concentrating on kinesiology and muscle function. Recommended preparation: EMAE 181 or equiv-

EMAE 403. Aerophysics (3)
The course introduces the physical and chemical...
EMAE 415. Introduction to Musculo-skeletal Biomechanics (3)

EMAE 424. Introduction to Nanotechnology (3)
An exploration of emerging nanotechnology research. Lectures and class discussion on 1) nanostructures: superlattices, nanowires, nanotubes, quantum dots, nanoparticles, nanocomposites, proteins, bacteria, DNA; 2) nanoscale physical phenomena: mechanical, electrical, chemical, thermal, biological, optical, magnetic; 3) nanofabrication: bottom up and top down methods; 4) characterization: microscopy, property measurement techniques; 5) devices/applications: electronics, sensors, actuators, biomedical, energy conversion. Topics will cover interdisciplinary aspects of the field. Offered as ECNS 424 and EMAE 424.

EMAE 453. Advanced Fluid Dynamics I (3)
Derivation and discussion of the general equations for conservation of mass, momentum, and energy using tensors. Several exact solutions of the incompressible Navier-Stokes equations. Kinematics and dynamics of inviscid, incompressible flow including free streamline theory developed using vector, complex variable, and numerical techniques.

EMAE 454. Advanced Fluid Dynamics II (3)

EMAE 457. Combustion (3)
Chemical kinetics and thermodynamics: governing conservation equations for chemically reacting flows; laminar premixed and diffusion flames; turbulent flames; ignition; extinction and flame stabilization; detonation; liquid droplet and solid particle combustion; flame spread, combustion-generated air pollution; applications of combustion processes to engines, rockets, and fire research.

EMAE 458. Propulsion (3)
Energy sources of propulsion. Momentum theorems and performance criteria. Air breathing systems and their components: chemical rockets—liquid and solid propellant; nuclear rockets—solid core, liquid core and gaseous core; rocket heat transfer and heat protection; electric propulsion—electrothermal, electrostatic and plasma thrusters; thermonuclear propulsion. Recommended preparation: Consent of instructor.

EMAE 459. Advanced Heat Transfer (3)
Analysis of engineering heat transfer from first principles including conduction, convection, radiation, and combined heat and mass transfer. Examples of significance and role of analytic solutions, approximate methods (including integral methods) and numerical methods in the solution of heat transfer problems. Recommended preparation: EMAE 453.

EMAE 460. Theory and Design of Fluid Power Machinery (3)
Fluid mechanic and thermodynamic aspects of the design of fluid power machinery such as axial and radial flow turbomachinery, positive displacement devices and their component characteristics. Recommended preparation: Consent of instructor.

EMAE 471. Design Methods (3)
An advanced course on design methodologies. Conceptualization, preliminary design, detail design, and manufacturing. Failure analysis, materials selection, methods of design optimization, and current approaches in computer-aided design. Recommended preparation: EMAE 360.

EMAE 477. Biorobotics Team Research (3)
Many exciting research opportunities cross disciplinary lines. To participate in such projects, researchers must operate in multi-disciplinary teams. The Biorobotics Team Research course offers a unique capstone opportunity for undergraduate students to utilize skills they developed during their undergraduate experience while acquiring new teaming skills. A group of eight students form a research team under the direction of two faculty leaders. Team members are chosen from appropriate majors through interviews with the faculty. They will research a biological mechanism or principle and develop a robotic device that captures the actions of that mechanism. Although each student will cooperate on the team, they each have a specific role, and must develop a final paper that describes the research generated on their aspect of the project. Students meet for one class period per week and two 2-hour lab periods. Initially students brainstorm ideas and identify the project to be pursued. They then acquire biological data and generate robotic designs. Both are further developed during team meetings and reports. Final oral reports and a demonstration of the robotic device occur in week 15. Offered as BIOL 377, EMAE 377, BIOL 477, and EMAE 477. SAGES Senior Cap

EMAE 478. Mechanics of Machinery I (3)
Comprehensive treatment of design analysis methods and computational tools for machine components. Emphasis is on bearings, seals, gears, hydraulic drives and actuators, with applications to machine tools. Recommended preparation: EMAE 370. Offered as EMAE 378 and EMAE 478.

EMAE 479. Mechanics of Machinery II (3)
The focus of this course is Rotating Machinery Vibration, and it is comprised of four major components: 1) modeling, 2) analyses, 3) measurement techniques, and 4) physical insights into rotor vibration phenomena. Recommended preparation: EMAE 181. Offered as EMAE 379 and EMAE 479.

EMAE 480. Fatigue of Materials (3)

EMAE 481. Advanced Dynamics I (3)

EMAE 486. Stress Waves in Solids (3)

EMAE 487. Vibration Problems in Engineering (3)

EMAE 489. Robotics I (3)

EMAE 500T. Graduate Teaching II (0)
This course will engage the Ph.D. candidate in a variety of teaching experiences that will include direct contact (for example, teaching, recitations and laboratories, guest lectures, office hours) as well as non-contact preparation (exams, quizzes, demonstration) and grading activities. The teaching experience will be conducted under the supervision of the faculty member(s) responsible for coordinating student teaching activities. All Ph.D. candidates enrolled in this course sequence will be expected to perform direct contact teaching at some point in the sequence. Recommended preparation: Ph.D. student in Mechanical Engineering.
EMAE 540. Advanced Dynamics II (3)

EMAE 552. Viscous Flow Theory (3)
Compressible boundary layer theory. Blowing and suction effects. Three-dimensional flows; unsteady flows. Introduction to real gas effects. Recommended preparation: EMAE 454.

EMAE 554. Turbulent Fluid Motion (3)

EMAE 557. Convection Heat Transfer (3)
Energy equation of viscous fluids. Dimensional analysis. Forced convection; heat transfer from non-isothermal and unsteady boundaries, free convection and combined free and forced convection; stability of free convection flow; thermal instabilities. Real gas effects, combined heat and mass transfer; ablation, condensation, boiling. Recommended preparation: EMAE 453 and EMAE 454.

EMAE 558. Conduction and Radiation (3)
Fundamental law, initial and boundary conditions, basic equations for isotropic and anisotropic media, related physical problems, steady and transient temperature distributions in solid structures. Analytical, graphical, numerical, and experimental methods for constant and variable material properties. Recommended preparation: Consent of instructor.

EMAE 570. Computational Fluid Dynamics (3)

EMAE 587. Experimental Stress Analysis (3)

EMAE 600T. Graduate Teaching III (0)
This course will engage the Ph.D. candidate in a variety of teaching experiences that will include direct (for example, teaching recitations and laboratories, guest lectures, office hours) as well non-contact preparation (exams, quizzes, demonstrations) and grading activities. The teaching experience will be conducted under the supervision of the faculty member(s) responsible for coordinating student teaching activities. All Ph.D. candidates enrolled in this course sequence will be expected to perform direct contact teaching at some point in the sequence. Recommended preparation: Ph.D. student in Mechanical Engineering.

EMAE 601. Independent Study (1 - 18)
EMAE 651. Thesis M.S. (1 - 18)
EMAE 657. Experimental Techniques in Fluid and Thermal Engineering Sciences (3-0-4)
Exposure to experimental problems and techniques provided by the planning, design, execution, and evaluation of an original project. Lectures: review of the measuring techniques for flow, pressure, temperature, etc.; statistical analysis of data: information theory concepts of instrumentation; electrical measurements and sensing devices; and the use of digital computer for data acquisition and reduction. Graduate standing or consent of instructor required.

EMAE 689. Special Topics (1 - 18)
EMAE 701. Dissertation Ph.D. (1 - 18)
Prepr: Pre-doctoral research consent or advanced to Ph.D. candidacy milestone.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Aerospace Engineering

First Year Class-Lab-Credit Hours
Fall
CHEM 111 Properties and Structure of Matter I (4-0-4)
MATH 121 Calculus for Science and Engineering I* (4-0-4)
PHYS 121 General Physics I ± (4-0-4)
ENGR 131 Elementary Computer Programming ±* (2-2-3)
PHED 101 Physical Education Activities (2-2-3)
FSCC 100 First Seminar (3-0-3)
Total (17-5-18)

Spring
MATH 122 Calculus for Science and Engr. II * (4-0-4)
PHYS 122 General Physics II ± (4-0-4)
ENGR 145 Chemistry of Materials ± (4-0-4)
University Seminar * (3-0-3)
PHED 102 Physical Education Activities (0-3-0)
Total (15-3-15)

Second Year
Fall
EMAE 172 Mechanical Manufacturing * (3-3-4)
EMAE 181 Dynamics * (3-0-3)
ENGR 200 Introduction to Mechanics ± (3-0-3)
MATH 223 Calculus for Science & Engineering III + (3-0-3)
EMAE 250 Computers in Mechanical Engineering + (2-2-3)
Total (14-5-16)

Spring
University Seminar (3-0-3)
ENGR 210 Electronic Circuits ±* (3-2-4)
PHYS 221 General Physics III + (3-0-3)
MATH 224 Elementary Differential Equations ± (3-0-3)
ENGR 225 Introduction to Fluid & Thermal Engr * (4-0-4)
Total (16-2-17)

Third Year Class-Lab-Credit Hours
Fall
Humanities or Social Science elective (3-0-3)
EMAE 325 Fluid and Thermal Engineering II (4-0-4)
EMAE 282 Mechanical Engineering Lab I (1-3-2)
ECIV 310 Strength of Materials ± (3-0-3)
EMAE 350 Mechanical Engineering Analysis (3-0-3)
Total (14-3-15)

Spring
Humanities or Social Science elective (3-0-3)
EMAE 283 Mechanical Engineering Laboratory II (1-3-2)
EMAE 359 Aero/Gas Dynamics (3-0-3)
EMAE 376 Aerostructures (3-0-3)
Open elective ± (3-0-3)
Technical elective ± (3-0-3)
Total (16-3-17)

Fourth Year
Fall
Humanities or Social Science elective (3-0-3)
EECS 246 Signals and Systems (3-2-4)
EMAE 381 Flight and Orbital Mechanics (3-0-3)
EMAE 355 Design of Fluid and Thermal Elements (3-0-3)
EMAE 360 Engineering Design (3-0-3)
Total (15-2-16)

Spring
Humanities or Social Science elective (3-0-3)
EMAE 356 Aerospace Design (3-0-3)
EMAE 382 Propulsion (3-0-3)
EMAE 398 Senior Project ± (1-6-3)
ENGL 398N/ENGR398 Professional Communication ± (2-1-3) (Dept. Seminar)
Total (13-6-17)

Hours required for graduation: 129
b. Engineering Core Course
d. Selected students may be invited to take PHYS 123-124, General Physics I, II-Honors (3) in place of PHYS 121-122, General Physics I, II (4).
e. May be taken fall or spring semester.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Mechanical Engineering

First Year Class-Lab-Credit Hours
Fall
CHEM 111 Properties and Structure of Matter I (4-0-4)
MATH 121 Calculus for Science and Engineering I* (4-0-4)
PHYS 121 General Physics I ± (4-0-4)
ENGR 131 Elementary Computer Programming ±* (2-2-3)
PHYS 122 General Physics II (4-0-4)
PHYS 145 The Chemistry of Materials (4-0-4)
PHED 102 Physical Education Activities (0-3-0)

Total (15-3-15)

Second Year
Fall
University Seminar (3-0-3)
ENGR 225 Introduction to Fluid & Thermal Engr (3-0-3)
MATH 224 Elementary Differential Equations (3-0-3)

Total (13-6-15)

Spring
Open elective (3-0-3)
EAE 181 Dynamics (3-0-3)
MATH 224 Elementary Differential Equations (3-0-3)
ENGR 225 Introduction to Fluid & Thermal Engr (4-0-4)
Science elective (3-0-3)

Total (16-0-16)

Third Year Class-Lab-Credit Hours
Fall
Humanities or Social Science elective (3-0-3)
ENGR 282 Mechanical Engineering Lab I (1-3-2)
ECE 310 Strength of Materials (3-0-3)
EAE 350 Mechanical Engineering Analysis (3-0-3)

Total (14-3-15)

Spring
Humanities or Social Science elective (3-0-3)
ENGR 210 Electronic Circuits (3-2-4)
EAE 271 Kinematic Analysis and Synthesis (2-2-3)
ENGR 283 Mechanical Engineering Laboratory II (1-3-2)
EAE 370 Design of Mechanical Elements (3-0-3)
Technical elective (3-0-3)

Total (15-7-18)

Fourth Year
Fall
Humanities or Social Science elective (3-0-3)
EECS 246 Signals and Systems (3-2-4)
EAE 355 Design of Fluid and Thermal Elements (3-0-3)
EAE 360 Engineering Design (3-0-3)
OPRE 345 Engineering Economics and Decision Theory (3-0-3)

Total (15-2-16)

Spring
Humanities or Social Science elective (3-0-3)
Technical elective (3-0-3)
EAE 398 Senior Project (1-6-3)
ENGL 398N Professional Communication (2-1-3) (Dept. Seminar)
Technical elective (3-0-3)

Total (13-6-15)

Hours required for graduation: 129
b. Engineering Core Course
d. Selected students may be invited to take PHYS 123-124, General Physics I, II-Honors (3) in place of PHYS 121-122, General Physics I, II (4).
e. May be taken fall or spring semester.

Technical Electives
By Program

AEROSPACE ENGINEERING
- EAE 271 Kinematic Analysis & Synthesis
- EAE 370 Design of Mechanical Elements
- EAE 352 Energy Processes in Thermodynamics

MECHANICAL ENGINEERING
- EAE 352 Energy Processes in Thermodynamics
- EAE 356 Aerospace Design
- EAE 359 Aero/Gas Dynamics
- EAE 376 Aerostructures
- EAE 381 Flight and Orbital Mechanics
- EAE 382 Propulsion

Both Programs
- EAE 372 Relation of Materials to Design
- EAE 378 Mechanics of Machinery I
- EAE 387/487 Vibration Problems in Engr.
- Technical electives

AEROSPACE
- EAE 356 Aerospace Design
- EAE 359 Aero/Gas Dynamics
- EAE 376 Aerostructures
- EAE 381 Flight and Orbital Mechanics
- EAE 382 Propulsion

BIOMECHANICS
- EBME 201 Physiology-Biophysics I
- EBME 202 Physiology-Biophysics II
- EBME 306 Introduction to Biomedical Materials
- EBME 309 Modeling of Biomedical Systems
- EBME 310 Principles of Biomedical instrumentation
- EAE 366 Biologically Inspired Robotics
- EAE 402 Muscles, Biomechanics and Control of Movement
- EAE 415 Introduction to Musculo-skeletal Biomechanics

Digital Electronics and Control
- EECS 245 Electronic Circuits
- EECS 246 Circuits, Signals & Systems II
- EECS 304 Control Engr. I
- EECS 281 Logic Design and Computer Organization
- EECS 382 Microprocessor-based Design

Dynamics and Vibration
- EAE 378/478 Mechanics of Machinery I
- EAE 387/487 Vibration Problems in Engineering
- EAE 379/479 Mechanics of Machinery II
- EAE 481 Advanced Dynamics I

Fluid and Thermal Engineering
- EAE 352 Energy Processes in Thermodynamics
- EAE 359 Aero/Gas Dynamics
- EAE 424 Intro to Nanotechnology
- EAE 453 Advanced Fluid Dynamics I
- EAE 460 Theory & Design of Fluid Power Machinery

Fluid and Thermal Sciences
- EECS 403 Aerophysics
- EAE 453 Advanced Fluid Dynamics I
- EAE 454 Advanced Fluid Dynamics II
- EAE 457 Combustion

Mathematics and Statistics
- MATH 323 Advanced Calculus
- MATH 324 Introduction to Complex Analysis
- MATH 331 Computational Linear Algebra
- STAT 312 Statistics for Engr & Sci.
- STAT 333 Uncertainty in Engr & Sci.

Materials
- EMSE 301 Fundamentals of Materials Processing
- EMSE 303 Mechanical Behavior of Materials
- EMSE 307 Foundry Metallurgy
- EMSE 313 Engineering Applications of Materials
- EAE 473 Mechanical Behavior of Composite Materials
- EAE 480 Fatigue of Materials

Mechanical Design
- EAE 372 Relations of Materials to Design
- EAE 471 Design Methods
- EAE 472 Computers, Optimization and Design

Mechanical Manufacturing
• EMAE 290 Computer Aided Manufacturing
• EMAE 390 Advanced Manufacturing
• EECS 350 Production and Operational Systems
• EECS 360 Manufacturing and Integrated Systems
• OPMT 350 Operations Management
• OPMT 352 Design of Production Systems
• OPRE 201 Introduction to Operations Research I

SOLID MECHANICS
• ECIV 220 Structural Analysis I
• ECIV 221 Structural Design I
• EMAE 372 Relation of Materials to Design
• EMAE 376 Aerostructures
• EMAE 378/478 Mechanics of Machinery I
• ECIV 410 Advanced Strength of Materials
• EMAE 473 Mechanical Behavior of Composite Material
• EMAE 480 Fatigue of Materials

POLYMER ENGINEERING AND PROCESSING
• EMAC 270 Intro to Polymer Sci and Engr.
• EMAC 276 Polymer Properties and Design
• EMAC 375 Intro to Fundamentals and Practices of Rheology
• EMAC 376 Polymer Engineering
• EMAC 377 Polymer Processing
• EMAC 372 Polymer Processing and Testing Laboratory
The College of Arts and Sciences combines a history of educational excellence with a commitment to innovation and discovery. Building on a 173-year-old tradition, the College traces its origins to several predecessor institutions, including Adelbert College, Flora Stone Mather College, Cleveland College, Western Reserve College, and the Case Institute of Technology.

Today, the College offers educational and research programs in the arts, humanities, mathematics and natural sciences, and social sciences. It comprises 22 academic departments and 34 interdisciplinary programs and centers.

**BRIEF HISTORY**

Western Reserve College, the earliest of our predecessor institutions, was founded in 1826 in Hudson, Ohio, about 26 miles southwest of Cleveland. In 1882 the college moved to Cleveland, where it formed the basis for Western Reserve University. The institution expanded to include several professional and graduate schools in addition to its liberal arts programs. It also served as a magnet for other artistic, cultural, educational, medical, and scientific organizations, now its neighbors in the extraordinary setting known as University Circle.

Central to the heritage of the college are the traditions of the programs that preceded it: Adelbert College, as the men's undergraduate unit of Western Reserve University was known after the move to Cleveland; Flora Stone Mather College, initially founded in 1888 as the Cleveland College for Women; and Cleveland College, founded in 1925 in downtown Cleveland to serve part-time and adult students. These three units, each with a distinguished history of scholarship and achievement, were brought together in 1972 under the revived name of “Western Reserve College.” The College took its present form in 1992, when undergraduate and graduate programs and research in the arts, humanities, and social sciences were united with those in the physical sciences to form the College of Arts and Sciences.

Today, the college continues to benefit from its participation in several of the most important developments in higher education since the early 19th century. Examples include: *Engagement in issues of social justice.* Western Reserve College’s early years in Hudson saw debates between two groups, each opposing slavery. Colonizationists believed that liberated slaves should be resettled in Africa; abolitionists did not favor such a policy. After long and bitter conflict, supporters of the abolitionist movement carried the day.

*Emergence of science.* The college in Hudson was home to early and distinguished programs in astronomy and mathematics. Later, in 1887, Professor Edward Morley collaborated with Professor Albert Michelson of the Case School of Applied Science in a series of experiments that remain among the most significant in the field of physics.

*Education of women.* In the 1850s, the college’s Cleveland-based Department of Medicine awarded six of the first seven medical degrees granted to women in this country. The founding of the College for Women in 1888 was only the second instance of a separate “coordinate” college for women at a major university.

*Demographic and technological change.* Following World War II, enrollment in Cleveland College swelled with returning veterans. During this period, the introduction of new technologies and fields of study drove increasing demand for advanced education and research in a wide range of disciplines.

**ADMINISTRATION**

Cyrus C. Taylor, Ph.D.
(Massachusetts Institute of Technology)  
Dean and Albert A. Michelson Professor in Physics

Molly W. Berger, Ph.D.
(Case Western Reserve University)  
Associate Dean

Stephen E. Haynesworth, Ph.D.
(Case Western Reserve University)  
Associate Dean

Jill E. Korbin, Ph.D.
(University of California, Los Angeles)  
Associate Dean

Peter J. Whiting, Ph.D.
(University of California, Berkeley)  
Associate Dean

Kenneth L. Klika, M.S.
(Case Western Reserve University)  
Assistant Dean, Facilities Management

Thomas Neville, M.A.
Assistant Dean, Development and External Relations  
(Marquette University)
American Studies
Asian Studies
Baker-Nord Center for the Humanities
Center for Cognition and Culture
Center for Education and Research in Cosmology and Astrophysics
Center for Policy Studies
Center for Research on Tibet
Center for Science and Mathematics Education
Center for the Study of Writing
Childhood Studies
Dittrick Medical History Center
Engineering Physics
Environmental Studies
Ernest B. Yeager Center for Electrochemical Sciences
Ethnic Studies
Evolutionary Biology
French and Francophone Studies
German Studies
Gerontological Studies
History and Philosophy of Science
International Studies
Japanese Studies
Judaic Studies
Mathematics and Physics
Natural Sciences
Pre-Architecture
Public Policy
Samuel Rosenthal Center for Judaic Studies
Schubert Center for Child Studies
Science and Technology Entrepreneurship
Skeletal Research Center
Teacher Licensure
Women’s and Gender Studies
World Literature

UNDERGRADUATE PROGRAMS

Undergraduates in the college can choose a major or minor from almost 60 programs, design their own courses of study, or enroll in integrated bachelor's/master's degree programs. The university offers great flexibility to students wishing to pursue double majors in disparate fields, such as physics and studio art. In addition, students from all fields are eligible to participate in the college’s vibrant performing arts programs, including music and dance ensembles.

Beyond their course work, students are encouraged to conduct independent research within the college, in other units of the university, or in the scientific and cultural institutions of University Circle. They also have opportunities to engage in service learning projects and internships in research institutions, businesses, cultural institutions, and governmental agencies. With funding from the college’s Experiential Learning Fellowship programs, undergraduates may design and carry out ambitious research projects in Cleveland or across the globe.

GRADUATE PROGRAMS

The college’s graduate offerings include doctoral programs in 19 fields. Through a partnership with The Cleveland Play House, the Department of Theater and Dance has created one of the nation’s preeminent master’s programs in acting. The Science and Technology Entrepreneurship Program (STEP) offers a three- or four-semester sequence of courses leading to a Master of Science degree in biotechnology, chemistry, mathematics, statistics, or physics.

ALUMNI/SENIOR AUDIT

712 Crawford Hall
www.case.edu/artsci/audit
Phone: 216-368-4413
Molly W. Berger, Associate Dean
E-mail: audit@case.edu

The Alumni/Senior Audit is a program sponsored by the College of Arts and Sciences that enables Case Western Reserve University alumni of all ages and members of the community age 65 and older to audit College of Arts and Sciences courses for 10 percent of regular tuition. Audit enrollment is limited to five percent of Case Western Reserve student enrollment and is subject to approval by the faculty member teaching a given course. Auditors do not receive a grade or credit. Courses taken through the audit do not appear on existing transcripts, nor do they generate transcripts for students new to the university. Complete information is available on the Alumni/Senior Audit Web site. Registration materials must be submitted to the Arts and Sciences Office of the Dean one week before classes begin. The Alumni/Senior Audit is limited to courses taught in the College of Arts and Sciences.

AMERICAN STUDIES PROGRAM

202 Mather House
www.case.edu/artsci/hsty/amst
Phone: 216-368-5413
Renée M. Sentilles, Director
E-mail: renee.sentilles@case.edu

The American Studies program is designed to give students the flexibility to cross traditional intellectual boundaries in order to develop perspectives on American life that are more expansive and critical than those normally found within the limits of a single discipline. The interdisciplinary approach makes available a wide variety of materials, methods, theories, and themes to use as tools to investigate the complexities of the American past and present. The process of investigation is as important as the outcome, for it teaches students to analyze with breadth as well as depth, to think creatively as well as critically.

American Studies will enrich any primary major and offers interdepartmental concentrations to students with interests in areas such as Women’s Studies. Students will take required core courses and work with the director to select elective courses and create their own approach to the major.

What can you do with a degree in American Studies? Just about anything. The interdisciplinary nature of American Studies encourages initiative and creative thinking, giving our majors an advantage in later life. American Studies provides excellent preparation for careers in a variety of fields, including but not limited to law, journalism, social work, museum studies, teaching, and communications.

PROGRAM FACULTY

Renée M. Sentilles, Ph.D.
Associate Professor of History

Henry Adams, Ph.D.
Professor of Art History and Art

Mary E. Davis, Ph.D.
Associate Professor of Music

Robert Spadoni, Ph.D.
Associate Professor of English

John Grabowski, Ph.D.
Krieger-Mueller Associate Professor in Applied History

Daniel Cohen, Ph.D.
Associate Professor of History

Daniel Goldmark, Ph.D.
Associate Professor of Music
UNDERGRADUATE PROGRAMS

Major
(30 credit hours)

Required courses (9 hours):
AMST 117, HSTY 112, and AMST 390
Elective Courses (21 hours):

Students are to choose seven electives, in two areas of concentration. An area of concentration consists of either 1) courses in a single department, or 2) courses from more than one department focusing on a theme or issue such as technology and culture, urban studies, literature and society, etc.

Please note that any course in the College’s curriculum that focuses on the United States and its cultures is eligible to be counted towards the American Studies major, if approved by the program director.

PROGRAM HONORS

The faculty nominate majors with a cumulative average of 3.85 in American Studies courses for program honors. Candidates present to the faculty a term paper or project of outstanding quality as the basis for the award of honors.

Minor

A minor consists of five courses: the introductory class and four electives that focus on a significant period, problem area, or aspect of American civilization. The rationale for selecting such a minor program, and its relation to the student’s career or intellectual interests, must be discussed with and approved by the minor advisor.

COURSE DESCRIPTIONS

AMST 117. Introduction to American Studies (3)

This course is designed to introduce students to the interdisciplinary field of American Studies while also empowering them to use the tools and perspectives of several disciplines, such as history, literature, art history, and anthropology. This course aims to introduce students to the various disciplines that constitute American Studies while paying special attention to the ways in which these disciplines can work together to illuminate the study of American cultures, past and present. Students will combine different methodologies in the process of completing assignments designed to make use of a variety of University Circle institutions.

For the purposes of this course, biography is treated as a constructed genre that comes in a variety of forms, including autobiography, biographical novels, oral histories, and film. The class will discuss how certain biographies have created archetypal American identities, and how gender/race/class/historical context, etc., have affected the writing and reading of biography and restructured notions of identity. Offered as AMST 117 and HSTY 117.

AMST 270. American Art and Culture Before 1900 (3)

Survey of the development of American art from colonial times to the present which explores how art has expressed both American values and American anxieties. Painting is emphasized, but the course also considers architecture, the decorative arts, film, literature, and music. Offered as AMST 270 and ARTH 270.

AMST 271. American Art and Culture: The Twentieth Century (3)

Survey of the development of American art from 1900 to the present (and the future) which will explore how art has expressed both American values and American anxieties. Painting will be emphasized, but the course will also consider architecture, the decorative arts, film, literature, and music. Offered as AMST 271 and ARTH 271.

AMST 327. American Theater and Playwrights (3)

Designed to provide students an overview of the development of theater in the United States and to familiarize them with the work and themes of selected American playwrights. Offered as AMST 327 and THTR 327.

AMST 390. Independent Study (1–3)

AMST 431. (3)

DEPARTMENT OF ANTHROPOLOGY

238 Mather Memorial Building
www.case.edu/artsci/anth
Phone: 216-368-2264; Fax: 216-368-5334
Lawrence Greksa, Chair
E-mail: lawrence.greksa@case.edu

Anthropology, with its broad comparative approach, is in a strategic position to contribute to the identification and resolution of many of the problems, both local and global, that challenge society today. The Department of Anthropology offers programs leading to both undergraduate (Bachelor of Arts) and graduate (Master of Arts, Doctor of Philosophy) degrees. In addition, the department offers joint graduate degree programs with Case Western Reserve University School of Medicine (M.A. or Ph.D./M.P.H. and M.D./M.A. or Ph.D.) and with the Frances Payne Bolton School of Nursing (M.S.N./M.A.). Students graduating with a B.A. in anthropology normally must continue for the M.A. or Ph.D. degree if they are interested in working as anthropologists.

DEPARTMENT FACULTY

Lawrence P Greksa, Ph.D.
(Pennsylvania State University)
Professor and Chair

Physical anthropology; human biology; growth and development; nutrition; modernization; Polynesia; Andes; Old Order Amish

Eileen Anderson-Fye, Ed.D.
(Princeton University)
Assistant Professor; Associate Director, Schubert Center for Child Studies

Psychological and medical anthropology; culture, gender, and human development; anthropology of adolescence; globalization; immigration; mental health; eating and body image disorders; child abuse and trauma; adolescent psychiatric medication usage; person-centered ethnography; mixed methods; Belize; Belizian immigrants in the United States

Cynthia Beall, Ph.D.
(Pennsylvania State University)
Sarah Idell Pyle Professor; Co-Director, Center for Research on Tibet; Director, Evolutionary Biology Program

Psychological and medical anthropology; adaptation to high-altitude hypoxia on the Andean, Tibetan, and East African plateaus

Atwood D. Gaines, Ph.D., M.P.H.
(University of California, Berkeley; University of California, Berkeley, School of Public Health)
Professor

Medical and psychiatric anthropology; bioethics; aging; cultural studies of science; social identity; United States; the Mediterranean

Melvyn C. Goldstein, Ph.D.
(Pennsylvania State University)
Professor and Chair

Physical anthropology; human biology; growth and development; nutrition; modernization; Polynesia; Andes; Old Order Amish

Lee D. Hoffer, Ph.D., M.P.E.
(University of Colorado, Denver; Washington University School of Medicine)
Assistant Professor

Cultural and medical anthropology; drug addiction; psychiatric epidemiology; ethnographic research methods; complex systems; computational modeling; economic anthropology; United States
Adjunct Assistant Professor
(New School University)
Sharon Dean, Ph.D.
Cultural and social anthropology; art and aesthetics in cross-cultural perspective; Amazonian ethnology; Latin American studies

Adjunct Assistant Professor
(Federal University of Rio Janeiro)
Katia Almeida, Ph.D.
Cognitive archaeology; prehistory of eastern North America; prehistoric social organization; Shawnee ethnohistory

Adjunct Faculty
Marc Abramiuk, Ph.D.
(University College London)
Adjunct Assistant Professor
Cognitive archaeology; Maya

Katia Almeida, Ph.D.
(Federal University of Rio Janeiro)
Adjunct Assistant Professor
Cultural and social anthropology; art and aesthetics in cross-cultural perspective; Amazonian ethnology; Latin American studies

Sharon Dean, Ph.D.
(New School University)
Adjunct Assistant Professor
Photography and anthropology; Great Basin and California basketry; West Africa

N’omi Greber, Ph.D.
(Case Western Reserve University)
Adjunct Associate Professor; Curator of Archaeology, Cleveland Museum of Natural History
Computer and remote sensing applications; early/middle Woodland; eastern U.S. archaeology; prehistory of eastern North America; prehistoric social organization; Shawnee ethnohistory

Yohannes Haile-Selassie, Ph.D.
(University of California, Berkeley)
Adjunct Assistant Professor; Curator and Head of Physical Anthropology, Cleveland Museum of Natural History
Human evolution

Joseph Hannibal, Ph.D.
(Kent State University)
Adjunct Assistant Professor; Curator of Invertebrate Paleontology, Cleveland Museum of Natural History
Cultural geology

Bruce Latimer, Ph.D.
(Kent State University)
Adjunct Associate Professor; Associate Professor of Anatomy, School of Medicine
Biological anthropology; Plio-Pleistocene hominin evolution; comparative primate anatomy; biomechanics of locomotor system

Ellen S. Lazarus, Ph.D.
(Case Western Reserve University)
Adjunct Assistant Professor; MetroHealth Medical Center
Sociocultural and medical anthropology; maternal and child health; gender, ethnicity and social class; medical ethics and education; urban anthropology; longitudinal reproductive patterns of childbirth including birth outcomes; family planning and patient assessment of perinatal health care

Brian Redmond, Ph.D.
(Indiana University)
Adjunct Associate Professor; Museum Director of Science and Curator and Head of Archaeology, Cleveland Museum of Natural History
North American prehistory; Eastern Woodland settlement patterns; ceramic analysis; museum archaeology

Scott Simpson, Ph.D.
(Kent State University)
Adjunct Associate Professor; Associate Professor of Anatomy, School of Medicine
Biological anthropology; Plio-Pleistocene hominin evolution

Medical Anthropologists in Other Departments
Patricia A. Marshall, Ph.D.
(University of Kentucky)
Adjunct Associate Professor; Associate Professor of Bioethics, School of Medicine
HIV and AIDS; bioethics and research; cross-cultural issues

Isabel Parraga, Ph.D.
(Case Western Reserve University)
Adjunct Associate Professor; Associate Professor of Nutrition, School of Medicine
Nutritional anthropology; international nutrition; nutrition and growth; maternal and child nutrition; schistosomiasis and growth and nutrition; public health nutrition

UNDERGRADUATE PROGRAMS

Majors
The undergraduate major requires a minimum of 30 semester hours in anthropology. The undergraduate program provides a cross-cultural perspective on human behavior, culture, and biology. Students study other cultures as well as their own. Students may choose from four major concentrations, or may consult with the department to tailor the major to their individual interests and goals.

(1) The General Anthropology Concentration
The General Anthropology Concentration provides training in three subdisciplines of anthropology. The first, sociocultural anthropology, emphasizes relationships among socioeconomic institutions, cultural ecology, health and medicine, religion and symbolism, individual psychological variables, and language. The second, physical anthropology, emphasizes human ecology and adaptability, human growth and development, nutritional adaptation, epidemiology, and human and nonhuman primate evolution. The third, archaeology, deals with the long sequences of independent sociocultural, technological, and ecological evolution that have taken place under diverse conditions.

(2) The Health Science-Oriented Anthropology Concentration
The Health Science-Oriented Anthropology Concentration builds upon the department’s expertise in medical anthropology. Students learn about the three subdisciplines discussed above, but with a focus on their relationship to physical and mental health, illness, disease, and medicine.

(3) The Physical Anthropology Concentration
The Physical Anthropology Concentration deals with the biological nature of humans past and present. Physical anthropologists look beyond purely biological phenomena to
understand how biology, behavior, and environment interact. Most course work is in the subdiscipline of human biology, which seeks to understand those interactions by studying physiology, genetics, nutrition, and epidemiology in modern human populations throughout the world. But the concentration also provides training in paleoanthropology, which documents the biological history of humans and, in conjunction with archaeology, analyzes those interactions for past humans.

(4) The Archaeology Concentration focuses on the customs and daily life of people who lived in the past. Anthropologists excavate and analyze the material remains of the sites of human occupation. At the same time, archaeological research seeks to understand the evolution of culture and society by determining how and why changes in human society have occurred in the past.

**GENERAL ANTHROPOLOGY CONCENTRATION**
- ANTH 102 and 103
- ANTH 319
- One course dealing with a geographic area (e.g., ANTH 331, 341, 352, 353, or 357)
- Approved anthropology electives: 18 semester hours

**HEALTH SCIENCE-ORIENTED ANTHROPOLOGY CONCENTRATION**
- ANTH 102, 103, and 215
- ANTH 319
- One course dealing with a geographic area (e.g., ANTH 331, 341, 352, 353, or 357)
- At least three courses dealing with health/illness-related topics (e.g., ANTH 301, 302, 304, 306, 309, 313, 317, 318, 323, 326, 335, 337, 351, 359, 365, 369, 371, 376, 393, or 397)
- Approved anthropology electives: 6 semester hours

**PHYSICAL ANTHROPOLOGY CONCENTRATION**
- ANTH 102 and 103
- ANTH 319
- One course dealing with a geographic area (e.g., ANTH 331, 341, 352, 353, or 357)
- At least three courses dealing with physical anthropology (e.g., 301, 302, 323, 367, 369, 366D, 375, 377, 378, 383, 393, 394, 396, 397)
- Approved anthropology electives: 9 semester hours

**ARCHAEOLOGY CONCENTRATION**
- ANTH 102, 103, and 107
- ANTH 319
- One course dealing with a geographic area (e.g., ANTH 202, 331, 341, 352, 353, or 357)
- Three approved archaeology courses (e.g., ANTH 202, 321, 324, 330, 331, 333, 399, summer fieldwork)
- Two approved anthropology electives: 6 semester hours

**Departmental Honors**
This program is open to qualified majors in anthropology who have completed 15 hours of anthropology with a 3.25 GPA and who have an overall 3.0 GPA. Students should apply for the program in the fall semester of their junior year and, if approved, register for ANTH 391 and 392, Honors Tutorial, in the spring of their junior year and fall of their senior year.

Honors students are required to undertake a research project under the supervision of one or more faculty members and to present an acceptable research paper in the fall semester of their senior year. Students interested in the program should contact the department’s undergraduate advisor.

**Integrated Graduate Studies**
The Department of Anthropology participates in the Integrated Graduate Studies program. Interested students should note the general requirements and the admission procedures for the Integrated Graduate Studies program in the Undergraduate Studies section of this bulletin and may consult the department for further information.

**Minors**
The department offers four minor emphases in anthropology: a general anthropology emphasis, an archaeology emphasis, and a physical anthropology emphasis. All require a minimum of 15 semester hours in anthropology.

**GENERAL ANTHROPOLOGY MINOR**
- ANTH 102 and 103
- One course dealing with a geographic area (e.g., ANTH 331, 341, 352, 353, or 357)
- Two approved electives: 6 semester hours

**PHYSICAL ANTHROPOLOGY MINOR**
- ANTH 102 and 103
- One course dealing with a geographic area (e.g., ANTH 331, 341, 352, 353, or 357)
- Two approved electives: 6 semester hours

**ARCHAEOLOGY MINOR**
- ANTH 102, 103, and 107
- One course dealing with a geographical area (e.g., ANTH 331, 341, 352, 353, or 357)
- One approved archaeology elective: ANTH 202, 321, 330, 331, 333, 399, summer fieldwork

**GRADUATE PROGRAMS**
The Department of Anthropology offers graduate programs leading to the Master of Arts and Doctor of Philosophy degrees in anthropology with specializations in medical anthropology, cross-cultural aging, physical anthropology/human biology, international health, urban health, psychological anthropology, and other areas.

The department also offers three combined degrees:
- M.A. or Ph.D./M.P.H. (with the School of Medicine)
- M.D./M.A. or Ph.D. (with the School of Medicine)
- M.S.N./M.A. (with the Frances Payne Bolton School of Nursing)

**Master of Arts**
The main purpose of the Master of Arts degree program is to prepare students to begin teaching, research, or service careers with a solid background in anthropology. Undergraduate course work in anthropology, while helpful, is not a prerequisite for admission. However, students with no previous training in anthropology are expected to remedy deficiencies prior to taking the M.A. examination.

Requirements for the master’s degree include credit hour requirements, core course requirements, and a six-hour comprehensive written Master of Arts examination. A candidate for the master’s degree is required to complete 27
hours of class work, including an approved statistics course (3 hours) in which the student has earned a grade of C or better. Not more than 6 credit hours of electives may be taken in 300-level courses (advanced undergraduate courses). All master’s degree candidates are required to attain a minimum cumulative grade point average of 3.0 in the core courses (described below) in order to qualify for the degree. Any student may retake an examination in a required course the next time it is given. The second grade will be the one considered for the student's overall average.

All master’s degree candidates are required to take a six-hour comprehensive written examination in their field set by the department examination committee. This examination must be taken before the completion of 27 semester hours of graduate work. Written master’s degree examinations can receive one of three grades: High Pass, Pass, or Fail. “High Pass” signifies performance sufficient for both the Master of Arts degree and advancement to the Doctor of Philosophy program, provided other requirements have also been satisfied. “Pass” signifies performance adequate for the master’s degree but insufficient to enter the doctoral program. “Fail” means a performance inadequate for the master’s degree. In the case of grades of Pass and Fail, the written examination may be retaken once.

Doctor of Philosophy
The Doctor of Philosophy degree program includes specializations in medical anthropology, international health, psychological anthropology, cross-cultural aging, human biology/physical anthropology, and sociocultural anthropology. It requires a minimum of 36 credit hours.

After completing course requirements, a student must take the written Doctor of Philosophy candidacy examination. Within one semester of successfully completing this examination, the student is required to defend a dissertation prospectus with the cooperation of his or her advisor and committee. Before a candidate is permitted to defend the dissertation, he or she must demonstrate a reading knowledge in a foreign language in which there is a scholarly literature relevant to his or her program of studies. A foreign-born student may substitute his or her native language (if it is not English) if it meets the above conditions.

Program Concentrations

Medical Anthropology Program
The objective of the Medical Anthropology program is to train medical anthropologists, physicians, nurses, and other health professionals (1) to recognize and deal with, on both theoretical and practical levels, the complex relations between the biological, social, cultural, psychological, economic, and technoenvironmental determinants and concomitants of sickness and health; and (2) to analyze and evaluate how health services are organized and delivered.

Within the Medical Anthropology program, students may choose to specialize in medical anthropology, cross-cultural aging, international health, urban health, or psychological anthropology.

M.A. Requirements
The curriculum covers the range of medical anthropology interests: ethnomedicine, international health, urban health, psychiatric anthropology, human adaptation and disease, nutrition, social demography, and so on. All Master of Arts degree students in medical anthropology must complete 27 hours, including the following core courses: ANTH 462, 480, 481, and 504 as well as an approved statistics course. The remaining 12 credit hours are taken as electives in anthropology or in other departments with the advisor’s approval.

Ph.D. Requirements
All Ph.D. students in medical anthropology are required to complete the Ph.D. requirements. Students develop a specific plan of study, requiring a minimum of 36 credit hours, in consultation with their advisor.

• Students must take an approved statistics course (3 credits) and earn a grade of C or better if this requirement has not been fulfilled at the M.A. level.
• Students must complete two approved seminars (500 level).
• Students must take 9 credit hours in electives, as approved by their advisory committee. For those students completing the statistics requirement at the M.A. level, 12 hours of electives are required. Students may not take more than six total credit hours of either ANTH 599 or ANTH 601.
• Students must take 18 credit hours in dissertation (ANTH 701).

After completing course requirements, a student must take the written Doctor of Philosophy candidacy examination. Within one semester of successfully completing this examination, the student is required to defend a dissertation prospectus with the cooperation of his or her advisor and committee. Before a candidate is permitted to defend the dissertation, he or she must demonstrate a reading knowledge in a foreign language in which there is a scholarly literature relevant to his or her program of studies. A foreign-born student may substitute his or her native language (if it is not English) if it meets the above conditions.

Specializations in Medical Anthropology

International Health
The international health specialization within the graduate program in medical anthropology offers students training in international health research as well as in evaluation of international health projects. The curriculum includes course work in medical anthropology, epidemiology, and special topics in international health, including child survival, fertility and family planning, and nutritional intervention. Students are qualified to work in international health research, in academic positions, or in administrative positions in governmental or private agencies.

All M.A. students in international health must complete 27 credit hours including the following core courses: ANTH 459, 462, 480, 481, 497, and 504, as well as an approved statistics course. The remaining 6 credit hours are taken as electives in anthropology or other departments with the advisor’s approval. At the Ph.D. level, students specializing in international health must develop a program with their advisor to meet all Ph.D. requirements.

Urban Health
The urban health specialization within the graduate program in medical anthropology prepares students for careers in anthropology, public health, or allied fields, with a special focus on racial and ethnic disparities in health and on underserved populations in urban areas around the world. Under the guidance of faculty with research experience both domestically and internationally, students will learn anthropological theory and methods focusing on health and illness among urban populations.

All M.A. students in urban health must complete 27 credit hours including the following
core courses: ANTH 462, 480, 481, and 504, as well as an approved statistics course, plus the urban health core courses: ANTH 461 and EPBI 490. The remaining 3 credit hours are taken as electives in anthropology or other departments with the advisor's approval. At the Ph.D. level, students specializing in urban health anthropology must develop a program with their advisor to meet all Ph.D. requirements.

Psychological Anthropology
The psychological anthropology specialization within the graduate program in medical anthropology prepares students for positions in teaching and research institutions. It is also relevant for mental health professionals concerned with research and theoretical issues related to multiethnic patient populations.

All M.A. students in the psychological anthropology specialization must complete ANTH 462, 471, 480, 481, and 504 as well as an approved statistics course. The remaining 9 credit hours are taken as electives in anthropology or other departments with the advisor's approval. At the Ph.D. level, students specializing in psychological anthropology must develop a program with their advisor to meet all Ph.D. requirements.

Cross-Cultural Aging
The cross-cultural aging specialization within the graduate program in Medical Anthropology focuses on the processes of aging and the circumstances of older people throughout the world. Particular attention is given to the impact of social, cultural, economic, political, and demographic variables on the experience of aging.

All M.A. students in the cross-cultural aging specialization must complete 27 credit hours, including the medical anthropology core courses, an approved statistics course, and 12 credit hours of electives approved by the advisor. At the Ph.D. level, students specializing in cross-cultural aging must develop a program with their advisor to meet all Ph.D. requirements.

CROSS-CULTURAL AGING PROGRAM
In addition to the cross-cultural aging specialization in the Medical Anthropology program, the department offers a distinct Cross-Cultural Aging program. Degree candidates are required to demonstrate mastery of the literature, theories, and methods appropriate to Western and non-Western gerontology, and are encouraged to gain research experience in both Western and non-Western settings. The program emphasizes the integration of qualitative and quantitative methodologies.

M.A. Requirements
Graduates of the master's program are qualified to work in research or administrative positions in governmental and private agencies, and to teach at the college and university levels. All M.A. students in cross-cultural aging must complete 27 credit hours including the following core courses: ANTH 401, 404, 462, and 504. In addition to the four core courses, students must take an approved statistics course. Twelve credit hours are taken as electives in anthropology or in other departments with the advisor's approval.

Ph.D. Requirements
All Ph.D. students in cross-cultural aging are required to develop a specific plan of study, with a minimum of 36 credit hours, in consultation with their advisor.

- Students must take 18 credit hours in electives as approved by their advisory committee. (For those students who have not completed the M.A. statistics requirement, an approved 3-credit course in statistics is required.)
- Students must take 18 credit hours in dissertation (ANTH 701).

After completing course requirements, a student must take the written Doctor of Philosophy candidacy examination. Within one semester of successfully completing this examination, the student is required to defend a dissertation prospectus with the cooperation of his or her advisor and committee. Before a candidate is permitted to defend the dissertation, he or she must demonstrate a reading knowledge in a foreign language in which there is a scholarly literature relevant to his or her program of studies. A foreign-born student may substitute his or her native language (if it is not English) if it meets the above conditions.

M.A. or Ph.D./M.P.H. Program with the School of Medicine
The joint M.A. or Ph.D. program provides students with the opportunity to receive an anthropology graduate degree and a public health degree simultaneously. A combined public health/anthropology degree will be especially valuable to students interested in working in urban health or international health, or within health policy programs. The joint M.A./M.P.H. requires 54 credit hours (21 in anthropology and 33 in public health). The joint Ph.D./M.P.H. requires an additional 18 credit hours in anthropology beyond the M.A. level and 18 hours of ANTH 701 (Dissertation Research), for a total of 90 credit hours. All joint-degree students will develop a program of study with their advisors in both anthropology and public health.

M.D./M.A. or Ph.D. Program with the School of Medicine
The objectives of the joint M.D./M.A. or Ph.D. program are to train unusually qualified students:

- to conduct research on a broad range of bio-cultural problems, with emphasis on the relationship between medicine, ecology, subsistence variables, population dynamics, and disease epidemiology; and
- to identify and analyze sociocultural impediments to the successful introduction of effective functioning and evaluation of health care programs in diverse contexts.

M.S.N./M.A. Program with the Frances Payne Bolton School of Nursing
The joint M.S.N./M.A. program affords students a unique opportunity to combine the cross-cultural expertise of medical anthropology with clinical expertise in nursing. This combination of skills and knowledge will be of particular value in preparing students for careers in international health and in our multicultural society. Students must complete a minimum of 19 credits in nursing core courses, 12 to 22 credits in clinical major courses, and a minimum of 18 credits in anthropology courses. The actual number of credits depends upon the nursing major selected. The total M.S.N./M.A. degree requirement is a minimum of 55 hours. Applicants should make separate application for admission to the School of Medicine and the Department of Anthropology (through the School of Graduate Studies). Applications to the Department of Anthropology must include MCAT scores, in addition to other information indicated on the graduate school forms.

Application to the School of Medicine is initiated through the American Medical College
adaptations, the origin of food production, and the Pleistocene up to the coming of Europeans. Course material will focus on the archaeology of human societies through time.

ecological and cultural relationships affecting humans. Th e range of cultural phenomena include the genetic basis of micro- and macro- evolutionary adaptations, the origin of food production, and the development of ranked societies.

ANTH 225. Evolution (3)
Multidisciplinary study of the course and processes of organic evolution provides a broad understanding of the evolution of structural and functional diversity, the relationships among organisms and their environments, and the phylogenetic relationships among major groups of organisms. Topics include the genetic basis of micro- and macro-evolutionary change, the concept of adaptation, natural selection, population dynamics, theories of species formation, principles of phylogenetic inference, biogeography, evolutionary rates, evolutionary convergence, homology, Darwinian medicine, and conceptual and philosophic issues in evolutionary theory. Offered as ANTH 225, BIOL 225, GEOL 225, HSTY 225, and PHIL 225.

ANTH 233. Introduction to Jewish Folklore (3)
Exploration of a variety of genres, research methods and interpretations of Jewish folklore, from antiquity to the present. Emphasis on how Jewish folk traditions and culture give us access to the spirit and mentality of the many different generations of the Jewish ethnic group, illuminating its past and informing the direction of its future development. Offered as ANTH 233 and JDST 233.

ANTH 295. Comparative Primate Behavior (3)
The behavior of non-human primates (prosimians, monkeys, and apes) and the relevance of these studies for understanding the evolution of human behavior. Biological and ecological influences on behavior. The social aspects of primate life, both human and nonhuman. Recommended preparation: ANTH 102 or ANTH 103 or consent of department.

ANTH 301. Biological Aging in Humans (3)
Biological aging phenomena, evidence that various sociocultural and environmental influences may slow or accelerate the aging process, and theories explaining the evolution of the aging process. Recommended preparation: ANTH 103 or consent of department. Offered as ANTH 301 and ANTH 401.

ANTH 302. Darwinian Medicine (3)
Darwinian medicine deals with evolutionary aspects of modern human disease. It applies the concepts and methods of evolutionary biology to the question of why we are vulnerable to disease. Darwinian (or evolutionary) medicine proposes several general hypotheses about disease causation including disease as evolutionary legacy and design compromise, the result of a novel environment, a consequence of genetic adaptation, the result of infectious organisms’ evolutionary adaptations, and disease symptoms as manifestation of defense mechanisms. It proposes that evolutionary ideas can explain, help to prevent and perhaps help to treat some diseases. This course presents the basic logic of Darwinian medicine and evaluates hypotheses about specific diseases that illustrate each of the hypotheses about disease causation. Recommended preparation: ANTH 103 or consent of department. Offered as ANTH 302 and ANTH 402.

ANTH 304. Introduction to the Anthropology of Aging (3)
Reviews historical and methodological approaches to the study of aging. Examines theoretical assumptions about aging by comparing studies from Western and non-Western societies that illustrate the differential importance of culture in the experience of aging. Recommended preparation: ANTH 102 or consent of department.

Other Specializations
Students interested in graduate degrees in social-cultural or physical anthropology should contact the department about requirements.

COURSE DESCRIPTIONS

ANTH 102. Being Human: An Introduction to Social and Cultural Anthropology (3)
The nature of culture and humans as culture-bearing animals. The range of cultural phenomena including language, social organization, religion, and culture change, and the relevance of anthropology for contemporary social, economic, and ecological problems.

ANTH 103. Introduction to Human Evolution (3)
Physical, cultural, and technological evolution of humans. The systematic interrelationships between humans, culture, and environment.

ANTH 107. Archaeology: An Introduction (3)
Basic archaeological concepts are discussed followed by a review of human cultural and biological evolution from the earliest times through development of state organized societies. Geographical scope is worldwide with special attention given to ecological and cultural relationships affecting human societies through time.

ANTH 202. Archaeology of Eastern North America (3)
This course is an introduction to the archaeology and prehistory of the eastern woodlands of North America. Course material will focus on the archaeological record of native societies living east of the Mississippi River from the first arrivals at the end of the Pleistocene up to the coming of Europeans. Specific topics for discussion include late Pleistocene settlement, hunter-gatherer environmental adaptations, the origin of food production, and the development of ranked societies.
ANTH 305. Child Policy (3)  
This course introduces students to issues in child policy. Local, state and federal child policy will be considered, and topics will include, for example, policies related to child poverty, schooling, child welfare, and children's physical and mental health. Students will learn how policy is developed, how research informs policy and vice versa. Recommended preparation: One social sciences course or consent. Offered as ANTH 305 and CHST 301.

ANTH 306. The Anthropology of Childhood and the Family  
Child-rearing patterns and the family as an institution, using evidence from Western and non-Western cultures. Human universals and cultural variation, the experience of childhood and recent changes in the American family. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 306 and ANTH 406.

ANTH 307. Experiential Learning in Child Policy (3–6)  
Focus on state and federal legislation impacting children, youth, and families. Course includes an experiential learning component at the state or federal level and a travel experience to either Columbus, OH or Washington, D.C. to learn firsthand how policy is formed. Students may take this course twice for credit. Offered as ANTH 307 and CHST 302.

ANTH 308. Child Policy Externship (3)  
This course provides students with externships in child policy. These externships give students an opportunity to work directly with professionals who design and implement policies that impact the lives of children and their families. Agencies involved are active in areas such as childcare, education, juvenile justice, and physical and mental health. Students apply for the externship. Selected students are placed in a local child policy agency. An individualized learning plan is developed in consultation with the Childhood Studies Program faculty, the supervisor in the agency, and the student. This course is a 3 credit-hour course and may be taken twice for a total of 6 credit hours. Offered as ANTH 308 and CHST 398.

ANTH 309. Family Violence and Child Abuse (3)  
The prevalence and causes of intrafamilial violence. Spouse abuse, child abuse, adolescent abuse, sexual abuse, parent abuse, and sibling violence. Major theoretical positions on the occurrence of these behaviors in light of information from both Western and non-Western cultures. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 309 and ANTH 409.

ANTH 310. Introduction to Linguistic Anthropology (3)  
This is an introduction to the core concepts, theories and methodologies that form the study of language from an anthropological point of view. The course provides exposure to current issues in linguistic anthropological research and reviews some of the foundational topics of research past, highlighting the contributions of linguistics to anthropology and social science. Topics to be explored include: 1) an overview of the study of language (language structure and patterns, the effects of linguistic categories on thought and behavior, meaning and linguistic relativity, cross-language comparison, and non-verbal communication); 2) doing linguistic anthropology “on the ground” (an intro to the laboratory and field techniques of linguistic anthropology); 3) the study of language as function and social action (language and social structure speech acts and events, verbal art, language and emotion); and 4) the study of language/ discourse and power (language in politics, medicine, and law). Offered as ANTH 310 and ANTH 410.

ANTH 312. “Where Does it Hurt”: Doctor-Patient Talk (3)  
Taking medical interactions as our focus, this course explores the problems of doctor-patient (mis)communication from the view of language and culture. By examining a wide range of texts on patients’ illness experiences and healthcare encounters, we will identify underlying variations in communication styles and bodily comportment, which can and do affect the successful outcome of both intra- and cross-cultural medical interactions. Specific topics to be covered are: the relationship of clinical questioning and answering to the power to speak and to issues of legitimacy, authority, and the negotiation of treatment; the distinctions between ‘interview’ and ‘conversation’ and how these particular ways of speaking encourage or discourage different anthropological interactions; how cultural understandings of what it means to be a patient reflect socio-cultural assumptions about the nature of wellness, illness, and care; and how differences in sex, ethnicity, and the presence (or absence) of interpreters in cross-cultural care complicate doctor-patient talk. Offered as ANTH 312 or ANTH 412.

ANTH 313. The Anthropology of Adolescence (3)  
This course investigates the anthropology of adolescence. What are the conditions under which adolescence has appeared around the world as a life stage? What are the roles of adolescence cross-culturally? What are the varieties of adolescent experience? Through classic and contemporary texts, the course will address these questions as well as special topics particularly important to adolescence such as globalization, mental health, and sexuality. Offered as ANTH 313 and ANTH 413.

ANTH 314. Cultures of the United States  
This course considers the rich ethnic diversity of the U.S. from the perspective of social/cultural anthropology. Conquest, immigration, problems of conflicts and accommodation, and the character of the diverse regional and ethnic cultures are considered as are forms of racism, discrimination, and their consequences. Groups of interest include various Latino/o and Native peoples, African-American groups, and specific ethnic groups of Pacific, Mediterranean, European, Asian, and Caribbean origin. Offered as ANTH 314, ETHS 314, and ANTH 414.

ANTH 317. Asian Medical Systems  
Examines the philosophical assumptions and therapies of the traditional and contemporary medical systems of India, Tibet, China, and Japan. Particular attention will be given to the folk, popular, and institutional sectors of medical practice as well as to the contemporary relationship between traditional medicine and Western medicine in each of these societies. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 317 and ANTH 417.

ANTH 318. Death and Dying (3)  
Examines cultural context of death and dying. Topics include social and psychological consequences of changing patterns of mortality, attitudes towards the taking of life, preparation for death, mortuary rituals, grief and mourning, and nature of relationship between living and dead. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 318 or ANTH 418.

ANTH 319. Introduction to Statistical Analysis in the Social Sciences (3)  
Statistical description (central tendency, variation, etc.) and statistical evaluation (two sample comparisons, regression, analysis of variance, non-parametric statistics). Developing an understanding of statistical inference, particularly on proper usage of statistical methods. Examples from the social sciences. Cannot be used to meet the A&S Humanities and Social Sciences requirement. Not available for credit to students who have completed STAT 201 or PSCL 282.

ANTH 320. Doing Ethnography in Cleveland (3)  
Anthropologists use ethnography to understand the complexity and diversity of cultures by studying people in their daily lives. Through hands-on participation in ethnographic fieldwork, students will prepare an ethnography on an aspect of life in the city of Cleveland. Class activities will focus on issues of conducting, analyzing, and interpreting ethnographic research. Prereq: ANTH 102.

ANTH 321. Methods in Archaeology (3)  
This course reviews the basic methods and techniques used in modern archaeological archaeology. Topics to be discussed include the nature of the archaeological record, research design, tech-
niques of field archaeology, methods of laboratory analysis, museum archaeology, ethnoarchaeology, and cultural interpretation.

Prerequisite: ANTH 107.

**ANTH 322. Living Africa (3)**
This course is an introduction to the peoples and cultures of Africa. Rather than a traditional, survey approach, this course takes a thematic approach to issues regarding core aspects of African societies such as history, political organization, family and kinship, art and literature, religion, gender, international relations, and economy. Taking a multi-disciplinary perspective, the course will draw on diverse sources, from classical ethnographic writings to popular cultural criticism, literature, films, poetry, and news media.

Offered as ANTH 322 and ANTH 422.
Global & Cultural Diversity

**ANTH 323. AIDS: Epidemiology, Biology, and Culture (3)**
This course will examine the biological and cultural impact of AIDS in different societies around the world. Topics include: the origin and evolution of the virus, the evolutionary implications of the epidemic, routes of transmission, a historical comparison of AIDS to other epidemics in human history, current worldwide prevalences of AIDS, and cultural responses to the epidemic. Special emphasis will be placed on the long-term biological and social consequences of the epidemic. Recommended preparation: ANTH 102 or ANTH 103 or ANTH 105 or consent of department.

Offered as ANTH 323 and ANTH 423.

**ANTH 324. Field Methods in Archaeology (3–6)**
This field course is designed to give the student a comprehensive introduction to archaeological field work. All participants will be introduced to the methods of archaeological survey, techniques of hand excavation, artifact identification, and the preparation of field notes and documentation. In large measure this is a “learning through doing” course which is supplemented by formal and informal lectures and discussions about archaeological methods and regional prehistory. The Fields School is held as two, three-week sessions of instruction in the field. All participants are required to attend an orientation meeting that is held at the Museum on the first day of each session. The remainder of each session will take place from Monday through Friday at an archaeological site in northeast Ohio. Students are responsible for their own transportation to and from the field site and must bring a sack lunch. All participants will receive a held manual which will provide detailed information on the course and techniques of field work.

**ANTH 326. Power, Illness, and Inequality: The Political Economy of Health (3)**
This course explores the relationship between social inequality and the distribution of health and illness across class, race, gender, sexual orientation, and national boundaries. Class readings drawn from critical anthropological approaches to the study of health emphasize the fundamental importance of power relations and economic constraints in explaining patterns of disease. The course critically examines the nature of Western biomedicine and inequality in the delivery of health services. Special consideration is given to political economic analysis of health issues in the developing world such as AIDS, hunger, reproductive health, and primary health care provision. Recommended preparation: ANTH 102 or ANTH 215 or consent of department.

Offered as ANTH 326 and ANTH 426.

**ANTH 327. Ancient Cultures of the Ohio Region (3)**
This course surveys the archaeology of Native American cultures in the Great Lakes region from ca. 10,000 B.C. to A.D. 1700. The geographic scope of this course is the upper Midwest, southern Ontario, and the St. Lawrence Valley with a focus on the Ohio region. Recommended preparation: ANTH 107 or consent of the department.

Offered as ANTH 327 and ANTH 427.

**ANTH 330. Special Topics in Prehistory (3)**
Special topics of geographical areas of archaeological significance (e.g., the origins of food production, the archaeology of the Mediterranean, the archaeology of North America). Recommended preparation: ANTH 102 or ANTH 107 or consent of department.

**ANTH 331. Ancient Civilizations of the Near East (3)**
The social, economic, and ecological factors involved in the formation of the earliest Asian civilizations. The developmental role of cities, warfare, trade, and irrigation considered with respect to “state” formation in Mesopotamia, Iran, and the Indus Valley. Recommended preparation: ANTH 102 or ANTH 107 or consent of department.

**ANTH 333. Roots of Ancient India: Archaeology of South Asia (3)**
Examination of the archaeological record of cultural development from earliest times through the Iron Age in India, Pakistan, Sri Lanka, and Bangladesh. Particular attention devoted to how these ancient cultural developments laid the foundations for the early historic civilizations of this region. Recommended preparation: ANTH 102 or ANTH 107 or consent of department.

Offered as ANTH 333 and ANTH 433.

**ANTH 334. Urban Anthropology (3)**
This urban anthropology course will focus on contemporary understandings of the institutions of urban, national and transnational life. We will explore the complex ways that urban worlds and social problems are shaped by globalizing capitalism, national, and transnational processes. As well, we will examine how and why various identities, nations, and transnational institutions are expressed in and by people living in current global urban hierarchies. In particular, we will look at how the urban, national, and transnational dynamically produce and are produced by the everyday cultural practices of people living and struggling in North American urban spaces. Recommended preparation: ANTH 102 or consent of department.

Offered as ANTH 334 and ANTH 434.

**ANTH 337. Comparative Medical Systems (3)**
This course considers the world’s major medical systems. Foci include professional and folk medical systems of Asia and South Asia, North and South America, Europe and the Mediterranean, including the Christian and Islamic medical traditions. Attention is paid to medical origins and the relationship of popular to professional medicines. The examination of each medical tradition includes consideration of its psychological medicine and system of medical ethics. Recommended preparation: ANTH 215.

Offered as ANTH 337 and ANTH 437.

**ANTH 340. Culture and Emotion (3)**
The cross-cultural consideration of the relationship of culture and emotion. The cultural construction of the experience and expression of emotion. Key substantive issues include: ethnopsychological variations in indigenous conceptualizations and displays of emotion; the socialization of affect; the self and emotion; contextual variations in emotional expression with respect to gender, power relations, patterns of subsistence, and the individual; and the relationship between emotion and illness processes. Recommended preparation: ANTH 102 or consent of department.

Offered as ANTH 340 and ANTH 440.

**ANTH 341. Cultural Area Studies in Anthropology (3)**
Recommended preparation: ANTH 102.

Offered as ANTH 341 and ANTH 441.

**ANTH 343. Psychoanalytic Anthropology (3)**
Psychoanalytic theory and its application to cross-cultural materials. The cultural context of analytic theory’s development and its applications in social/cultural and medical anthropology; application of cultural criticism to psychoanalytic conceptions and its constructions of the following: social evolution; religious ideology, praxis, patterns and dynamics; altered states of consciousness; individual personality and psychopathology; individual and cultural defense mechanisms; socialization; cognition; emotion; symbolism; and gender. Also considers bases for a culturally relative analytic theory. Recommended preparation: ANTH 102 or consent of department.

Offered as ANTH 343 and ANTH 443.

**ANTH 345. Ethnicity, Gender, and Mental Health (3)**
An overview of mental health status and ethnicity. Analysis of ethnicity in relation to culture, social class, gender, sociopolitical conflict and the world refugee crisis. Consideration of populations at special risk for the development of specific mental disorders (e.g., schizophrenia, affective disorders,
ANTH 348. Sexuality and Gender (3)
This course examines the relationships among gender, sexuality, race, nation, and the body. In particular, it focuses on contemporary ideas and theories in the study of the complex historical and cultural relationships between sexuality and gender. In addition, we examine sexuality and social movements, identity politics, and the so-called "culture wars." In short, this class will not be a voyeuristic narration of exotic sexual or gender practices; and where we use the "other" it will be solely for the purpose of exploring our own practices and ideologies. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 348 and ANTH 448.

ANTH 351. Topics in International Health (3)
Special topics of interest in International Health. Recommended preparation: ANTH 102 or ANTH 215 or consent of department. Offered as ANTH 351 and ANTH 451.

ANTH 352. Japanese Culture and Society (3)
Focuses on contemporary Japanese cultural and social institutions. Topics include child-rearing, personality, values, education, gender roles, the dual economy, and popular culture. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 352 and ANTH 452. Global & Cultural Diversity

ANTH 353. Chinese Culture and Society (3)
Focuses on Chinese cultural and social institutions during the Maoist and post-Maoist eras. Topics include ideology, economics, politics, religion, family life, and popular culture. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 353 and ANTH 453. Global & Cultural Diversity

ANTH 356. Mediterranean Culture and Society (3)
Ethnography of the Mediterranean culture area. Topics include geography, topography, climate, rural and urban life styles, economy, social identity (encompassing gender, ethnic, national, provincial, tribal and religious identity), religion, ritual relations, concepts of self, health and healing, politics, worldview and values, family and kinship, aging, death and dying. Past and present methods and problems of anthropological research in the region and the theoretical frameworks that have guided researchers. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 356 and ANTH 456. Global & Cultural Diversity

ANTH 357. Native American Cultures (3)
Intensive examination of the cultures of selected Native American peoples, including historical, political, religious, social organizational, linguistic, and medical/psychiatric aspects of American Indian life. Not available for credit to students who have completed USSO 219. Recommended preparation: ANTH 102. Offered as ANTH 357 and ANTH 457. SAGES Dept Seminar Global & Cultural Diversity

ANTH 358. Women’s Mental Health (3)
This anthropological course is an examination of the cultural psychology of women in the following domains: (1) women’s social status cross-culturally; (2) specific psychiatric syndromes, such as psychoses, mood and personality disorders as they affect women; and (3) power and resilience. Issues of the cultural validity of psychological theories for women across diverse settings is the subject of critique throughout the seminar. Recommended preparation: ANTH 102 or ANTH 215. Offered as: ANTH 358, ANTH 458.

ANTH 359. Introduction to International Health (3)
Critical health problems and needs in developing countries. Prevalence of infectious disease, malnutrition, chronic disease, injury control. Examines strategies for improvement of health in less developed countries. Recommended preparation: ANTH 102. Offered as ANTH 359 and ANTH 459.

ANTH 361. Urban Health (3)
This course provides an anthropological perspective on the most important health problems facing urban population around the world. Special attention will be given to an examination of disparities in health among urban residents based on poverty, race/ethnicity, gender, and nationality. Offered as ANTH 361 and ANTH 461.

ANTH 362. Contemporary Theory in Anthropology (3)
A critical examination of anthropological thought in England, France and the United States during the second half of the twentieth century. Emphasis will be on the ways authors formulate questions that motivate anthropological discourse, on the way central concepts are formulated and applied and on the controversies and debates that result. Readings are drawn from influential texts by prominent contemporary anthropologists. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 362 and ANTH 462.

ANTH 363. Anthropology and Bioethics (3)
The course will review theoretical work on anthropometry and values, the discipline of bioethics, its philosophical roots, the body of anthropological work in bioethics, and critically examine a number of current bioethical issues in the United States and internationally. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 363 and ANTH 463.

ANTH 365. Gender and Sex Differences: Cross-cultural Perspective (3)
Gender roles and sex differences throughout the life cycle considered from a cross-cultural perspective. Major approaches to explaining sex roles discussed in light of information from both Western and non-Western cultures. Offered as ANTH 365 and ANTH 465 and WGST 365. Prereq: ANTH 102 or consent of department.

ANTH 367. Topics in Evolutionary Biology (3)
The focus for this course on a special topic of interest in evolutionary biology will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution. ANAT/ANTH/GEOL/PHIL 467/BIOL 468 will require a longer, more sophisticated term paper, and additional class presentation. Offered as ANTH 367, BIOL 368, GEOL 367, PHIL 367, ANAT 467, ANTH 467, BIOL 468, GEOL 467, and PHIL 467. Prereq: ANTH 225 or equivalent.

ANTH 368. Evolutionary Biology Capstone (3)
This course focuses on a special topic of interest in evolutionary biology that will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution. Students will participate in discussions and lead class seminars on evolutionary topics and in collaboration with an advisor or advisors, select a topic for a research paper or project. Each student will write a major research report or complete a major project and will make a public presentation of her/his findings. Offered as ANTH 368, BIOL 369, PHIL 368. Prereq: ANTH 225, BIOL 225, GEOL 225, HSTY 225, PHIL 225 or its equivalent or permission of instructor. SAGES Senior Cap

ANTH 369. The Anthropology of Nutrition (3)
Examines human nutrition and physical performance within the framework of human adaptability theory. The emphasis is on the measurement of energetic intake and expenditure in human populations; the assessment, health consequences, and bio-cultural correlates of malnutrition and obesity; and the uses of energetic data in assessing human population adaptation. Recommended preparation: ANTH 103 or consent of department. Offered as ANTH 369 and ANTH 469.

ANTH 369D. The Anthropology of Nutrition (3)
Examines human nutrition and physical performance within the framework of human adaptability theory. The emphasis is on the measurement of energetic intake and expenditure in human populations; the assessment, health consequences, and bio-cultural correlates of malnutrition and obesity; and the uses of energetic data in assessing human population adaptation. Recommended preparation: ANTH 103 or consent of department. Offered as ANTH 369 and ANTH 469.
focus on various social, ecological, and genetic factors which influence human nutritional patterns and the causes and consequences of protein-energy malnutrition. The course will be taught in a seminar format and is designed to enhance your skills in critically reading the anthropological literature and in improving your written and oral communication skills. A student may not receive credit for both ANTH 369 and ANTH 369D. Recommended preparation: ANTH 102, ANTH 103.

SAGES Dept Seminar

ANTH 371. Culture, Behavior, and Person: Psychological Anthropology (3)
Cross-cultural perspectives on personality, human development, individual variability, cognition, deviant behavior, and the role of the individual in his/her society. Classic and contemporary anthropological writings on Western and non-Western societies. Recommended preparation: ANTH 102 or consent of department.
Offered as ANTH 371 and ANTH 471.

ANTH 372. Anthropological Approaches to Religion (3)
The development of, and current approaches to, comparative religion from an anthropological perspective. Topics include witchcraft, ritual, myth, healing, religious language and symbolism, religion and gender, religious experience, the nature of the sacred, religion and social change, altered states of consciousness, and evil. Using material from a wide range of world cultures, critical assessment is made of conventional distinctions such as those between rational/irrational, natural/supernatural, magic/religion, and primitive/civilized. Recommended preparation: ANTH 102.
Offered as ANTH 372, RLGN 372 and ANTH 472.

ANTH 375. Human Evolution: The Fossil Evidence (3)
This course will survey the biological and behavioral changes that occurred in the hominid lineage during the past five million years. In addition to a thorough review of the fossil evidence for human evolution, students will develop the theoretical framework in evolutionary biology. Recommended preparation: ANTH 377, BIOL 225.
Offered as ANTH 375, ANTH 475, and ANTH 475.
Prereq: ANTH 103.

ANTH 376. Topics in the Anthropology of Health and Medicine (3)
Special topics of interest, such as the biology of human adaptability; the ecology of the human life cycle; health delivery systems; transcultural psychiatry; nutrition, health, and disease; paleoepidemiology; and population anthropology. Recommended preparation: ANTH 102 or ANTH 103. Offered as ANTH 376 and ANTH 476. SAGES Dept Seminar

ANTH 377. Human Osteology (4)
This course for upper division undergraduates and graduate students will review the following topics: human skeletal development and identification; and forensic identification (skeletal aging, sex identification and population affiliation). Offered as ANAT 377, ANTH 377, ANAT 477 and ANTH 477.

ANTH 378. Reproductive Health: An Evolutionary Perspective (3)
This course provides students with an evolutionary perspective on the factors influencing human reproductive health, including reproductive biology, ecology, and various aspects of natural human fertility. Our focus will be on variation in human reproduction in mostly non-Western populations. Recommended preparation: ANTH 103.
Offered as ANTH 378 and ANTH 478. SAGES Dept Seminar

ANTH 379. Topics in Cultural and Social Anthropology (3)
Special topics of interest across the range of social and cultural anthropology. Recommended preparation: ANTH 102.
Offered as ANTH 379 and ANTH 479.

ANTH 380. Independent Study in Laboratory Anthropology I (1–3)
This course provides an introduction to the basic methods and techniques of artifact curation and laboratory analysis in archaeology. Under the supervision of the instructor, each student will develop and execute a focused project of material analysis and interpretation using the archaeology collections of the Cleveland Museum of Natural History. Each student is required to spend a minimum of two hours per week in the Archaeology Laboratory for each credit hour taken. By the end of the course, the student will prepare a short report describing the results of their particular project. Recommended preparation: ANTH 107 and permission of department, and prior permission of Department of Archaeology at the Cleveland Museum of Natural History.

ANTH 381. Independent Study in Laboratory Anthropology II (1–3)
This course provides an introduction to the basic methods and techniques of artifact curation and laboratory analysis in archaeology. Under the supervision of the instructor, each student will develop and carry out a focused project of material analysis and interpretation using the archaeology collections of the Cleveland Museum of Natural History. Each student is required to spend a minimum of two hours per week in the Archaeology Laboratory for each credit hour taken. By the end of the course, the student will prepare a short report describing the results of their particular project. Recommended preparation: ANTH 107 and permission of department, and prior permission of Department of Archaeology at the Cleveland Museum of Natural History.

ANTH 388. Globalization, Development and Underdevelopment: Anthropological Perspectives (3)
This course examines both theoretical and practical perspectives on globalization and economic development in the “Third World.” From “Dependency,” “Modernization,” and “World System” theory to post-structuralist critiques of development discourse, the class seeks to provide a framework for understanding current debates on development and globalization. The “neoliberal monologue” that dominates the contemporary development enterprise is critically examined in the context of growing global inequality. Special consideration is given to the roles of international agencies such as the World Bank, International Monetary Fund, United Nations, and non-governmental organizations (NGOs) in the “development industry.” The course follows the contribution of anthropologists to development theory and practice with emphasis on the impact of development on the health of the poor and survival of indigenous cultures. Opportunities for professional anthropologists in the development field are reviewed. Offered as ANTH 388 and ANTH 488. Global & Cultural Diversity

ANTH 389. Crossroads: Transformation of Rural Blues into Urban Rock (3)
A multimedia approach to the development and transformation of an American musical form, the blues. Foci include the social and cultural history of rural and urban blues, rhythm and blues, rock ‘n’ roll, and the later forms of rock, the social context and life histories of modern music’s creators and innovators, the development of vocal and instrumental styles, blues and rock, visual and performance iconography, milestones in the development of musical genres and the major roles of racism and discrimination in the development of these forms of popular music. Recommended preparation: ANTH 102.
Offered as ANTH 389 and ANTH 489.

ANTH 391. Honors Tutorial (3)
Prereq: Acceptance into Honors Program.

ANTH 392. Honors Tutorial (3)
Prereq: Acceptance into Honors Program.

ANTH 393. Human Ecology: The Biology of Human Adaptability (3)
The place of human populations in the ecosystem. The importance of biological and behavioral responses of populations ranging from hunters and gatherers to contemporary and industrial societies. The effect of various natural and manmade stresses on man’s adaptation to the environment. Recommended preparation: ANTH 103 or consent of department.
Offered as ANTH 393 and ANTH 493.

ANTH 394. Seminar in Evolutionary Biology (3)
This seminar investigates 20th-century evolutionary theory, especially the Modern Evolutionary synthesis and subsequent expansions of and challenges to that synthesis. The course encompasses
the multidisciplinary nature of the science of evolution, demonstrating how disciplinary background influences practitioners’ conceptualizations of pattern and process. This course emphasizes practical writing and research skills, including formulation of testable theses, grant proposal techniques, and the implementation of original research using the facilities on campus and at the Cleveland Museum of Natural History.

Offered as ANTH 394, BIOL 394, GEOL 394, HSTY 394, PHIL 394, ANTH 494, BIOL 494, GEOL 494, HSTY 494, and PHIL 494.

ANTH 396. Undergraduate Research in Evolutionary Biology (3)

Students propose and conduct guided research on an aspect of evolutionary biology. The research will be sponsored and supervised by a member of the CASE faculty or other qualified professional. A written report must be submitted to the Evolutionary Biology Steering Committee before credit is granted.

Offered as ANTH 396, BIOL 396, GEOL 396, and PHIL 396.

Prereq: ANTH 225 or equivalent.

ANTH 397. Epidemiology and the Evolution of Human Diseases (3)

Basic concepts of infectious and degenerative diseases. Description and analysis of the changing distribution and determinants of disease in prehistoric, historic, and contemporary human populations. Recommended preparation: ANTH 103 or consent of department.

Offered as ANTH 397 and ANTH 497.

ANTH 398. Anthropology SAGES Capstone (3)

Supervised original research on a topic in anthropology, culminating in a written report and a public presentation. The research project may be in the form of an independent research project, a literature review, or some other original project with anthropological significance. The project must be approved and supervised by faculty. Group research projects are acceptable, but a plan which clearly identifies the distinct and substantial role of each participant must be approved by the supervising faculty.

Prereq: Major in Anthropology.

SAGES Senior Cap

ANTH 398C. Child Policy Externship and Capstone (3)

This course provides students with externships in child policy. These externships give students an opportunity to work directly with professionals who design and implement policies that impact the lives of children and their families. Agencies involved are active in areas such as childcare, education, juvenile justice, and physical and mental health. Students apply for the externship. Selected students are placed in a local child policy agency. An individualized learning plan is developed in consultation with the Childhood Studies Program faculty, the supervisor in the agency, and the student.

Offered as ANTH 398C. CHST 398C, PSDL 398C.

SAGES Senior Cap

ANTH 399. Independent Study (1–6)

Students may propose topics for independent reading and research.

ANTH 401. Biological Aging in Humans (3)

Biological aging phenomena, evidence that various sociocultural and environmental influences may slow or accelerate the aging process, and theories explaining the evolution of the aging process. Recommended preparation: ANTH 103 or consent of department.

Offered as ANTH 301 and ANTH 401.

ANTH 402. Darwinian Medicine (3)

Darwinian medicine deals with evolutionary aspects of modern human disease. It applies the concepts and methods of evolutionary biology to the question of why we are vulnerable to disease. Darwinian (or evolutionary) medicine proposes several general hypotheses about disease causation, including disease as evolutionary legacy and design compromise, the result of a novel environment, a consequence of genetic adaptation, the result of infectious organisms’ evolutionary adaptions, and disease symptoms as manifestation of defense mechanisms. It proposes that evolutionary ideas can explain, help to prevent and perhaps help to treat some diseases. This course presents the basic logic of Darwinian medicine and evaluates hypotheses about specific diseases that illustrate each of the hypotheses about disease causation. Recommended preparation: ANTH 103 or consent of department.

Offered as ANTH 302 and ANTH 402.

ANTH 404. Introduction to the Anthropology of Aging (3)

Reviews historical and methodological approaches to the study of aging. Examines theoretical assumptions about aging by comparing studies from Western and non-Western societies that illustrate the differential importance of culture in the experience of aging. Recommended preparation: ANTH 102 or consent of department.

Offered as ANTH 304 and ANTH 404.

ANTH 406. The Anthropology of Childhood and the Family (3)

Child-rearing patterns and the family as an institution, using evidence from Western and non-Western cultures. Human universals and cultural variation, the experience of childhood and recent changes in the American family. Recommended preparation: ANTH 102 or consent of department.

Offered as ANTH 306 and ANTH 406.

ANTH 409. Family Violence and Child Abuse (3)

The prevalence and causes of intrafamilial violence. Spouse abuse, child abuse, adolescent abuse, sexual abuse, parent abuse, and sibling violence. Major theoretical positions on the occurrence of these behaviors in light of information from both Western and non-Western cultures. Recommended preparation: ANTH 102 or consent of department.

Offered as ANTH 309 and ANTH 409.

ANTH 410. Introduction to Linguistic Anthropology (3)

This is an introduction to the core concepts, theories, and methodologies that form the study of language from an anthropological point of view. The course provides exposure to current issues in linguistic anthropological research and reviews some of the foundational topics of research past, highlighting the contributions of linguistics to anthropology and social science. Topics to be explored include: 1) an overview of the study of language (language structure and patterns, the effects of linguistic categories on thought and behavior, meaning and linguistic relativity, cross-language comparison, and non-verbal communication); 2) doing linguistic anthropology “on the ground” (an intro to the laboratory and field techniques of linguistic anthropology); 3) the study of language as function and social action (language and social structure speech acts and events, verbal art, language and emotion); and 4) the study of language/discourse and power (language in politics, medicine, and law).

Offered as ANTH 310 and ANTH 410.

ANTH 412. “Where Does it Hurt”: Doctor-Patient Talk (3)

Taking medical interactions as our focus, this course explores the problems of doctor-patient (mis)communication from the view of language and culture. By examining a wide range of texts on patients’ illness experiences and healthcare encounters, we will identify underlying variations in communication styles and bodily comportment, which can and do affect the successful outcome of both intra- and cross-cultural medical interactions. Specific topics to be covered are: the relationship of clinical questioning and answering to the power to speak and to issues of legitimacy, authority, and the negotiation of treatment; the distinctions between ‘interview’ and ‘conversation’ and how these particular ways of speaking encourage or discourage different doctor-patient interactions; how cultural understandings of what it means to be a patient reflect socio-cultural assumptions about the nature of wellness, illness, and care; and how differences in sex, ethnicity, and the presence (or absence) of interpreters in cross-cultural care complicate doctor-patient talk.

Offered as ANTH 312 or ANTH 412.

ANTH 413. The Anthropology of Adolescence (3)

This course investigates the anthropology of adolescence. What are the conditions under which adolescence has appeared around the world as a life stage? What are the roles of adolescence cross-culturally? What are the varieties of adolescent experience? Through classic and contemporary texts, the course will address these questions as well as special topics particularly important to adoles-
cidence such as globalization, mental health, and sexuality. Offered as ANTH 313 and ANTH 413.

ANTH 414. Cultures of the United States (3)
This course considers the rich ethnic diversity of the U.S. from the perspective of social/cultural anthropology. Conquest, immigration, problems of conflicts and accommodation, and the character of the diverse regional and ethnic cultures are considered as are forms of racism, discrimination, and their consequences. Groups of interest include various Latin/o and Native peoples, African-American groups, and specific ethnic groups of Pacific, Mediterranean, European, Asian, and Caribbean origin. Offered as ANTH 314, ETHS 314, and ANTH 414.

ANTH 417. Asian Medical Systems (3)
Examines the philosophical assumptions and therapies of the traditional and contemporary medical systems of India, Tibet, China, and Japan. Particular attention will be given to the folk, popular, and institutional sectors of medical practice as well as to the contemporary relationship between traditional medicine and Western medicine in each of these societies. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 317 and ANTH 417.

ANTH 418. Death and Dying (3)
Examines cultural contexts of death and dying. Topics include social and psychological consequences of changing patterns of mortality, attitudes towards the taking of life, preparation for death, mortuary rituals, grief and mourning, and nature of relationship between living and dead. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 318 or ANTH 418.

ANTH 422. Living Africa (3)
This course is an introduction to the peoples and cultures of Africa. Rather than a traditional, survey approach, this course takes a thematic approach to issues regarding core aspects of African societies such as history, political organization, family and kinship, art and literature, religion, gender, international relations, and economy. Taking a multi-disciplinary perspective, the course will draw on diverse sources, from classical ethnographic writings to popular cultural criticism, literature, films, poetry, and news media. Offered as ANTH 322 and ANTH 422.

ANTH 423. AIDS: Epidemiology, Biology, and Culture
This course will examine the biological and cultural impact of AIDS in different societies around the world. Topics include: the origin and evolution of the virus, the evolutionary implications of the epidemic, routes of transmission, a historical comparison of AIDS to other epidemics in human history, current worldwide prevalences of AIDS, and cultural responses to the epidemic. Special emphasis will be placed on the long-term biological and social consequences of the epidemic. Recommended preparation: ANTH 102 or ANTH 103 or ANTH 105 or consent of department. Offered as ANTH 323 and ANTH 423.

ANTH 426. Power, Illness, and Inequality: The Political Economy of Health (3)
This course explores the relationship between social inequality and the distribution of health and illness across class, race, gender, sexual orientation, and national boundaries. Class readings drawn from critical anthropological approaches to the study of health emphasize the fundamental importance of power relations and economic constraints in explaining patterns of disease. The course critically examines the nature of Western biomedicine and inequality in the delivery of health services. Special consideration is given to political economic analysis of health issues in the developing world such as AIDS, hunger, reproductive health, and primary health care provision. Recommended preparation: ANTH 102 or ANTH 215 or consent of department. Offered as ANTH 326 and ANTH 426.

ANTH 427. Ancient Cultures of the Ohio Region (3)
This course surveys the archaeology of Native American cultures in the Great Lakes region from ca. 10,000 B.C. to A.D. 1700. The geographic scope of this course is the upper Midwest, southern Ontario, and the St. Lawrence Valley with a focus on the Ohio region. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 327 and ANTH 427.

ANTH 433. Roots of Ancient India: Archaeology of South Asia (3)
Examines the archaeological record of cultural development from earliest times through the Iron Age in India, Pakistan, Sri Lanka, and Bangladesh. Particular attention devoted to how these ancient cultural developments laid the foundations for the early historic civilizations of this region. Recommended preparation: ANTH 102 or ANTH 107 or consent of department. Offered as ANTH 333 and ANTH 433.

ANTH 434. Urban Anthropology (3)
This urban anthropology course will focus on contemporary understandings of the institutions of urban, national, and transnational life. We will explore the complex ways that urban worlds and social problems are shaped by globalizing capitalism, national, and transnational processes. As well, we will examine how and why various identities, nations, and transnational institutions are expressed in and by people living in current global urban hierarchies. In particular, we will look at how the urban, national, and transnational dynamically produce and are produced by the everyday cultural practices of people living and struggling in North American urban spaces. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 334 and ANTH 434.

ANTH 437. Comparative Medical Systems (3)
This course considers the world’s major medical systems. Foci include professional and folk medical systems of Asia and South Asia, North and South America, Africa, Europe, and the Mediterranean, including the Christian and Islamic medical traditions. Attention is paid to medical origins and the relationship of popular to professional medicines. The examination of each medical tradition includes consideration of its psychological medicine and system of medical ethics. Recommended preparation: ANTH 215. Offered as ANTH 337 and ANTH 437.

ANTH 440. Culture and Emotion (3)
The cross-cultural consideration of the relationship of culture and emotion. The cultural construction of the experience and expression of emotion. Key substantive issues include: ethnopsychological variations in indigenous conceptualizations and displays of emotion; the socialization of affect; the self and emotion; contextual variations in emotional expression with respect to gender, power relations, patterns of subsistence, and the individual; and the relationship between emotion and illness processes. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 340 and ANTH 440.

ANTH 441. Cultural Area Studies in Anthropology (3)
Recommended preparation: ANTH 102. Offered as ANTH 341 and ANTH 441.

ANTH 443. Psychoanalytic Anthropology (3)
Psychoanalytic theory and its application to cross-cultural materials. The cultural context of analytic theory’s development and its applications in social/cultural and medical anthropology; application of cultural criticism to psychoanalytic conceptions and its constructions of the following: social evolution; religious ideology, praxis, patterns and dynamics; altered states of consciousness; individual personality and psychopathology; individual and cultural defense mechanisms; socialization; cognition; emotion; symbolism; and gender. Also considers bases for a culturally relative analytic theory. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 343 and ANTH 443.

ANTH 445. Ethnicity, Gender, and Mental Health (3)
An overview of mental health status and ethnicity. Analysis of ethnicity in relation to culture, social class, gender, sociopolitical conflict and the world refugee crisis. Consideration of populations at special risk for the development of specific mental disorders (e.g., schizophrenia, affective disorders, adjustment and stress disorders). Contemporary ethnographic survey of ethnic groups at risk both at home and abroad. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 345 and ANTH 445.
ANTH 448. Sexuality and Gender (3)
This course examines the relationships among gender, sexuality, race, nation, and the body. In particular, it focuses on contemporary ideas and theories in the study of the complex historical and cultural relationships between sexuality and gender. In addition, we examine sexuality and social movements, identity politics, and the so-called “culture wars.” In short, this class will not be a voyeuristic narration of exotic sexual or gender practices; and where we use the “other” it will be solely for the purpose of exploring our own practices and ideologies. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 348 and ANTH 448.

ANTH 451. Topics in International Health (3)
Special topics of interest in International Health. Recommended preparation: ANTH 102 or ANTH 215 or consent of department. Offered as ANTH 351 and ANTH 451.

ANTH 452. Japanese Culture and Society (3)
Focuses on contemporary Japanese cultural and social institutions. Topics include child-rearing, personality, values, education, gender roles, the dual economy, and popular culture. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 352 and ANTH 452.

ANTH 453. Chinese Culture and Society (3)
Focuses on Chinese cultural and social institutions during the Maoist and post-Maoist eras. Topics include ideology, economics, politics, religion, family life, and popular culture. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 353 and ANTH 453.

ANTH 456. Mediterranean Culture and Society (3)
Ethnography of the Mediterranean culture area. Topics include geography, topography, climate, rural and urban life styles, economy, social identity (encompassing gender, ethnic, national, provincial, tribal and religious identity), religion, ritual relations, concepts of self, health and healing, politics, worldview and values, family and kinship, aging, death and dying. Past and present methods and problems of anthropological research in the region and the theoretical frameworks that have guided researchers. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 356 and ANTH 456.

ANTH 457. Native American Cultures (3)
Intensive examination of the cultures of selected Native American peoples, including historical, political, religious, social organizational, linguistic, and medical/psychiatric aspects of American Indian life. Not available for credit to students who have completed USSO 219. Recommended preparation: ANTH 102. Offered as ANTH 357 and ANTH 457.

ANTH 458. Women’s Mental Health (3)
This anthropological course is an examination of the cultural psychology of women in the following domains: (1) women’s social status cross-culturally; (2) specific psychiatric syndromes, such as psychoses, mood and personality disorders as they affect women; and (3) power and resilience. Issues of the cultural validity of psychological theories for women across diverse settings is the subject of critique throughout the seminar. Recommended preparation: ANTH 102 or ANTH 215. Offered as: ANTH 358, ANTH 458.

ANTH 459. Introduction to International Health (3)
Critical health problems and needs in developing countries. Prevalence of infectious disease, malnutrition, chronic disease, injury control. Examines strategies for improvement of health in less developed countries. Recommended preparation: ANTH 102. Offered as ANTH 359 and ANTH 459.

ANTH 461. Urban Health (3)
This course provides an anthropological perspective on the most important health problems facing urban population around the world. Special attention will be given to an examination of disparities in health among urban residents based on poverty, race/ethnicity, gender, and nationality. Offered as ANTH 361 and ANTH 461.

ANTH 462. Contemporary Theory in Anthropology (3)
A critical examination of anthropological thought in England, France and the United States during the second half of the twentieth century. Emphasis will be on the way authors formulate questions that motivate anthropological discourse, on the way central concepts are formulated and applied and on the controversies and debates that result. Readings are drawn from influential texts by prominent contemporary anthropologists. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 362 and ANTH 462.

ANTH 463. Anthropology and Bioethics (3)
The course will review theoretical work on anthropological thought and values, the discipline of bioethics, its philosophical roots, the body of anthropological work in bioethics, and critically examine a number of current biomedical issues in the United States and internationally. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 363 and ANTH 463.

ANTH 465. Gender and Sex Differences: Cross-cultural Perspective (3)
Gender roles and sex differences throughout the life cycle considered from a cross-cultural perspective. Major approaches to explaining sex roles discussed in light of information from both Western and non-Western cultures. Offered as ANTH 365 and ANTH 465 and WGST 365.

ANTH 466. Topics in Evolutionary Biology (3)
The focus for this course on a special topic of interest in evolutionary biology will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution. ANAT/ANTH/GEOL/PHIL 467/BIOL 468 will require a longer, more sophisticated term paper, and additional class presentation. Offered as ANTH 367, BIOL 368, GEOL 367, PHIL 367, ANAT 467, ANTH 467, BIOL 468, GEOL 467, and PHIL 467.

ANTH 469. The Anthropology of Nutrition (3)
Examines human nutrition and physical performance within the framework of human adaptability theory. The emphasis is on the measurement of energetic intake and expenditure in human populations; the assessment, health consequences, and bio-cultural correlates of malnutrition and obesity; and the uses of energetic data in assessing human population adaptation. Recommended preparation: ANTH 103 or consent of department. Offered as ANTH 369 and ANTH 469.

ANTH 470. Tutorial in Physical Anthropology (3)
Guided readings in physical anthropology. Recommended preparation: Graduate standing and consent of department.

ANTH 471. Culture, Behavior, and Person: Psychological Anthropology (3)
Cross-cultural perspectives on personality, human development, individual variability, cognition, deviant behavior, and the role of the individual in his/her society. Classic and contemporary anthropological writings on Western and non-Western societies. Recommended preparation: ANTH 102 or consent of department. Offered as ANTH 371 and ANTH 471.

ANTH 472. Anthropological Approaches to Religion (3)
The development of, and current approaches to, comparative religion from an anthropological perspective. Topics include witchcraft, ritual, myth, healing, religious language and symbolism, religion and gender, religious experience, the nature of the sacred, religion and social change, altered states of consciousness, and evil. Using material from a wide range of world cultures, critical assessment is made of conventional distinctions such as those between rational/irrational, natural/supernatural, magic/religion, and primitive/civilized. Recommended preparation: ANTH 102. Offered as ANTH 372, RLGN 372 and ANTH 472.

ANTH 475. Human Evolution: The Fossil Evidence (3)
This course will survey the biological and behavioral changes that occurred in the hominid lineage
ANTH 476. Topics in the Anthropology of Health and Medicine (3)
Special topics of interest, such as the biology of human adaptability; the ecology of the human life cycle health delivery systems; transcultural psychiatry; nutrition, health, and disease; paleoepidemiology; and population anthropology. Recommended preparation: ANTH 102 or ANTH 103. Offered as ANTH 376 and ANTH 476.

ANTH 477. Human Osteology (3)
This course for upper division undergraduates and graduate students will review the following topics: human skeletal development and identification; forensic identification (skeletal aging, sex identification and population affiliation). Offered as ANAT 377, ANTH 377, ANAT 477 and ANTH 477.

ANTH 478. Reproductive Health: An Evolutionary Perspective (3)
This course provides students with an evolutionary perspective on the factors influencing human reproductive health, including reproductive biology, ecology, and various aspects of natural human fertility. Our focus will be on variation in human reproduction in mostly non-western populations. Recommended preparation: ANTH 103. Offered as ANTH 378 and ANTH 478. Prereq: ANTH 103.

ANTH 479. Topics in Cultural and Social Anthropology (3)
Special topics of interest across the range of social and cultural anthropology. Recommended preparation: ANTH 102. Offered as ANTH 379 and ANTH 479.

ANTH 480. The Anthropology of Health and Illness I (3)
Part one of the graduate core course in medical anthropology includes sections giving an overview of topics such as the history and conceptual development of medical anthropology, anthropological epidemiology, psychiatric anthropology, social networks/support systems, and health care systems. Recommended preparation: Graduate standing.

ANTH 481. The Anthropology of Health and Illness II (3)
Part two of the graduate core course in medical anthropology includes sections giving an overview of topics such as human adaptability theory, nutritional anthropology, demography, the anthropology of biomedicine, cross-cultural aging, clinical anthropology, and international health. Recommended preparation: ANTH 480.

ANTH 488. Globalization, Development and Underdevelopment: Anthropological Persp (3)
This course examines both theoretical and practical perspectives on globalization and economic development in the “Third World.” From “Dependancy,” “Modernization,” and “World System” theory to post-structuralist critiques of development discourse, the class seeks to provide a framework for understanding current debates on development and globalization. The “neoliberal monologue” that dominates the contemporary development enterprise is critically examined in the context of growing global inequality. Special consideration is given to the roles of international agencies such as the World Bank, International Monetary Fund, United Nations, and non-governmental organizations (NGOs) in the “development industry.” The course also focuses on the contribution of anthropologists to development theory and practice with emphasis on the impact of development on the health of the poor and survival of indigenous cultures. Opportunities for professional anthropologists in the development field are reviewed. Offered as ANTH 388 and ANTH 488.

ANTH 489. Crossroads: Transformation of Rural Blues into Urban Rock (3)
A multimedia approach to the development and transformation of an American musical form, the blues. The authors include the social and cultural history of rural and urban blues, rhythm and blues, rock ‘n’ roll, and the later forms of rock, the social context and life histories of modern music’s creators and innovators, the development of vocal and instrumental styles, blues and rock, visual and performance iconography, milestones in the development of musical genres and the major roles of racism and discrimination in the development of these forms of popular music. Recommended preparation: ANTH 102. Offered as ANTH 389 and ANTH 489.

ANTH 493. Human Ecology: The Biology of Human Adaptability (3)
The place of human populations in the ecosystem. The importance of biological and behavioral responses of populations ranging from hunters and gatherers to contemporary and industrial societies. The effect of various natural and manmade stresses on man’s adaptation to the environment. Recommended preparation: ANTH 103 or consent of department. Offered as ANTH 393 and ANTH 493.

ANTH 494. Seminar in Evolutionary Biology (3)
This seminar investigates 20th-century evolutionary theory, especially the Modern Evolutionary synthesis and subsequent expansions of and challenges to that synthesis. The course encompasses the multidisciplinary nature of the science of evolution, demonstrating how disciplinary background influences practitioners’ conceptualizations of pattern and process. This course emphasizes practical writing and research skills, including formulation of testable theses, grant proposal techniques, and the implementation of original research using the facilities on campus and at the Cleveland Museum of Natural History. Offered as ANTH 394, BIOL 394, GEOL 394, HSTY 394, PHIL 394, ANTH 494, BIOL 494, GEOL 494, HSTY 494, and PHIL 494.

ANTH 497. Epidemiology and the Evolution of Human Diseases (3)
Basic concepts of infectious and degenerative diseases. Description and analysis of the changing distribution and determinants of disease in prehistoric, historic, and contemporary human populations. Recommended preparation: ANTH 103 or consent of department. Offered as ANTH 397 and ANTH 497.

ANTH 498. Public Policy and Aging (3)
Overview of aging and the aged. Concepts in the study of public policy. Policies on aging and conditions that they address. The politics of policies on aging. Emergent trends and issues. Offered as ANTH 498, BETH 496, EPBI 408, GERO 496, HSTY 480, MPH 408, NURS 479, NURS 579, POSC 480, and SOCI 496.

ANTH 502. Research Practicum in Med Anthropology and Cross-cultural Gerontology (3)
Provides M.A. students with firsthand experience in applying anthropology to health and aging problems. Prereq: Graduate standing.

ANTH 503. Seminar in Social Cultural Anthropology (3)

ANTH 504. Anthropological Research Design (3)
Practical and theoretical issues in the selection of questions for health and aging research in societal settings. Illustration of frameworks and designs for research. Discussion of the problems of collection, analysis, and interpretation of data along with the nonscientific influences on the research process and the use of results. Prereq: Graduate standing.

ANTH 506. Seminar in Comparative Health Systems (3)
Prereq: ANTH 480.

ANTH 507. Seminar in Controversial Issues in Anthropology (3)
The goals of this course are to provide students with opportunities to: (1) Familiarize themselves with the (alleged) facts of various controversial issues that have characterized the field of anthropology over the past 50 years; (2) enhance their skills in analyzing and assessing the nature and quality of the arguments and empirical data employed by parties to the controversies; (3) develop an appreciation of the role of historical and political contexts in shaping the emergence and evolution of the controversies; and (4) consider the ethics involved in the practice and public representation of...
anthropology.
Prereq: ANTH 480 and ANTH 481.

ANTH 508. Seminar in Policy and Program Planning and Evaluation
Prereq: ANTH 504.

ANTH 509. Seminar in the Ethnopsychology of Emotion (3)
In this seminar we will be concerned with the relationship of culture and emotion. The study of emotion, traditionally the domain of philosophy, psychology, and physiology, has increasingly attracted the attention of psychological and medical anthropologists. Contemporary anthropological approaches to the problem have documented the substantial role that culture plays in mediating both the experience and the expression of emotion. These issues will be examined through review of cross-cultural, ethnographic materials.
Prereq: ANTH 480.

ANTH 510. Seminar in International Health (3)
This seminar will survey the major areas of research in the field of international health, including anthropology and public health research in international health. Emphasis will be on critical evaluation of current international health theory and methods and review of relevant literature, in regard to the health of the world’s population.
Prereq: ANTH 480 and ANTH 481.

ANTH 511. Topics Seminar in Anthropology and Global Health (3)
Various topics will be offered for graduate students in medical anthropology, such as “Global Mental Health,” “Global Child Health,” and “Global Disease Patterns.”
Prereq: ANTH 480 or ANTH 481.

ANTH 513. Seminar in Ethnopsychiatry (3)
Theory and practice of psychotherapeutic forms. Diagnostic and therapeutic forms from Europe, the United States, Japan, India, and other major cultural traditions and those of local areas such as West Africa, Native America, and Latin America. The cultural theories of mental disorders, related conceptions of self and person, and the relationships of local psychological theory to clinical practice and outcome.

ANTH 519. Seminar in Human Ecology and Adaptability (3)

ANTH 530. Seminar in Medical Anthropology: Topics (3)
Various topics will be offered for graduate students in medical anthropology, such as “Anthropological Perspectives on Women’s Health and Reproduction” and “Bicultural Anthropology.”
Prereq: ANTH 480.

ANTH 542. Human Body: Discourse and Experience (3)
Interdisciplinary approach to embodiment as a starting point for rethinking the concepts of culture and existence. Methodological distinction between phenomenological and semiotic approaches. Topics include cultural uses of the body, the body as representation and expression, the body as an object of domination, the body of health and illness, sexuality and gendered body, religion and the sacred body, and technology and the body.
Prereq: Graduate standing.

ANTH 591. Seminar in Physical Anthropology (3)

ANTH 599. Tutorial: Advanced Studies in Anthropology (1–18)
(Credit as arranged.) Advanced studies in anthropology.

ANTH 601. Independent Research (1–18)
(Credit as arranged.)

ANTH 651. Thesis M.A. (1–18)
Prereq: Graduate standing.

ANTH 700. Dissertation Fieldwork (0)
Students conducting dissertation fieldwork off-campus may choose to register for this course with the permission of their dissertation advisor. Students may register for a maximum of one academic year. Under extraordinary circumstances (e.g., civil war) students may petition for additional time.
Prereq: Ph.D. candidate with an approved dissertation prospectus.

ANTH 701. Dissertation Ph.D. (1–18)
(Credit as arranged.)
Prereq: Doctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF ART HISTORY AND ART

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The Department of Art History and Art offers opportunities to study art history, both in Europe and in the Americas, in a wide range of studio offerings, and to pursue state teacher licensure in art education, and to study in pre-professional museum training. The Bachelor of Arts degree is granted in Art History and in Pre-Architecture (second major only), and the Bachelor of Science degree in Art Education. In addition, the department offers graduate programs leading to the degrees of Master of Arts in Art History, in Art History and Museum Studies, and in Art Education, and to the Doctor of Philosophy in Art History and in Art History and Museum Studies. All art programs are considerably enhanced by close cooperation with and access to the facilities of cultural institutions located in University Circle, in particular the Cleveland Museum of Art, the Cleveland Institute of Art, and the Museum of Contemporary Art (MOCA).

The undergraduate and graduate programs in art history are offered as part of the Program in Art History of Case Western Reserve University and the Cleveland Museum of Art. Many classes are taught at the museum, and courses are occasionally offered or co-taught by museum curators who hold adjunct appointments in the department. Students taking advanced-level courses use the museum’s extensive research library, and all students have an opportunity to study original works of art in the museum’s superb collections.

Students majoring in art history have a wide variety of career opportunities. Graduates with a strong background in art are employed as teachers; as museum professionals (both curatorial and administrative); as art librarians and archivists; as journalists or as sales representatives in commercial art galleries, auction houses, and bookstores; as art conservationists; and as art specialists in the diplomatic service and at all levels of government; and in industry, film, and television. Some of these specialties require additional study and professional preparation beyond the bachelor’s degree.

ART EDUCATION

The Art Education program’s mission is “to prepare proactive, scholar-practitioner art educators who will develop into leaders, teachers, and talented artists in the field of art education.”

The undergraduate and graduate degree programs in art education are given jointly with the Cleveland Institute of Art. Art Education majors have the advantage of pursuing their academic studies in a university environment and their studio studies at a professional art school that educates artists and designers. Students participate in educational field experiences conducted in many of Greater Cleveland’s urban, suburban, and rural school systems, its hospitals, museums, and cultural institutions. Graduates of the Art Education program have pursued careers as teachers, supervisors, and consultants in public and
private schools, colleges, art schools, and museums; as administrators of galleries and art organizations; as designers of educational programs for industry; and as practicing artists. The program is especially proud of its record in recruiting and graduating students from diverse backgrounds.

The program offers Pre-Architecture as a second major and as a minor sequence for students who expect to continue architectural studies at the graduate level or who simply wish to pursue an area of interest. For students seeking to develop and nurture their artistic and creative talents, the program offers a variety of introductory and intermediate art studio courses, taught by experienced artists/teachers in a newly renovated building.

Qualified undergraduates majoring in art history or art education may also participate in the Integrated Graduate Studies program (see below).

DEPARTMENT FACULTY

Edward J. Olszewski, Ph.D.  
(University of Minnesota)  
Professor and Chair  
Italian Renaissance and Baroque art

Henry Adams, Ph.D.  
(Yale University)  
Professor  
American art

David Carrier, Ph.D.  
(Columbia University)  
Champney Family Professor  
Contemporary art and art criticism

Anne Helmreich, Ph.D.  
(Northwestern University)  
Associate Professor  
18th- and 19th-century European art

Ellen G. Landau, Ph.D.  
(University of Delaware)  
Andrew W. Mellon Professor of the Humanities  
20th-century American and European art; critical theory and gender studies

Jenifer Neils, Ph.D.  
(Princeton University)  
Ruth Coulter Heede Professor  
Ancient art and classical archaeology

Catherine B. Scallen, Ph.D.  
(Princeton University)  
Associate Professor  
Northern Renaissance and Baroque art and historiography

Secondary Faculty

Charles Burroughs, Ph.D.  
(The Warburg Institute)

Elise B. Smith  
Professor of Liberal Arts;  
Professor of Classics

Miriam R. Levin, Ph.D.  
(University of Massachusetts)  
Professor

Adjunct Faculty

CURATORS OF THE CLEVELAND MUSEUM OF ART

Michael Bennett, Ph.D.  
(Harvard University)  
Ancient art

Susan Bergh, Ph.D.  
(Columbia University)  
Art of the Ancient Americas

Jane Glaubinger, Ph.D.  
(Case Western Reserve University)  
Prints and drawings

Tom Hinson, M.A.  
(Case Western Reserve University)  
Contemporary art and photography

Heather Lemonedes, Ph.D.  
(The Graduate School and University Center, City University of New York)  
Prints and drawings; 19th-century artists

Constantine Petridis, Ph.D.  
(Ghent University)  
African art

William Robinson, Ph.D.  
(Case Western Reserve University)  
Modern European art

Marjorie Williams, M.A.  
(University of Michigan)  
Asian art

Art Education

Tim Shuckerow, M.A.  
(Case Western Reserve University)  
Director, Art Education and Art Studio

Judy Flamik, B.A.  
(Lake Erie College)  
University Supervisor, Secondary Student Teaching

Sandra Noble, M.A.  
(Cleveland State University)  
University Supervisor, Elementary Student Teaching and Clinical/Field-Based Experience

Art Studio Instructors

Tim Shuckerow, M.A.  
(Case Western Reserve University)  
Director, Art Education and Art Studio  
Painting

Alexander Aitkin, M.F.A.  
(Ohio University)  
Photography I; Creative Photography

Jared Bendis, M.A.  
(Case Western Reserve University)  
Multimedia I; Color Photography

Gail Berg, M.A.  
(Case Western Reserve University)  
Photography II

Martin Boyle, M.F.A.  
(Yale University)  
Color and Design; Printmaking

Margaret Fischer, M.A.  
(Case Western Reserve University)  
Enameling and Jewelry

JoAnn Giordano, M.F.A.  
(Cranbrook Academy of Art)  
Weaving, Fibers, and Textiles

Sally Levine, M.A.  
(University of Illinois)  
Architecture

Martha Lois, M.F.A.  
(Kent State University)  
Ceramics

Christopher Pekoc  
Creative Drawing

UNDERGRADUATE PROGRAMS

The art history curriculum is designed to give students a broad grounding in painting, sculpture, architecture, and the decorative arts, with a strong emphasis on understanding the cultural context in which they were produced. Students also develop a technical and critical vocabulary as well as sound writing skills to analyze works of art.

Majors

BACHELOR OF ARTS IN ART HISTORY

This major requires 36 hours of course work in art history, including ARTH 101, 102, and 396. At least 6 credit hours must be taken at the 200 level, and at least 15 credit hours must be taken at the 300 level. One approved art studio course is also required. Foreign language study (French, German, or Italian) is highly recommended.
DEPARTMENTAL HONORS
Majors who wish to earn the Bachelor of Arts degree with Honors in Art History must make written application to the department chair no later than the fall semester of their senior year. Departmental honors are awarded upon fulfillment of the following requirements: a grade point average of at least 3.5 in the major and an honors thesis (ARTH 399) that receives a grade of A.

BACHELOR OF ARTS IN PRE-ARCHITECTURE
The Pre-Architecture program introduces the student to the forms, history, and functions of architecture as well as to the studio skills relevant to its practice. The program is designed to provide a background for undergraduate students who plan to continue architectural studies at the graduate level, as well as for those interested in the study of architecture as part of a liberal or technical education.

Pre-architecture may be chosen only as a second major. The double major is required so that the perspectives provided by this interdisciplinary program may be complemented by a concentrated disciplinary experience. For a student who completes a Bachelor of Science degree (B.S., B.S.E., or B.S.N.), pre-architecture may serve as the sole major for a B.A. degree.

To declare a pre-architecture major, students should have declared a first major and have sophomore or junior standing. Up to 6 credits in general education requirements and elective courses taken by students for their first major may be applied to their pre-architecture major.

The major consists of a minimum of 30 credit hours, 15 of which are in required courses and the remainder of which are approved elective courses. Detailed information about approved electives is available in the departmental office.

The required courses are:
ARTS 302, 303 Architecture and City Design I, II (3, 3)
ARTH 101 (3)
ARTH 102 (3)
ARTS 106 Creative Drawing I (3)

Fifteen hours of electives must be selected from the following groups:
1. 6 hours from selected art history courses
2. 6 hours from
   ARTS 101, 201 Design and Color I, II (3, 3)
   ARTS 206 Creative Drawing II (3)
   ARTS 220 Photography Studio I (3)
   THTR 223, 224 Stagecraft I, II (3, 3)

3. For students whose interests lie in aesthetics and the history of architecture, 3 hours in sociology, American studies, anthropology, history of science and technology, civil engineering, or geology. Students are encouraged to include as many of the courses listed below as possible in their schedules:
   MATH 125, 126 Mathematics I, II (4, 4)
   PHYS 115, 116 Introduction to Physics (4, 4) and Laboratory (4, 4)
   PHYS 121 General Physics-Mechanics (4)
   PHYS 122 General Physics II-Electricity and Magnetism (4) and Laboratory

BACHELOR OF SCIENCE IN ART EDUCATION
The B.S. in art education requires a total of 124 credits and is designed to educate professional teachers of art for the public and private schools who are also competent, creative artists. The program meets all requirements of the Ohio Board of Education to qualify its university-recommended students for Pre-K-12 Art Specialist Licensure to teach art in the public schools of Ohio and more than 40 reciprocating states.

This program is conducted jointly by Case Western Reserve University and the Cleveland Institute of Art. Admission requires application to Case Western Reserve and submission of an art portfolio to the Cleveland Institute of Art. Credentials must be acceptable to both institutions. Academic work is taken at Case Western Reserve University, and the majority of studio courses at the Cleveland Institute of Art, as follows:

ACADEMIC COURSES AT CASE WESTERN RESERVE UNIVERSITY
SAGES First Seminar (4)
SAGES University Seminar. Two selected from:
USNA Thinking About Natural and Technological World (3)
USSO Thinking about the Social World (3)
USSY Thinking about the Symbolic World (3)
Natural Sciences (3)
Quantitative Reasoning (MATH or STAT) (3)
Global & Cultural Diversity (3)
ARTH 101 and 102 (6)
ARTH electives (one must be at 300 level) (6)
PHED Physical Education (2 semesters) (0)
Professional Education/Art Education (39 total credit hours)
ARTS 295, 300, 385, 386, 387, 393, 395, 366a, 366b, 465
EDUC 301, PSCL 101, and EDUC 304
EDUC 225 (or EDJC 255)

ART STUDIO COURSES AT THE CLEVELAND INSTITUTE OF ART
Total of 51 hours of studio possible:
Digital Art and Design (6)
Design 2D and 3D (6)
Drawing I, II, III (9)
Painting Arts 216 and CIA Color (6)
2D Visualization (3)
Studio Project (3)
Sculpture (3)
5 Studio Electives (15)

Retention and Advanced Standing (Undergraduate Level)
The Bachelor of Science program in art education is designed to educate professional teachers of art. There are four decision points in the program, and for each of these decision points, there are three possible outcomes: unconditional admission; conditional admission with a prescribed remedial plan which when successfully completed will result in unconditional admission; or denial of admission. Denial of admission at any decision point means the student is no longer able to pursue an Art Education degree at Case Western Reserve.

DECISION POINT 1: APPLICATION FOR ADMISSION TO THE PROGRAM
Official admission to the Art Education program generally occurs at the end of the fall semester of the sophomore year. Admission to
the program requires: (1) being accepted to the university; (2) being accepted as an art major through a portfolio review before matriculation; (3) successful completion of ARTS 295, including evaluation of an initial Teaching ePortfolio; (4) cumulative Case GPA of 2.5 or better; (5) submission of a signed Statement of Assurance of Good Moral Character, and (6) a satisfactory interview with Art Education faculty, documented on the Teacher Licensure Admission Assessment Form.

**DECISION POINT 2: APPLICATION FOR ADVANCED STANDING**

The Application for Advanced Standing should be submitted by the junior year and the fall semester after Decision Point 1. Application for Advanced Standing requires: (1) a successful review of the updated Teaching ePortfolio; (2) submission of a current DPR form documenting the following: a cumulative GPA of 2.5 or better, an art course GPA of 2.5 or better, and an education GPA of 3.0 or better; and (3) a passing score on the Candidate Disposition Assessment Inventory completed by the Art Education faculty.

**DECISION POINT 3: APPLICATION FOR STUDENT TEACHING**

The Application for Student Teaching should be completed by week 8 of the semester prior to student teaching. The application requires: (1) a successful review of the updated Teaching ePortfolio; (2) submission of a current DPR form documenting the following: a cumulative GPA of 2.5 or better, an art course GPA of 2.5 or better, and an education GPA of 3.0 or better; (3) a passing score on the Candidate Disposition Assessment Inventory completed by the Art Education faculty; (4) passing a TB test; (5) presenting documentation of Hepatitis B vaccination; and (6) passing an official criminal background check.

**DECISION POINT 4: APPLICATION FOR INITIAL LICENSURE**

Application for Initial Licensure occurs after successful completion of all degree requirements. The application requires: (1) a successful review of the updated Teaching ePortfolio; (2) submission of a current DPR form documenting the following: a cumulative GPA of 2.5 or better, an art course GPA of 2.5 or better, and an education GPA of 3.0 or better; (3) a passing score on the Candidate Disposition Assessment Inventory completed by the Art Education faculty; (4) achievement of state-mandated scores on the two Praxis II national teacher exams; (5) completion of the Case Student Teaching Final Assessment by the cooperating teacher and university supervisor with a grade of B or better; and (6) completion of the Case Teacher Licensure Exit Interview and Survey.

After successfully completing all requirements at the four decision points, the student is recommended by the university’s director of teacher education for the Ohio Provisional Art (Pre-K-12) License. Completion of the B.S. in Art Education degree is separate from the assurance that the State of Ohio’s Provisional Art Teacher License will be awarded. Teacher Licensure is also obtainable through the Art Education Graduate Program of Study.

Additional information on this program is available in the office of the director of art education.

**Integrated Graduate Studies**

Qualified undergraduates majoring in art history or art education may also participate in the Integrated Graduate Studies program. Interested students should note the general requirements and the admission procedures in this bulletin and may consult the department for further information.

**Minors**

Four minors are available in art: one in art history, and three through the Art Studio program.

**ART HISTORY**

Requires 18 hours of art history, including:

- ARTH 101 (3)
- ARTH 102 (3)

At least three credit hours must be taken at the 200 level.

**ART STUDIO**

Requires 18 hours in Art Studio courses, including:

- ARTS 101 Design and Color (3)
- ARTS 106 Creative Drawing (3)

Four additional studio courses, two of which must be in the same area (i.e., drawing, painting, design, textiles, photography, ceramics and enameling).

**PHOTOGRAPHY**

Requires 18 hours, including:

- ARTS 220 Photography Studio I (3)
- ARTS 320 Photography Studio II (3)
- ARTS 322 Photography: Color Studio (3)
- ARTS 325 Creative Photography (3) or ARTS 365D, Black & White Photography Studio (3)
- ARTS 365E Color Studio (3) or ARTS 365K, Creative Photography (3)

An elective, either ARTS 399, Independent Study in Art Studio (3), ARTH 102, Art History II (3), or ARTS 350, Multimedia I

**PRE-ARCHITECTURE**

Requires 18 hours, including:

- ARTH 101 (3)
- ARTH 102 (3)
- ARTS 106 Creative Drawing (3)
- ARTS 302, 303 Architecture and City Design I, II (3, 3)

One approved elective. Recommended: ARTS 304, Architecture and City Design III, or ARTS 350, Multimedia I

**GRADUATE PROGRAMS**

**Master of Arts in Art History**

The master’s program in art history is designed to provide the student with a broad knowledge of the major art historical periods, the scholarly and bibliographical resources, and the methodologies of art history. It also offers an opportunity to investigate art historical problems in some depth. In addition to the regular graduate school application form, applicants to the graduate program in art history are required to submit GRE scores and copies of two term papers that they consider to represent their best work. Applicants for the M.A. should have a B.A. major or minor concentration in art history or a related humanities field and a minimum GPA of 3.0.

The master’s degree in art history is conducted exclusively under Plan B as described under the School of Graduate Studies in this bulletin. All other requirements of the M.A. program must be fulfilled:

- Eight graduate courses, including one each from four of the following five areas, three of which must be seminars at the 500 level (24):
- Non-Western
• Ancient
• Medieval
• Renaissance/Baroque
• Modern and American
• A reading knowledge of one foreign language (French, German, Italian or Spanish)
• Successful performance on the M.A. comprehensive examination
• 3 credit hours of qualifying paper (ARTH 489)

Total: 30 hours

Master of Arts in Art History and Museum Studies

The master’s program in Art History and Museum Studies includes the same broad requirements and objectives of the master’s program in art history, with additional study of art museum procedures and two supervised museum internships.

The requirements include:

• ARTH 495, Methodology of Art History (3)
• ARTH 490, Visual Arts and Museums (3)
• ARTH 491A&B, Visual Arts and Museums: Internship (1/3)
• Seven graduate courses, including one each from four of the following five areas, three of which must be graduate seminars at the 500 level (21):
  • Non-Western
  • Ancient
  • Medieval
  • Renaissance/Baroque
  • Modern and American

Total: 31 hours

Master of Arts in Art Education

The Master of Arts in Art Education is offered in two plans: Plan I for those who already hold teacher licenses and who desire advanced studio- and art-related studies; Plan II for those holding the Bachelor of Fine Arts or equivalent degree who desire teaching licensure multiple as visual art specialists. Both programs are offered jointly by Case Western Reserve University and the Cleveland Institute of Art, and both require 36 semester hours.

The admission procedure includes a formal application, three letters of recommendation, and a college transcript, which are to be submitted to the Art Education Office. The Cleveland Institute of Art admission procedure requires a portfolio of artwork. Approval by both the University and the Cleveland Institute of Art is required for admission. Information and application forms are available online through the Office of Graduate Admission at Case Western Reserve University.

**PLAN I**

18 hours in studio to be taken at the Cleveland Institute of Art at the 300 level or above; and 18 hours in academic courses to be taken at Case Western Reserve University at the 400 level or above, to be selected in consultation with the director of art education; or

• 30 semester hours of course credit: 18 hours in studio to be taken at the Cleveland Institute of Art at the 300 level or above; and 12 hours in academic courses to be taken at Case Western Reserve University at the 400 level or above, to be selected in consultation with the director of art education; AND a thesis based on individual research (not less than 6 semester hours of registration).

**PLAN II**

EDUC 401 Introduction to Education (3)
EDUC 404 Educational Psychology (3)
ARTS 385 Clinical Field-Based Experience I (1)
ARTS 386 Clinical Field-Based Experience II (1)
ARTS 387 Clinical Field-Based Experience III (1)
ARTS 400 Current Issues in Art Education (3)
ARTS 493 Art Content, Pedagogy, Methodology, and Assessment (3)
ARTS 466 A&B Student Teaching in Art for Pre-K-6th Grade and 7th-12th Grade (4 each)
ARTS 465 Seminar for Art Teachers (4)
ARTS 602 Study in Art Education (3)
ARTS 495 Introduction to Multimedia Technology (3)
ARTS 497 Summer Workshop in Art Education (3)

The Master’s Plan II Program in Art Education is designed to educate professional teachers of art. There are four decision points in the Art Education program. For each of the decision points, there are three possible outcomes: unconditional admission; conditional admission with a prescribed remedial plan which when successfully completed will result in unconditional admission; or denial of admission. Denial of admission at any decision point means the student is no longer able to pursue an Art Education degree at Case Western Reserve University.

**DECISION POINT 1: APPLICATION FOR ADMISSION TO THE PROGRAM**

Application for admission to the program requires: (1) being accepted to the university; (2) being accepted as an art major through a portfolio review; (3) submission of a signed Statement of Assurance of Good Moral Character, and (4) a satisfactory interview with Art Education faculty, documented on the Teacher Licensure Admission Assessment Form.

**DECISION POINT 2: APPLICATION FOR ADVANCED STANDING**

Application for Advanced Standing requires: (1) a successful review of the updated Teaching ePortfolio; (2) submission of a current transcript documenting the following: a cumulative GPA of 3.0 or better, an art course GPA of 3.0 or better, and an education GPA of 3.0 or better; and (3) a passing score on the Candidate Disposition Assessment Inventory, completed by the Art Education faculty at the end of the first semester.

**DECISION POINT 3: APPLICATION FOR STUDENT TEACHING**

Application for Student Teaching requires: (1) a successful review of the updated Teaching ePortfolio; (2) submission of a current transcript documenting the following: a cumulative GPA of 3.0 or better, an art course GPA of 3.0 or better, and an education GPA of 3.0 or better; (3) a passing score on the Candidate Disposition Assessment Inventory, completed by the Art Education faculty; (4) passing a TB test; (5) presenting documentation of Hepatitis B vaccination; and (6) passing an official criminal background check.

**DECISION POINT 4: APPLICATION FOR INITIAL LICENSURE**

Application for Initial Licensure occurs after successful completion of all degree requirements. The application requires: (1) a successful review of the updated Teaching ePortfolio; (2) submission of a current final transcript documenting the following: a cumulative GPA of 3.0 or better, an art course GPA of
Ph.D. students are required to pass a written examination during the first semester of doctoral study. The department lists a foreign language that must be completed by the time of admission or for the dissertation. A Ph.D. qualifying examination or the equivalent is required for admission, as well as GRE scores and a reading knowledge of one foreign language. A Ph.D. qualifying examination or the equivalent is also required for admission to the doctoral level.

The doctoral program in art history is designed to allow advanced graduate students the opportunity to specialize in designated areas. Admission to the program requires an M.A. in art history or its equivalent, including a reading knowledge of one approved foreign language (French, German, Italian or Spanish). A qualifying examination or the equivalent is also required for admission at the doctoral level.

Applicants are required to submit GRE scores and two papers written during their matriculation for a master’s degree, or a thesis if completed by the time of application.

University requirements for the Ph.D. include a minimum of 36 hours of course credits, but the department may require additional course work as preparation for the general examination or for the dissertation. The minimum credits are to be distributed as follows: ARTH 495, Methodologies of Art History (3); two graduate seminars at the 500 level or above (6); three additional courses at the 400 level or above (9); and a minimum of 18 hours of ARTH 701, Ph.D. Dissertation.

Doctoral students must demonstrate an ability to read two approved languages (other than English) useful in art historical research. German is normally required as one of the two languages for students concentrating in Western art. Both languages must be approved by the department at the time of admission or during the first semester of doctoral study.

Ph.D. students are required to pass a written and oral general examination before being advanced to candidacy. Within two weeks after the examination, the faculty examining committee will administer the oral examination. A final evaluation will be based on the student’s performance in both the written and oral sections of the general examination.

**Doctor of Philosophy in Art History and Museum Studies**

The Ph.D. program in Art History and Museum Studies is offered to a limited number of candidates. The program combines the academic requirements of a Ph.D. with practical museum training, and is designed to provide experience in connoisseurship, conservation, and art education, as well as a planned program of academic course work and independent research. Admission to the program is made on the basis of academic record, experience, recommendations, and personal interviews. A master’s degree in art history or its equivalent is required for admission, as well as GRE scores and a reading knowledge of one foreign language. A Ph.D. qualifying examination or the equivalent is also required for admission.

Students in the museum studies program are required to take a minimum of 38 hours of graduate study as follows: ARTH 610, Cleveland Museum of Art Internship (2); two graduate seminars at the 500 level or above (6); four elective courses at the 400 level or above (12); and a minimum of 18 hours of ARTH 701, Ph.D. Dissertation.

During the two-semester internship, the student will be assigned to one or more departments in the Cleveland Museum of Art for supervised study and practice that will be evaluated by a member of the faculty in art history. The dissertation subject may be related to some aspect of art museum research; it may take the form of a special collection or exhibition catalogue, but it must satisfy the scholarly standards of the department and the university. Any student who has not taken ARTH 495, Methodologies of Art History, or the equivalent will be required to do so as part of the 12 hours of elective courses. Students also must satisfy all other requirements for the Ph.D. degree in art history.

**COURSE DESCRIPTIONS**

**ARTH 101. Art History I: Pyramids to Pago- das (3)**

The first half of a two-semester survey of world art highlighting the major monuments of the ancient Mediterranean, medieval Europe, MesoAmerica, Africa, and Asia. Special emphasis on visual analysis, and socio-cultural contexts, and objects in the Cleveland Museum of Art.

**ARTH 102. Art History II: Michelangelo to Maya Lin (3)**

The second half of a two-semester survey of world art highlighting the major monuments of Renaissance and Baroque Europe, America, and Asia. Special emphasis on visual analysis, historical and sociocultural contexts, and objects in the Cleveland Museum of Art. (ARTH 101 and 102 may be combined, or either can be taken in conjunction with any other 100 or 200 level Art History class to complete a sequence in the Arts portion of the Humanities section of the General Education Requirements in the College of Arts and Sciences or can be used as part of a three course Humanities sequence in the Engineering Core curriculum.)

**ARTH 203. The Arts of Asia (3)**

A survey of Japanese and Chinese art from the Bronze Age to the 18th century, with particular emphasis on objects in the Cleveland Museum of Art. The relationship of art works to Buddhism and Hinduism is explored along with cultural rituals, ceremonies, and traditions. Global & Cultural Diversity

**ARTH 211. Building on Antiquity (3)**

This course will provide orientation in the architectural orders and in most periods of European and Euro-American architectural history as well as, to an extent, criticism. Students will learn how to research buildings from different historical epochs, how to work with relevant databases and a range on on-line resources, and with the print resources available. Students will gain some familiarity with the conventions of architectural representation as these became established over centuries. There will be an important writing component, and a considerable amount of group work involving oral presentation and classroom discussion. The issue of the meaning(s) of architecture will be central; we will consider the blatant political uses of architecture and of imagery associated with architecture, more elusive and/or ambiguous cases, and the phenomenon of meanings changing from one era to another or according to audience. We will consider the relationship of the relatively formal “language” of classical architecture (the orders, especially as endowed with gender associations in the Vitruvian tradition) and the more subtle, ad hoc ways that buildings project meaning or mood. Offered as ARTH 211 and CLSC 211.

**ARTH 220. Jewish Traditional Art and Architecture (3)**
Tradition and transformation in Jewish artistic expression over time and across space. Course will begin with the biblical period and continue down to the present day in Israel and America. Examination of how concepts such as “Jewish” and “art” undergo change within the Jewish community over this period. Offered as ARTH 220 and JDST 220.

Global & Cultural Diversity

ARTH 226. Introduction to Greek and Roman Art (3)
Classical art from the 8th century B.C. to the fourth century A.D.; the major developments in the architecture, sculpture, and painting of ancient Greece, Etruria, and Rome; their political and religious institutions and the relationship to contemporary art forms. Offered as ARTH 226 and CLSC 226.

ARTH 227. Ancient Cities and Sanctuaries
A selection of cities and sanctuaries from the ancient Near East, Egypt, the Aegean, Greece, Etruria, and Rome; their political and religious institutions and the relationship to contemporary art forms. Offered as ARTH 227 and CLSC 227.

ARTH 228. Ancient Greek Athletics (3)
Exploration of the role of athletics in the ancient, primarily Greek world, and their reflection in the art of the period. Offered as ARTH 228 and CLSC 228.

ARTH 240. Architecture: Ancient to 1850 (3)
Western traditions of architecture and urban design from antiquity to the early nineteenth century, with emphasis on pre-industrial cities and landscapes. Interactions between western theory and practice and certain non-western cultures, especially the Arab/Turkish world and China.

Global & Cultural Diversity

ARTH 250. Art in the Age of Discovery (3)
A survey of developments in Renaissance art and architecture in northern Europe and Italy during a new age of science, discovery and exploration, 1400-1600.

ARTH 260. Art in the Age of Grandeur (3)
A survey of European art in the seventeenth and eighteenth centuries, an era of rising nationalism, political aggendizegment, religious expansion and extravagant art patronage.

ARTH 270. American Art and Culture Before 1900 (3)
Survey of the development of American art from colonial times to the present which explores how art has expressed both American values and American anxieties. Painting is emphasized, but the course also considers architecture, the decorative arts, film, literature, and music.

Offered as AMST 270 and ARTH 270.

ARTH 271. American Art and Culture: The Twentieth Century (3)
Survey of the development of American art from 1900 to the present (and the future) which will explore how art has expressed both American values and American anxieties. Painting will be emphasized, but the course will also consider architecture, the decorative arts, film, literature, and music.

Offered as AMST 271 and ARTH 271.

ARTH 280. Modern Art and Modern Science (3)
An examination of the development of painting, sculpture, and architecture from the 19th to the mid 20th century. Special attention is given to the emergence of “modernism” and the influence of science on such movements as Impressionism and Cubism.

ARTH 284. History of Photography (3)
A survey of the history of photography from its inception in 1839 to the present. Emphasis is on the complex relationship between technological innovations and picture-making: the artistic, documentary, and personal uses of photography; and the relationship of photography to other art forms.

ARTH 290. Introduction to the Art of Sub-Saharan Africa (3)
Exploration of the diverse forms and multiple contexts of the visual arts of sub-Saharan Africa. Attention focused on the sculpture of different peoples of West and Central Africa. Ancient arts in terracotta and bronze of Nigeria, Mali, and Chad and rock art of Saharan, Southern, and Eastern Africa will also be explored. Topics such as the styles, aesthetics, meanings, and functions of African art and the training, techniques, and status of the African artist will be discussed.

Global & Cultural Diversity

ARTH 293. A World Art History (3)
Traditionally European (and American) art historians focused on the art tradition of their own culture. But recently there has been interest in a world art history. Specialists look at the history of other visual cultures. And so then the great intellectual challenge is to write a narrative including art from everywhere. This project is very important politically. Our world has so many dangerous conflicts, and so sympathetic study of art from other cultures is an important way to promote international understanding. In the first part of the class we look at the history of European art history. We discuss Vasari’s great pioneering history, and the development of his concerns by Hegel; and, in the mid-twentieth century by Ernst Gombrich and Clement Greenberg. This monocultural tradition focuses on the history of European art. In the second part we consider the art of three great cultures outside Europe: China, India, and Islam. We read a little about their art history, focusing on the ways in which it is very different from the history of European art. The aim is not to do a systematic analysis, which would be a very large task, but to introduce some suggestive themes. We will discuss the role of the medium in Chinese scroll painting and Islamic concepts of decoration. We will look at the representations of carpets within European paintings. They are an important example of what happens when diverse cultures connect.

Global & Cultural Diversity

ARTH 302. Buddhist Art in Asia (3)
The development of Buddhist art from its origins in India along the silk route to China and along the maritime routes to Japan and southeast Asia. Offered as ARTH 302 and ARTH 402.

Global & Cultural Diversity

ARTH 303. History of Far Eastern Art (3)
A survey of traditional arts of Asia east of the Indus river, designed to emphasize the creative contributions of the artist with particular attention to the international relations of: the Bronze Age, Buddhist art, Hindu art, and the later arts of China, Korea, and Japan. National and regional contributions to the developed styles of South Asia and the Far East will be stressed. Offered as ARTH 303 and ARTH 403.

ARTH 304. Art of West Africa (3)
This course will survey artistic traditions of the past, and traditions that continue to flourish to this day in culture regions in West Africa called the Western Sudan and the Guinea Coast. An area of immense geographical and human diversity, the Western Sudan is the homeland of some of Africa’s most renowned medieval empires. An ancient culture known as Jenne (8th – 17th century) has produced a wide variety of refined ceramic artifacts. The Guinea Coast is densely populated by hundreds of different ethnic groups and harbors a diversity of artistic traditions. An active trade with Europeans was established in the region as early as the 15th century. Gender-restricted and ritually powerful organizations still serve as the major patrons of the arts in the region. Contrary to the elongated so-called “pole style” typical of the Western Sudan, the arts of the Guinea Coast are characterized by organic and elegant forms and smooth surfaces in a variety of media. Offered as ARTH 304 and ARTH 404.

ARTH 305. The Art of India (3)
A survey of Indian art from the Indus valley civilization to the Islamic conquest of India. Stylistic developments of the three-dimensional arts examined through cave sites and other extant materials. Offered as ARTH 305 and ARTH 405.

ARTH 306. History of Indian Sculpture (3)
The stylistic development of both Buddhist and Hindu schools of Indian sculpture from the prehistoric period to the 12th century. Sculptural images are studied in terms of Indian mythology and literature. Offered as ARTH 306 and ARTH 406.

ARTH 311. Rome: City and Image (3)
This course studies the architectural and urban history of Rome from the republican era of the ancient city up to the eighteenth century using the city itself as the major “text.” The emphasis will be placed on the extraordinary transformations...
wrought in the city, or at least in key districts, by powerful rulers and/or elites, especially in the ancient empire and in the Renaissance and baroque eras. In a larger perspective, the great construction projects exerted a far-reaching effect within and beyond Europe, but we will study them in relation to their topographical situation, their functions, and their place in a long history of variations on prestigious themes since many of the artworks and the urban settings featured in the course carry the mark of the Long history of the city itself. Recommended preparation: At least one 200-level course in ARTH, ARTH, CLSC, ENGL, HSTY, or RLGN.

Offered as ARTH311/411 and CLSC 311.

ARTH 328. Greek Sculpture (3)
Greek sculpture from the Archaic period through the Hellenistic; style, the development of specific types, and the uses of architectural sculpture.

Offered as ARTH 328, CLSC 328, and ARTH 428.

ARTH 332. Art and Archaeology of Ancient Italy (3)
The arts of the Italian peninsula from the 8th century B.C. to the 4th century A.D., with emphasis on recent archaeological discoveries. Lectures deal with architecture, sculpture, painting, and the decorative arts; supplemented by gallery tours at the Cleveland Museum of Art.

Offered as ARTH 332, CLSC 332, and ARTH 432.

ARTH 333. Greek and Roman Painting (3)
Greek vase painting, Etruscan tomb painting and Roman wall painting. The development of monumental painting in antiquity.

Offered as ARTH 333, CLSC 333, and ARTH 433.

ARTH 334. Art and Archaeology of Greece (3)
A survey of the art and architecture of Greece from the beginning of the Bronze Age (3000 B.C.) to the Roman conquest (100 B.C.) with emphasis on recent archaeological discoveries. Lectures deal with architecture, sculpture, painting, and the decorative arts, supplemented by gallery tours at the Cleveland Museum of Art.

Offered as ARTH 334, CLSC 334, and ARTH 434.

ARTH 335. Issues in Ancient Art (3)
Various topics in Ancient art. Lectures, discussions and reports.

Offered as ARTH 335 and ARTH 435.

ARTH 340. Issues in the Art of China (3)
This is a topics course. Each offering will focus on a specific topic within the area of Chinese art. Sample topics may include: Women painters in Beijing, Modern Artists in China-1980-Present, Shang Dynasty Tombs, Yuan Dynasty Buddhist Art. Lectures, discussions, and reports.

Offered as ARTH 340 and ARTH 440.

Global & Cultural Diversity

ARTH 341. Issues in the Art of Japan (3)
This is a topics course. Each offering will focus on a specific topic within the area of Japanese art. Sample topics may include: Muromachi Hanging Scrolls, Ryoan-ji Temple Garden Architecture, Rimpua School Panel Screens, Buddhist Painting in the Edo Period. Lectures, discussions, and reports.

Offered as ARTH 341 and ARTH 441.

ARTH 342. Issues in the Art of India (3)
This is a topics course. Each offering will focus on a specific topic within the area of Indian art. Sample topics may include: Northern Temple Architecture, Mughal Painting, Gupta Period Sculpture, Great Stupa sculptural articulation. Lectures, discussions, and reports.

Offered as ARTH 342 and ARTH 442.

ARTH 343. Issues in the Art of Southeast Asia (3)
This is a topics course. Each offering will focus on a specific topic within the area of Southeast Asian art. Sample topics may include: Buddhist Art, Introduction to Southeast Asian Art, Temple Architecture in Thailand, Cambodian Stone Carvings, Lectures, discussions, and reports.

Offered as ARTH 343 and ARTH 443.

ARTH 344. Issues in the Art of Africa (3)
This is a topics course. Each offering will focus on a specific topic within the area of African art. Sample topics may include: Ritual Masks, Sub-Saharan Religious Architecture, Carvings of Twins in Fertility Rites, Benin Bronze Warrior Reliefs. Lectures, discussions, and reports.

Offered as ARTH 344 and ARTH 444.

ARTH 345. Issues in Pre-Columbian Art (3)
This is a topics course. Each offering will focus on a specific topic within the area of Pre-Columbian art. Sample topics may include: Ancient Mesoamerica, Mayan Temple/Palace Complexes, Royal Peruvian Settlements, Inca Decorative Arts. Lectures, discussions, and reports.

Offered as ARTH 345 and ARTH 445.

ARTH 346. Issues in the Art of Native Peoples (3)
This is a topics course. Each offering will focus on a specific topic within the area of native peoples. Sample topics may include: North American Indian Art, Mound Building Cultures in the Central United States, Introduction to Maori Polychrome Painting, Decorative American Indian Bead Work. Lectures, discussions, and reports.

Offered as ARTH 346 and ARTH 446.

ARTH 347. Issues in Islamic Art (3)
This is a topics course. Each offering will focus on a specific topic within the area of Islamic art. Sample topics may include: Mosque Architecture in Spain, Islamic Decorative Arts, Mughal Figurative Art, Introduction to the Art of Islam. Lectures, discussions, and reports.

Offered as ARTH 347 and ARTH 447.

ARTH 350. Issues in Medieval Art (3)
Various topics in Medieval Art. Lectures, discussions, and reports.

Offered as ARTH 350 and ARTH 450.

ARTH 351. Late Gothic Art in Italy (3)
Sculpture of the Pisani; early trends in Pisa, Siena, and Florence; Cimabue and Giotto; Duccio; Simone Martini, and the Lorenzetti; painting in Florence and Siena after the Black Death.

Offered as ARTH 351 and ARTH 451.

ARTH 352. Italian Art of the 15th Century (3)
The early 15th century in Florence, civic humanism, the sculpture of Ghiberti and Donatello, the painting of Masaccio; the International Style in painting, the art of Uccello, Piero della Francesca, Mantegna, and Botticelli; Carpaccio and the Bellini in Venice.

Offered as ARTH 352 and ARTH 452.

ARTH 353. Sixteenth Century Italian Art (3)
The development of the High Renaissance and Mannerist styles in Italy and late 16th century trends: painting and sculpture.

Offered as ARTH 353 and ARTH 453.

ARTH 356. Italian Renaissance and Baroque Sculpture (3)
Italian sculpture from the early 12th century to the later 18th century. The Pisani, Ghiberti, Donatello, Michelangelo, the Mannerists and Bernini.

Offered as ARTH 356 and ARTH 456.

ARTH 360. Renaissance Art in Northern Europe (3)
Painting, sculpture and the graphic arts in the Netherlands, Germany, and France, 1400-1580, highlighting artists such as Jan van Eyck, Albrecht Dürer and Pieter Bruegel. The rise of secular subjects and bourgeois patronage is explored.

Offered as ARTH 360 and ARTH 460.

ARTH 361. Dutch and Flemish 17th Century Painting (3)
The golden age of Dutch and Flemish art with study of major masters (Rubens, Hals, Rembrandt, and Vermeer) and developments in subject matter: landscape, still-life, and genre themes.

Offered as ARTH 361 and ARTH 461.

ARTH 362. Issues in Renaissance Art (3)
Various topics in Renaissance art. Lectures, discussions and reports.

Offered as ARTH 362 and ARTH 462.

ARTH 365. Issues in Baroque Art (3)
Various topics in baroque art. Lectures, discussions and reports.

Offered as ARTH 365 and ARTH 465.
lished a new and lasting form of government, but
subsistence farmers and most of their products,
In the 17th century, most Americans were
political revolution but an artistic and creative one
In the 8th century, Americans created not only a
production, and feminist criticism.
ERN use of feminine myths, subjects and modes of
works of art by and about women. Focus on the
in-depth thematic approach to issues aff ecting
Th e 20th/21st Century (3)
and new developments in literature, philosophy,
painting and sculpture with utopian goals. Focus
European Art (3)
Offered as ARTH 381 and ARTH 481.
ARTH 374. Impressionism to Symbolism (3)
Major developments in European painting and
sculpture during the latter half of the nineteenth
century. Post-impressionism, synthetism, symbol-
ism, and the arts and crafts movement considered
in their socio-cultural contexts. Works of Degas,
Manet, Monet, Klimt, Bocklin, Gauguin, etc.
Offered as ARTH 374 and ARTH 474.
ARTH 379. Issues in 19th Century Art (3)
Various topics in 19th century art, with class lec-
tures, discussions and reports. Consult department
for current topic.
Offered as ARTH 379 and ARTH 479.
ARTH 380. Abstract Expressionism and Its
Aftermath (3)
An examination of the development and influences of
Abstractionism, including the impact on the Beat Generation and Pop Art.
Offered as ARTH 380 and ARTH 480.
ARTH 381. Neoclassicism to Realism (3)
The main developments of European art, chiefly
painting and sculpture from post-impressionism to
the present; the nature of abstract art and the inter-
relation between art and the visual arts.
Offered as ARTH 381 and ARTH 481.
ARTH 382. Visions of Utopia: 20th Century
European Art (3)
Major movements in early 20th century European
painting and sculpture with utopian goals. Focus on
the interrelationships between the visual arts and new
developments in literature, philosophy, and science.
Offered as ARTH 382 and ARTH 482.
ARTH 383. Gender Issues in Feminist Art:
The 20th/21st Century (3)
An in-depth thematic approach to issues affecting
works of art by and about women. Focus on the
late 20th century. Emphasis on a specifically mod-
ern use of feminine myths, subjects and modes of
production, and feminist criticism.
Offered as ARTH 383, WGST 383 and ARTH 483.
ARTH 384. American Art and Architecture
in the Age of Washington and Jefferson (3)
In the 18th century, Americans created not only a
political revolution but an artistic and creative one
as well. In the 17th century, most Americans were
subsistence farmers and most of their products,
manufactures, and buildings were relatively crude.
In the 18th century, Americans not only estab-
lished a new and lasting form of government, but
for the first time produced paintings, buildings,
furniture and silver that rivaled the finest produc-
tions of Europe. Notably, many of the leaders of
the American Revolution, such as Paul Revere,
George Washington, and Thomas Jefferson, also
made significant contributions to the arts.
Offered as ARTH 384 and ARTH 484.
ARTH 385. American Avant-Garde: 1900 -
1925 (3)
An examination of the development of avant-garde
styles in New York during the early twentieth cen-
tury. In-depth discussion of the Photo-secession,
Stieglitz’s “291” gallery, the Armory Show, Marcel
Duchamp's move to America, and the formation
and demise of the New York Dada movement.
Offered as ARTH 385 and ARTH 485.
ARTH 392. Issues in 20th/21st Century Art
(3)
Various topics in 20th/21st century art, with class
lectures, discussions, and reports.
Offered as ARTH 392 and ARTH 492.
ARTH 393. Contemporary Art: Critical
Directions (3)
An examination of the directions taken by avant-
garde American art and criticism in the aftermath
of Abstract Expressionism. Includes the rise
and fall of modernism in the 1960s and ’70s, as well as an
investigation of Post-modern trends and theo-
ries.
Offered as ARTH 393 and ARTH 493.
ARTH 394. Departmental Seminar (3)
The Department of History of Art and Art depart-
mental seminar. A topical course, emphasizing
disciplinary writing and modes of investigation
and analysis. It is recommended for Art History
majors before the majors seminar/capstone course,
typically taken in the junior or senior years. The
course advances the goals of SAGES within the
disciplinary context of art history by focusing on
close readings of art history texts (with an empha-
sis upon methodological approaches), examination
of original works of art when possible, analytical
writing, and intensive seminar-style discussion.
Prereq: ARTH 101 or ARTH 102 and at least one
200-level ARTH course.
SAGES Dept Seminar
ARTH 395. Internship (3)
This course is designed for students seeking
professional experience in art history. It focuses
on the museum experience (registration, exhibi-
tion, interpretation, and administration) although
students may also elect to conduct internships in
museum-related environments such as art conser-
vation. Students are encouraged to have gained
significant experience in art history course work
before embarking on an internship. Students must
identify an internship and supervisor as well as a
campus internship supervisor the semester before
enrolling in the internship. Recommended prepa-
ration: ARTH 101, ARTH 102, or ARTH 104,
and consent.
ARTH 396. Majors Seminar (3)
Capstone course required of all undergraduate
Art History majors, typically taken in senior year.
Requires professional-level research with peer and
faculty oversight culminating in formal written
and oral presentations. Limited to Art History
majors.
ARTH 397. History of Prints and Printmak-
ing (3)
Development of techniques and style and the so-
cial function of prints. The great masters: Dürer,
Rembrandt, Goya, and others. Based on the exten-
sive collections of the Cleveland Museum of Art.
Offered as ARTH 397 and ARTH 497.
ARTH 398. Independent Study in Art His-
tory (1–3)
Individual research and reports on special topics.
ARTH 399. Honors Thesis (3)
Intensive study of a topic or problem leading to the
preparation of an honors thesis.
ARTH 402. Buddhist Art in Asia (3)
The development of Buddhist art from its origins
in India along the silk route to China and along
the maritime routes to Japan and southeast Asia.
Offered as ARTH 302 and ARTH 402.
ARTH 403. History of Far Eastern Art (3)
A survey of traditional arts of Asia east of the Indus
river, designed to emphasize the creative contribu-
tions of the artist with particular attention to the
international relations of: the Bronze Age, Bud-
dhist art, Hindu art and the later arts of China,
Korea, and Japan. National and regional contribu-
tions to the developed styles of South Asia and the
Far East will be stressed.
Offered as ARTH 303 and ARTH 403.
ARTH 404. Art of West Africa (3)
This course will survey artistic traditions of the
past, and traditions that continue to flourish to
this day in culture regions in West Africa called
the Western Sudan and the Guinea Coast. An area
of immense geographical and human diversity, the
Western Sudan is the homeland of some of Afri-
ca's most renowned medieval empires. An ancient
culture known as Jenne (8th - 17th century) has
produced a wide variety of refined ceramic arti-
facts. The Guinea Coast is densely populated by
hundreds of different ethnic groups and harbors a
diversity of artistic traditions. An active trade with
Europeans was established in the region as early as
the 15th century. Gender-restricted and ritu-
ally powerful organizations still serve as the ma-
jor patrons of the arts in the region. Contrary to
the elongated so-called “pole style” typical of the
Western Sudan, the arts of the Guinea Coast are
characterized by organic and elegant forms and
smooth surfaces in a variety of media.
Offered as ARTH 304 and ARTH 404.
ARTH 405. The Art of India (3)
A survey of Indian art from the Indus valley civilization to the Islamic conquest of India. Stylistic developments of the three-dimensional arts examined through cave sites and other extant materials. Offered as ARTH 305 and ARTH 405.

ARTH 406. History of Indian Sculpture (3)
The stylistic development of both Buddhist and Hindu schools of Indian sculpture from the prehistoric period to the 12th century. Sculptural images are studied in terms of Indian mythology and literature. Offered as ARTH 306 and ARTH 406.

ARTH 411. Rome: City and Image (3)
This course studies the architectural and urban history of Rome from the republican era of the ancient city up to the eighteenth century using the city itself as the major “text.” The emphasis will be placed on the extraordinary transformations wrought in the city, or at least in key districts, by powerful rulers and/or elites, especially in the ancient empire and in the Renaissance and baroque eras. In a larger perspective, the great construction projects exerted a far-reaching effect within and beyond Europe, but we will study them in relation to their topographical situation, their functions, and their place in a long history of variations on prestigious themes since many of the artworks and the urban settings featured in the course carry the mark of the Long history of the city itself. Recommended preparation: At least one 200-level course in ANTH, ARTH, CLSC, ENGL, HSTY, or RLGN. Offered as ARTH 311/411 and CLSC 311.

ARTH 428. Greek Sculpture (3)
Greek sculpture from the Archaic period through the Hellenistic; style, the development of specific types, and the uses of architectural sculpture. Offered as ARTH 328, CLSC 328, and ARTH 428.

ARTH 432. Art and Archaeology of Ancient Italy (3)
The arts of the Italian peninsula from the 8th century B.C. to the 4th century A.D., with emphasis on recent archaeological discoveries. Lectures deal with architecture, sculpture, painting, and the decorative arts; supplemented by gallery tours at the Cleveland Museum of Art. Offered as ARTH 332, CLSC 332, and ARTH 432.

ARTH 433. Greek and Roman Painting (3)
Greek vase painting, Etruscan tomb painting and Roman wall painting. The development of monumental painting in antiquity. Offered as ARTH 333, CLSC 333, and ARTH 433.

ARTH 434. Art and Archaeology of Greece (3)
A survey of the art and architecture of Greece from the beginning of the Bronze Age (3000 B.C.) to the Roman conquest (100 B.C.) with emphasis on recent archaeological discoveries. Lectures deal with architecture, sculpture, painting, and the decorative arts; supplemented by gallery tours at the Cleveland Museum of Art. Offered as ARTH 334, CLSC 334, and ARTH 434.

ARTH 435. Issues in Ancient Art (3)
Various topics in Ancient art. Lectures, discussions, and reports. Offered as ARTH 335 and ARTH 435.

ARTH 436. Issues in the Art of Native Peoples (3)
This is a topics course. Each offering will focus on a specific topic within the area of art of native peoples. Sample topics may include: North American Indian Art, Mound Building Cultures in the Central United States, Introduction to Maori Polychrome Painting, Decorative American Indian Bead Work. Lectures, discussions, and reports. Offered as ARTH 346 and ARTH 446.

ARTH 441. Issues in the Art of Japan (3)
This is a topics course. Each offering will focus on a specific topic within the area of Japanese art. Sample topics may include: Muromachi Hanging Scrolls, Ryoan-ji Temple Garden Architecture, Rimpa School Panel Screens, Buddhist Painting in the Edo Period. Lectures, discussions, and reports. Offered as ARTH 341 and ARTH 441.

ARTH 442. Issues in the Art of India (3)
This is a topics course. Each offering will focus on a specific topic within the area of Indian art. Sample topics may include: Northern Temple Architecture, Mughal Painting, Gupta Period Sculpture, Great Stupa sculptural articulation. Lectures, discussions, and reports. Offered as ARTH 342 and ARTH 442.

ARTH 443. Issues in the Art of Southeast Asia (3)
This is a topics course. Each offering will focus on a specific topic within the area of Southeast Asian art. Sample topics may include: Northern Temple Architecture, Mughal Painting, Gupta Period Sculpture, Great Stupa sculptural articulation. Lectures, discussions, and reports. Offered as ARTH 343 and ARTH 443.

ARTH 444. Issues in the Art of Africa (3)
This is a topics course. Each offering will focus on a specific topic within the area of African art. Sample topics may include: Ritual Masks, Sub-Saharan Religious Architecture, Carvings of Twins in Fertility Rites, Benin Bronze Warrior Reliefs. Lectures, discussions, and reports. Offered as ARTH 344 and ARTH 444.

ARTH 445. Issues in Pre-Columbian Art (3)
This is a topics course. Each offering will focus on a specific topic within the area of Pre-Columbian art. Sample topics may include: Ancient Meso-America, Mayan Temple/Palace Complexes, Royal Peruvian Settlements, Inca Decorative Arts. Lectures, discussions, and reports. Offered as ARTH 345 and ARTH 445.

ARTH 446. Issues in the Art of Native Peoples (3)
This is a topics course. Each offering will focus on a specific topic within the area of art of native peoples. Sample topics may include: North American Indian Art, Mound Building Cultures in the Central United States, Introduction to Maori Polychrome Painting, Decorative American Indian Bead Work. Lectures, discussions, and reports. Offered as ARTH 346 and ARTH 446.

ARTH 447. Issues in Islamic Art (3)
This is a topics course. Each offering will focus on a specific topic within the area of Islamic art. Sample topics may include: Mosque Architecture in Spain, Islamic Decorative Arts, Mughal Figurative Art, Introduction to the Art of Islam. Lectures, discussions, and reports. Offered as ARTH 347 and ARTH 447.

ARTH 450. Issues in Medieval Art (3)
Various topics in Medieval Art. Lectures, discussions, and reports. Offered as ARTH 350 and ARTH 450.

ARTH 451. Late Gothic Art in Italy (3)
Sculture of the Pisan; early trends in Pisa, Siena, and Florence; Cimabue and Giotto; Duccio, Simone Martini, and the Lorenzetti; painting in Florence and Siena after the Black Death. Offered as ARTH 351 and ARTH 451.

ARTH 452. Italian Art of the 15th Century (3)
The early 15th century in Florence, civic humanism, the sculpture of Ghiberti and Donatello, the painting of Masaccio; the International Style in painting, the art of Uccello, Piero della Francesca, Mantegna, and Botticelli; Carpaccio and the Bellini in Venice. Offered as ARTH 352 and ARTH 452.

ARTH 453. Sixteenth Century Italian Art (3)
The development of the High Renaissance and Mannerist styles in Italy and late 16th century trends; painting and sculpture. Offered as ARTH 353 and ARTH 453.

ARTH 456. Italian Renaissance and Baroque Sculpture (3)
Italian sculpture from the early 12th century to the later 18th century. The Pisani, Ghiberti, Donatello, Michelangelo, the Mannerists and Bernini. Offered as ARTH 356 and ARTH 456.

ARTH 460. Renaissance Art in Northern Europe (3)
Painting, sculpture and the graphic arts in the Netherlands, Germany, and France, 1400-1580, highlighting artists such as Jan van Eyck, Albrecht Durer and Pieter Bruegel. The rise of secular subjects and bourgeois patronage is explored. Offered as ARTH 360 and ARTH 460.
ARTH 461. Dutch and Flemish 17th Century Painting (3)
The golden age of Dutch and Flemish art with study of major masters (Rubens, Hals, Rembrandt, and Vermeer) and developments in subject matter: landscape, still-life, and genre themes. Offered as ARTH 361 and ARTH 461.

ARTH 462. Issues in Renaissance Art (3)
Various topics in Renaissance art. Lectures, discussions and reports. Offered as ARTH 362 and ARTH 462.

ARTH 465. Issues in Baroque Art (3)
Various topics in baroque art. Lectures, discussions and reports. Offered as ARTH 365 and ARTH 465.

ARTH 466. 17th and 18th Century French Art (3)
A survey of the arts of painting, sculpture and architecture in France from 1600-1780. Attention will be given to stylistic developments and to social and political contexts, patronage and art theory. Offered as ARTH 367 and ARTH 467.

ARTH 474. Impressionism to Symbolism (3)
Major developments in European painting and sculpture during the latter half of the nineteenth century. Post impressionism, synthetism, symbolism, and the arts and crafts movement considered in their socio-cultural contexts. Works of Degas, Manet, Monet, Klimt, Bocklin, Gauguin, etc. Offered as ARTH 374 and ARTH 474.

ARTH 479. Issues in 19th Century Art (3)
Various topics in 19th century art, with class lectures, discussions and reports. Consult department for current topic. Offered as ARTH 379 and ARTH 479.

ARTH 480. Abstract Expressionism and Its Aftermath (3)
An examination of the development and influences of Abstract Expressionism, including the impact on the Beat Generation and Pop Art. Offered as ARTH 380 and ARTH 480.

ARTH 481. Neoclassicism to Realism (3)
The main developments of European art chiefly painting and sculpture from post-impressionism to the present; the nature of abstract art and the interrelationships between the visual arts and new developments in literature, philosophy, and science. Offered as ARTH 381 and ARTH 481.

ARTH 482. Visions of Utopia: 20th Century European Art (3)
Major movements in early 20th century European painting and sculpture with utopian goals. Focus on the interrelationships between the visual arts and new developments in literature, philosophy, and science. Offered as ARTH 382 and ARTH 482.

ARTH 483. Gender Issues in Feminist Art:
The 20th/21st Century (3)
An in-depth thematic approach to issues affecting works of art by and about women. Focus on the late 20th century. Emphasis on a specifically modern use of feminine myths, subjects and modes of production, and feminist criticism. Offered as ARTH 383, WGST 383 and ARTH 483.

ARTH 484. American Art and Architecture in the Age of Washington and Jefferson (3)
In the 18th century, Americans created not only a political revolution but an artistic and creative one as well. In the 17th century, most Americans were subsistence farmers and most of their products, manufactures, and buildings were relatively crude. In the 18th century, Americans not only established a new and lasting form of government, but for the first time produced paintings, buildings, furniture and silver that rivaled the finest productions of Europe. Notably, many of the leaders of the American Revolution, such as Paul Revere, George Washington, and Thomas Jefferson, also made significant contributions to the arts. Offered as ARTH 384 and ARTH 484.

ARTH 485. American Avant-Garde: 1900-1925 (3)
An examination of the development of avant-garde styles in New York during the early twentieth century. In-depth discussion of the Photo-secession, Stieglitz’s “291” gallery, the Armory Show. Marcel Duchamp’s move to America, and the formation and demise of the New York Dada movement. Offered as ARTH 385 and ARTH 485.

ARTH 489. M.A. Qualifying Paper (3)
Individual research and intensive study of a specific topic in art history which culminates in a written M.A. Qualifying Paper. Recommended preparation: 27 credit hours of Art History.

ARTH 490. Visual Arts and Museums (3)
Students who successfully complete this course may be considered for admission into ARTH 491A, a supervised internship in an art museum or gallery situation.

ARTH 491A. Visual Arts and Museums: Internship (1)
Recommended preparation: ARTH 490.

ARTH 491B. Visual Arts and Museums: Internship (3)
Second semester of Internship; includes final project devised in consultation with the director of museum studies. Recommended preparation: ARTH 490 and ARTH 491A.

ARTH 492. Issues in 20th/21st Century Art (3)
Various topics in 20th/21st century art, with class lectures, discussions, and reports. Offered as ARTH 392 and ARTH 492.

ARTH 493. Contemporary Art: Critical Directions (3)
An examination of the directions taken by avant-garde American art and criticism in the aftermath of Abstract Expressionism. Includes the rise and fall of modernism in the 1960s and ’70s, as well as an investigation of Post-modern trends and theories. Offered as ARTH 393 and ARTH 493.

ARTH 494A. Directed Readings in Non-Western Art (1-3)
Directed reading.

ARTH 494B. Ancient Art (1-3)

ARTH 494C. Medieval Art (1-3)

ARTH 494D. Renaissance and Baroque Art (1-3)

ARTH 494E. American Art (1-3)

ARTH 494F. Modern Art (1-3)

ARTH 495. Methodologies of Art History (3)
The study of art history as a discipline in its practical and theoretical aspects. Consideration given to research methods, style and historical context, and a critical examination of selected major art historical texts with a view to understanding traditional as well as recent approaches. Special attention is given to art historical writing, employing selected original works in the Cleveland Museum of Art. Required of first-year graduate students in the Ph.D. and Master’s programs.

ARTH 497. History of Prints and Printmaking (3)
Development of techniques and style and the social function of prints. The great masters: Dürer, Rembrandt, Goya, and others. Based on the extensive collections of the Cleveland Museum of Art. Offered as ARTH 397 and ARTH 497.

ARTH 512. Seminar in Ancient Art (3)

ARTH 518B. Seminar in Asian Art (3)

ARTH 540. Seminar in Non-Western Art (3)
Topics may include: African Art and The West, Africa: Symbolism and Ritual, The Classic Period in Mesoamerica, Andean Textiles.

ARTH 545B. Seminar in Medieval Art (3)

ARTH 550. Seminar: Issues in Western European Art (3)

ARTH 551. Seminar in Renaissance Art (3)

ARTH 552. Seminar in Baroque Art (3)

ARTH 565. Seminar in American Art (3)
ARTS 106. Creative Drawing I (3)

Organizational and structural projects as a basis to Ph.D. candidacy milestone.

Prereq: ARTS 106.

ARTS 101. Design and Color I (3)

General history and theories of art education. Development of personal philosophy as basis for teaching art. Topics in professional standards, creativity, aesthetic theory, and art criticism. (Clinical/field experience required.)

ARTS 210. Enameling and Jewelry I (3)

Techniques in the application of vitreous enamel on copper and of constructed metal jewelry. Technical skill and suitability of design as applied to the medium.

ARTS 212. Weaving, Fibers, and Textiles I (3)

Learn basic concepts and methods for designing textile surfaces: fabric painting and dyeing. Construct textiles using off-loom weaving and interlacing techniques. Emphasis on development of technical skill and suitability of design as applied to the medium.

ARTS 214. Ceramics I (3)

The techniques of hand building in pinch, coil and slab methods. Development of sensitivity to design and form. Basic work in stoneware, earthenware, and glazing.

ARTS 216. Painting I (3)

The creative, conceptual, visual, and technical aspects of painting. Style ranging from naturalism to abstraction. Work in acrylic and mixed media.

ARTS 220. Photography Studio I (3)

Camera, film, and darkroom techniques. Development of basic black and white perceptual and photographic skills. Darkroom and photographic field and lab work. 35mm camera required.

ARTS 295. Introduction to Art Education (3)

General history and theories of art education. Development of personal philosophy as basis for teaching art. Topics in professional standards, creativity, aesthetic theory, and art criticism. (Clinical/field experience required.)

Prereq: ARTS 210.

ARTS 300. Current Issues in Art Education (3)

Contemporary issues in Art Education: understanding art goals and standards of National Art Education Association and the Ohio State Department of Education for teachers, students and administrators. Special topics: art and technology, multiculturalism, special populations and classroom management.

Offered as ARTS 390 and ARTS 400.

Prereq: ARTS 295.

ARTS 302. Architecture and City Design I (3)

The social, spatial, and aesthetic elements in architecture; the components of the building: the window, door, roof, enclosing walls, and character of interior and exterior space. Projects related to small, intimate scale and residential structures. Lectures, field trips, studio experiences. Recommended ARTS 101 or ARTS 106 courses prior to enrollment.

Offered as ARTS 302 or ARTS 402.

Prereq: ARTS 310. Elaboration of personal painting style.

ARTS 310. Enameling and Jewelry II (3)

Continuation of ARTS 210. Advanced enameling and jewelry techniques applied to copper or silver, cloisonné, champlevé, basse taille, plique-à-jour. Creative use of design principles and jewelry techniques.

Prereq: ARTS 210.

ARTS 312. Weaving, Fibers, and Textiles II (3)

Continuation of ARTS 212. Exploration of a selected area of textiles in surface design or constructed textiles. Development of a personal aesthetic through design and execution of a series of projects.

Prereq: ARTS 212.

ARTS 314. Ceramics II (3)

Continuation of ARTS 214. Problematic approach to technical aspects of ceramics; experience in wheel throwing and option of hand-building. Experimentation with glaze and clay body formulation available.

Prereq: ARTS 214.

ARTS 316. Painting II (3)

The creative, conceptual, visual and technical aspects of painting. Styles ranging from expressionism, cubism, surrealism and abstraction. Work in acrylic and mixed media leading to the development of personal painting style.

Prereq: ARTS 216.

ARTS 320. Photography Studio II (3)

Continuation of ARTS 220. Advanced theory and black and white techniques. Development of personal aesthetic encouraged. Field work. 35mm camera required.

Prereq: ARTS 220.

ARTS 322. Photography: Color Studio (3)

Personal expression through use of color photography. Introduction to color printing and processing techniques. History of the medium. Field and lab
Teaching art for early childhood, elementary, and middle school students in a school setting. Includes art curriculum development, implementation, and assessment. Professional standards and practices. Offered as ARTS 366A and ARTS 466A.


**ARTS 366B. Student Teaching in Art: 6th Grade (4)**

Teaching adolescents and young adults art in a school setting. Includes art curriculum development, implementation, assessment and classroom management. Professional standards and practices. Offered as ARTS 366B and ARTS 466B.


**ARTS 385. Clinical/Field Based Experience I (1)**

Art education students observe and assist art teachers in classes in a variety of public and private educational environments such as local schools, Cleveland Museum of Art, and Cleveland Children’s Museum. Students study, identify, and analyze differences in art curriculum taught at the various art programs that they observe. Written reports using departmental observation guidelines are required.

Prereq: ARTS 295.

**ARTS 386. Clinical/Field Based Experience II (1)**

Art education students become sensitized to serving needs of “special” populations. Observation of educational strategies for teaching learning disabled and/or physically disabled students. Written reports using departmental observation guidelines are required.

Prereq: ARTS 295.

**ARTS 387. Clinical/Field Based Experience III (1)**

Art education students observe and assist in art programs for artistically gifted students working in specialized art areas (drawing, painting, sculpture, printmaking, art history). Written reports using departmental observation guidelines are required.

Prereq: ARTS 295.

**ARTS 391. Art Content, Pedagogy, Methodology, and Assessment (3)**

Growth and development of image making from Pre-K through young adult. Principles and practices of art instruction in grades Pre-K through 12th grade. Issues in art education. Curriculum construction, implementation and assessment of art lessons that address content areas of art production, art history, art appreciation, and art criticism. Clinical field experiences required.

Offered as ARTS 393 and ARTS 493. Prereq: ARTS 295.
nization and management of the art program that incorporates writing sequential art curriculum that integrates art production, art history, appreciation, and criticism. Planning, development, and evaluation of teaching materials, lessons, and units. The seminar includes discussion of professional issues, ethics, art advocacy, and classroom management. Prereq: ARTS 295 or ARTS 602, and ARTS 393 or ARTS 493. Coreq: ARTS 366A and ARTS 366B or ARTS 466A and ARTS 466B.

ARTS 466A. Student Teaching in Art: Pre-K - 6th Grade (4)
Teaching art for early childhood, elementary, and middle school students in a school setting. Includes art curriculum development, implementation, and assessment. Professional standards and practices. Offered as ARTS 366A and ARTS 466A. Prereq: ARTS 385, ARTS 386, ARTS 387, ARTS 400, ARTS 493, and ARTS 602. Coreq: ARTS 465 and ARTS 466B.

ARTS 466B. Student Teaching in Art: 7th - 12th Grade (4)
Teaching adolescents and young adults art in a school setting. Includes art curriculum development, implementation, assessment and classroom management. Professional standards and practices. Offered as ARTS 366B and ARTS 466B. Prereq: ARTS 385, ARTS 386, ARTS 387, ARTS 400, ARTS 493, and ARTS 602. Coreq: ARTS 465 and ARTS 466A.

ARTS 493. Art Content, Pedagogy, Methodology, and Assessment (3)
Growth and development of image making from Pre-K through young adult. Principles and practices of art instruction in grades Pre-K through 12th grade. Issues in art education. Curriculum construction, implementation and assessment of art lessons that address content areas of art production, art history, art appreciation, and art criticism. Clinical field experiences required. Offered as ARTS 393 and ARTS 493. Prereq: ARTS 602.

ARTS 494. Teaching Art (3)
Research contrasting theories of art education in relationship to a variety of educational settings in elementary and secondary schools. Developing innovative, interdisciplinary, comprehensive curriculum models for a specific organization. For licensed art teachers only or consent of instructor.

ARTS 495. Introduction to Multimedia Technology (3)
Fundamental concepts and skills for using technology in art, electronic portfolio development, and teaching and learning. This project-oriented class will develop knowledge and competencies related to digital imaging and video, multimedia production and presentation, the Internet, information processing, computer systems and management as they relate to art education. Offered as ARTS 395 and ARTS 495.

ARTS 497. Summer Workshop in Art Education (3)
A current art education issue is covered in depth.

ARTS 602. Study in Art Education (3)
General history and theories of art education. Development of personal philosophy as basis for teaching art. Topics in professional standards, creativity, aesthetic theory, and art criticism. Students produce an art education research paper. Clinical/Field experiences are required.

ARTS 605. Final Creative Thesis (1–3)
Students receive individual guidance for an approved self-designed creative project from program faculty members. A public exhibition or presentation is required. By permit only.

ASIAN STUDIES PROGRAM
207 Mather Memorial www.case.edu/artsci/asia
Phone: 216-368-5331 Charlotte Ikels, Director
E-mail: charlotte.ikels@case.edu

Asian Studies has become an increasingly important area of study in North American colleges and universities. This is due in part to a growing acknowledgment that Asian cultures are of significance both regionally and globally. The Asian Studies program offers students the opportunity to explore these cultures from a multidisciplinary perspective so that they are able to understand the social, cultural, political, and other forces that shape and have shaped these nations.

The Asian Studies program is interdisciplinary, drawing faculty and courses from such departments as Anthropology, Art History and Art, Economics, Modern Languages and Literatures, History, Philosophy, Political Science, and Religious Studies. A current list of approved courses is available from a program advisor. Several Asian Studies courses contribute to the completion of the SAGES General Education Requirements.

The undergraduate program in Asian Studies offers a major and a minor. Students are encouraged to take courses in different disciplines in order to obtain broad exposure to the languages, literature, art, culture, religious traditions, and political, economic, and social institutions of Asian countries. Asian Studies also offers an honors program to qualified majors.

In addition to course offerings, the Asian Studies program sponsors extracurricular activities that enhance the formal study of Asia and give students additional opportunities to explore and understand Asia’s importance in the global community. The program sponsors lectures and films and administers a Web site devoted to Asia. It also encourages students to participate in study abroad programs in Asian countries and to utilize Asian resources at the Cleveland Museum of Art and other local institutions.

PROGRAM ADVISORY COMMITTEE
Charlotte Ikels, Ph.D. Professor of Anthropology, Director, Asian Studies Program
David Clingingsmith, Ph.D. Assistant Professor of Economics, Weatherhead School of Management
William E. Deal, Ph.D. Severance Professor of the History of Religion, Department of Religious Studies
Mylvyn C. Goldstein, Ph.D. John Reynolds Harkness Professor of Anthropology; Co-Director, Center for Research on Tibet
Kelly M. McMann, Ph.D. Assistant Professor of Political Science
Deepak Sarma, Ph.D. Associate Professor of Religious Studies
Paul Schroeder, Ph.D. Visiting Faculty in Political Science

UNDERGRADUATE PROGRAMS
Major
Students majoring in Asian Studies choose one of two tracks. Track 1 requires a minimum of 37 credit hours and includes an Asian language requirement. Track 2, which can only be pursued as a second major, does not require study of an Asian language. Both tracks require ASIA 133 and ASIA 134, and additional hours chosen from the list of approved courses. Students prepare a program of study, indicating specific course selections to meet the requirements for their chosen track. An Asian Studies advisor must approve each student’s program.

TRACK 1 (FIRST MAJOR) - 37 SEMESTER HOURS
- ASIA 133 and ASIA 134 (cross-listed as HSTY 133 and HSTY 134)
- At least 16 hours in an Asian language
- 3 hours in Anthropology (Asia-related)
- 3 hours in Political Science or Economics (Asia-related)
- 3 hours in Religious Studies (Asia-related)
6 additional hours (Asia-related), selected in consultation with a program advisor

**TRACK 2 (CAN ONLY BE TAKEN AS A SECOND MAJOR) - 36 SEMESTER HOURS**

- ASIA 133 and ASIA 134 (cross-listed as HSTY 133 and HSTY 134)
- 6 hours in Anthropology (Asia-related)
- 6 hours in Religious Studies (Asia-related)
- 3 hours in Comparative Literature (Asia-related)
- 3 hours in Political Science or Economics (Asia-related)
- 12 additional hours (Asia-related), selected in consultation with a program advisor

**PROGRAM HONORS**

Asian Studies Honors is a semester-long program for Asian Studies majors, normally taken during the senior year, which involves researching and writing an Honors Thesis. Honors program requirements include the completion of ASIA 133 and ASIA 134, at least two semesters of study of an Asian language, two further content courses in Asian Studies, and maintenance of a GPA of at least 3.0 overall and 3.2 in Asian Studies courses.

A participating student enrolls in ASIA 398 and writes a thesis under the direction of an Asian Studies faculty member. The student also receives guidance from a second reader, who must be a member of the Asian Studies program. A third reader, who need not be a member of the Asian Studies program, is optional. Each student must maintain regular contact with the supervising faculty member in the various stages of researching and writing the thesis. Detailed guidelines and deadlines for the course are available from the program director.

**Minor**

The minor in Asian Studies consists of 18 semester hours of courses, including ASIA 133 or ASIA 134. The remaining 15 credit hours are selected in consultation with a program advisor. Only one year (8 credits) of language study (Japanese or Chinese) counts toward the minor.

**COURSE DESCRIPTIONS**

**ASIA 133. Introduction to Chinese History and Civilization (3)**

This course explains the continuities and discontinuities in the history of China by stressing the development and distinctive adaptations of cultural, religious, and political patterns from the origins of the Chinese civilization to the present. By focusing on major cultural, socio-economic, and political issues such as Confucianism, Buddhism, trade relations, imperialism, and intellectual discourse in the overall Asian context (with particular reference to Korea and Japan), we discuss the historical development of China and its situation on entering the 21st century. Taking into account the key historical events in the last century, we examine the emergence of China as a modern nation-state and the fundamental transformation of Chinese society in the post-war period. Offered as ASIA 133 and HSTY 133.

**Global & Cultural Diversity**

**ASIA 134. Introduction to Japanese History and Civilization (3)**

This course provides an introduction to various aspects of Japanese civilization, from its origins to the present. By focusing on major cultural, socio-economic, and political issues such as the adaptation and transformation of Confucianism, Buddhism, Shintoism, social structures, material culture, foreign relations, militarism, nationalism, and intellectual discourse in the overall Asian context (with particular reference to Korea and China), we discuss the historical development of Japan and the country’s position on entering the 21st century. We examine the emergence of Japan as a modern nation-state and the fundamental transformation of its society in the post-war period. Offered as ASIA 134 and HSTY 134.

**Global & Cultural Diversity**

**ASIA 235. Asian Cinema and Drama (3)**

Introduction to major Asian film directors and major traditional theatrical schools of India, Java and Bali, China, and Japan. Focus on the influence of traditional dramatic forms on contemporary film directors. Development of skills in cross-cultural analysis and comparative aesthetics. Offered as ASIA 235 and WLIT 235.

**Global & Cultural Diversity**

**ASIA 236. Daily Life in Imperial China (3)**

This course is an interdisciplinary study of Chinese society using methodological approaches from the fields of social, cultural, economic, and art history. In order to explore the fabric of society in Imperial China (from the beginning to the early 20th century) in a creative, interactive way—including folk customs, life at the court, in city and countryside, religious activities, gender roles, material culture, consumption, entertainment, and social hierarchies—we use the excellent Chinese collection in the Cleveland Museum of Art and various visual aids such as slides and CD-ROMs in the classroom. Offered as ASIA 284 and HSTY 284.

**Global & Cultural Diversity**

**ASIA 238. Daily Life in Imperial China (3)**

This course is an interdisciplinary study of Chinese society using methodological approaches from the fields of social, cultural, economic, and art history. In order to explore the fabric of society in Imperial China (from the beginning to the early 20th century) in a creative, interactive way—including folk customs, life at the court, in city and countryside, religious activities, gender roles, material culture, consumption, entertainment, and social hierarchies—we use the excellent Chinese collection in the Cleveland Museum of Art and various visual aids such as slides and CD-ROMs in the classroom. Offered as ASIA 284 and HSTY 284.

**Global & Cultural Diversity**

**ASIA 284. Daily Life in Imperial China (3)**

This course is an interdisciplinary study of Chinese society using methodological approaches from the fields of social, cultural, economic, and art history. In order to explore the fabric of society in Imperial China (from the beginning to the early 20th century) in a creative, interactive way—including folk customs, life at the court, in city and countryside, religious activities, gender roles, material culture, consumption, entertainment, and social hierarchies—we use the excellent Chinese collection in the Cleveland Museum of Art and various visual aids such as slides and CD-ROMs in the classroom. Offered as ASIA 284 and HSTY 284.

**Global & Cultural Diversity**

**ASIA 286. Daily Life in Imperial China (3)**

This course is an interdisciplinary study of Chinese society using methodological approaches from the fields of social, cultural, economic, and art history. In order to explore the fabric of society in Imperial China (from the beginning to the early 20th century) in a creative, interactive way—including folk customs, life at the court, in city and countryside, religious activities, gender roles, material culture, consumption, entertainment, and social hierarchies—we use the excellent Chinese collection in the Cleveland Museum of Art and various visual aids such as slides and CD-ROMs in the classroom. Offered as ASIA 284 and HSTY 284.

**Global & Cultural Diversity**

**ASIA 398. Honors Thesis (1–4)**

Intensive study of a topic or problem under the direction of a faculty member, resulting in the preparation of an honors thesis.

**Global & Cultural Diversity**

**ASIA 399. Independent Study (1–3)**

Tutorial in Asian studies.
of the Milky Way and nearby galaxies; dark matter

Idit Zehavi, Ph.D.
(Racah Institute of Physics, Hebrew University of Jerusalem)
Assistant Professor
Cosmology and the large-scale structure of the universe; galaxy biasing; galaxy formation and evolution; structure formation; clustering of galaxies; cosmic flows.

Secondary Faculty
John Ruhl, Ph.D.
(Princeton University)
Professor of Physics
Experimental astrophysics and cosmology

Glenn D. Starkman, Ph.D.
(Stanford University)
Professor of Physics
Theoretical cosmology; particle physics; astrophysics

Adjunct Faculty
Jeffrey R. Kriessler, Ph.D.
(Michigan State University)
Adjunct Assistant Professor
Substructure in galaxy clusters

UNDERGRADUATE PROGRAMS

Majors

BACHELOR OF SCIENCE

The Bachelor of Science degree in astronomy requires 122 credit hours, including 20 hours in astronomy, 43 hours in physics, 14 hours in math, and 12 hours in technical electives.

Technical electives are additional courses in astronomy, chemistry, mathematics, statistics, physics, or geological sciences that satisfy interests of the student and fall within the science/mathematics objectives of the major. For the B.S. degree, the approved technical electives include GEOL 345 (Planetary Materials), MATH 201 (Introduction to Linear Algebra), MATH 345 Introduction to Applied Mathematics), PHYS 316 (Introduction to Nuclear and Particle Physics), PHYS 349 (Methods of Mathematical Physics I), and PHYS 350 (Methods of Mathematical Physics II). For a complete list, please consult a department advisor.

Six hours of Mathematics and Natural Science (Physics) are double counted towards SAGES breadth requirement, and one required math course is double counted towards the SAGES Quantitative Reasoning requirement. The following is a recommended course sequence for the B.S. in astronomy:

Class-Lab-Credit Hours

First Year
Fall
MATH 121 Calculus for Science & Engineering I (4-0-4)
PHYS 121 General Physics I – Mechanics (4-0-4)
PHED 101 Physical Education Activities (0-3-0)
SAGES First Seminar (4-0-4)
Social Science I (3-0-3)
Total 15-3-15

Spring
MATH 122 Calculus for Science & Engineering II (4-0-4)
PHYS 122 General Physics II: Electricity & Magnetism (4-0-4)
PHED 102 Physical Education Activities (0-3-0)
ENGR 131 Elementary Computer Programming (3-0-3)
ASTR 151 Doing Astronomy* (1-0-1)
Arts & Humanities I (3-0-3)
Total 15-0-15

Sophomore Year
Fall
ASTR 221 Stars and Planets (3-0-3)
MATH 223 Calculus for Science & Engineering III or MATH 227 Calculus II (3-0-3)
PHYS 221 General Physics III: Modern Physics* (3-0-3)
PHYS 203 Laboratory Physics (2-4-4)
SAGES University Seminar (3-0-3)
Total 14-4-19

Spring
ASTR 222 Galaxies and Cosmology (3-0-3)
MATH 224 Elementary

Differential Equations (3-0-3)
PHYS 204 Advanced Instrumentation Lab (1-4-4)
PHYS 250 Mathematical Physics & Computing (3-0-3)
PHYS 310 Classical Mechanics (3-0-3)
SAGES University Seminar (3-0-3)
Total 16-4-19

Junior Year
Fall
ASTR 311 Stellar Physics* (3-0-3)
PHYS 313 Thermodynamics & Statistical Mechanics (3-0-3)
Technical Elective (3-0-3)
Arts & Humanities II (3-0-3)
Social Science I (3-0-3)
Total 15-0-15

Spring
ASTR 328 Cosmology and the Structure of the Universe* (3-0-3)
PHYS 324 Electricity & Magnetism I (3-0-3)
PHYS 326 Physical Optics (3-0-3)
Quantitative Reasoning (3-0-3)
Technical Elective (3-0-3)
Total 15-0-15

Senior Year
Fall
ASTR 306 Astronomical Techniques (3-0-3)
ASTR 309 Senior Seminar I (1-0-1)
PHYS 325 Electricity & Magnetism II (3-0-3)
PHYS 331 Quantum Mechanics I (3-0-3)
ASTR 351 SAGES Astronomy Capstone* (1-0-1)
Technical Elective (3-0-3)
Global and Cultural Diversity (3-0-3)
Total 17-0-17

Spring
ASTR 310 Senior Seminar II (1-0-1)
COLLEGE OF ARTS & SCIENCES

GENERAL BULLETIN 2009-2011

ASTR 323 The Local Universe\(^\text{c}\) \( (3-0-3) \)

PHYS 332 Quantum Mechanics II \( (3-0-3) \)

ASTR 351 SAGES Astronomy Capstone\(^\text{c}\) \( (3-0-3) \)

Social Science II \( (3-0-3) \)

Technical Elective \( (3-0-3) \)

Total 16-0-16

Selected students may be invited to take PHYS 123, 124, 221 in place of 121, 122, 221.

ASTR 306, 311, 323, and 328 are taught every other year only.

A SAGES Capstone Experience is required of all students. The B.S. does not require the astronomy capstone but only that a capstone be taken. The number of hours shown assumes the astronomy capstone with 1 hour in the senior fall semester and 3 hours in the senior spring semester. If another capstone is taken, the number of hours may be different.

BACHELOR OF ARTS

The Bachelor of Arts in astronomy requires 120 credit hours, including 17 hours in astronomy, 29 hours in physics, 14 hours in math, and 6 hours in technical electives.

The approved technical electives for the B.A. in astronomy include CHEM 107 (Properties and Structure of Matter I), CHEM 108 (Properties and Structure of Matter II), PHYS 204 (Advanced Instrumentation Lab), PHYS 316 (Introduction to Nuclear and Particle Physics), PHYS 325 (Electricity and Magnetism II), and PHYS 332 (Quantum Mechanics II). For a complete list, please consult a departmental advisor.

Six hours of Mathematics and Natural Science (Physics) are double counted towards SAGES breadth requirement, and one required math course is double counted towards SAGES Quantitative Reasoning requirement.

Credit Hours

First Year

Fall

MATH 121 Calculus for Science & Engineering I \( (4) \)

or MATH 123 Calculus I

PHYS 121 General Physics I: Mechanics \( (4) \)

PHED 101 Physical Education Activities \( (0) \)

SAGES First Seminar \( (4) \)

Spring

MATH 122 Calculus for Science & Engineering II

or MATH 124 Calculus II

PHYS 122 General Physics II: Electricity and Magnetism

PHED 102 Physical Education Activities \( (0) \)

ENGR 131 Elementary Computer Programming

ASTR 151 Doing Astronomy\(^*\) \( (1) \)

Social Science I \( (3) \)

Total: 15

Sophomore Year

Fall

ASTR 221 Stars and Planets \( (3) \)

MATH 223 Calculus for Science & Engineering III

or MATH 227 Calculus III

PHYS 221 General Physics III: Modern Physics

SAGES University Seminar \( (3) \)

Total: 15

Spring

ASTR 222 Galaxies and Cosmology \( (3) \)

MATH 224 Elementary Differential Equations

or MATH 228 Differential Equations

PHYS 250 Mathematical Physics & Computing

PHYS 310 Classical Mechanics

SAGES University Seminar \( (3) \)

Total: 18

Junior Year

Fall

ASTR 311 Stellar Physics\(^*\) \( (3) \)

PHYS 313 Thermodynamics & Statistical Mechanics

Arts & Humanities I

Arts & Humanities II

Technical Elective

Total:

Spring

ASTR 306 SAGES Departmental Seminar\(^*\) \( (3) \)

ASTR 309 Seminar I \( (1) \)

PHYS 331 Quantum Mechanics I \( (3) \)

ASTR 351 SAGES Astronomy Capstone\(^*\) \( (1) \)

Global and Cultural Diversity \( (3) \)

Total: 11

Senior Year

Fall

ASTR 306 SAGES Departmental Seminar\(^*\) \( (3) \)

ASTR 351 SAGES Astronomy Capstone\(^*\) \( (3) \)

Total: 4

Minor

For all students except physics majors, the requirements for the minor in astronomy are as follows:

- PHYS 115 or equivalent \( (3) \)
- PHYS 116 or equivalent \( (3) \)
- ASTR 221 \( (3) \)
- ASTR 222 \( (3) \)
- One of ASTR 306, 311, 323, 328 \( (3) \)

Because university rules do not allow hours within the major department to count towards a minor, physics majors wishing to pursue a
minor in astronomy must complete a different set of course requirements:

- ASTR 221 (3)
- ASTR 222 (3)
- One of ASTR 306, 311, 323, 328 (3)
- Two more astronomy courses, chosen from ASTR 151, 306, 309, 310, 311, 323, 328, 351, 369 (6)

GRADUATE PROGRAM

The Ph.D. degree in astronomy is granted to those students who have shown an extensive knowledge of advanced astronomy and the ability to do original research. The student is required to pass a general qualifying examination in astronomy, usually taken at the end of the student’s second year. The student must then prepare a dissertation based on the results of independent research. A Ph.D. candidate must also satisfy the general requirements of the School of Graduate Studies.

Full-time graduate students who maintain satisfactory academic performance while pursuing the Ph.D. degree in astronomy normally receive a stipend for teaching and/or research, which includes full tuition and a monthly amount sufficient to cover living expenses.

FACILITIES

The Department of Astronomy operates the Kitt Peak Station of the Warner and Swasey Observatory near Tucson, Arizona, home of the Burrell Schmidt telescope. This telescope is used for surveys and ultra-deep imaging with a large format CCD. The department is also a member of the Sloan Digital Sky Survey, which operates a 2.5m telescope with multi-object spectrographs and wide field imager at Apache Point, New Mexico. The third incarnation of this survey includes a Baryon Oscillation survey of the large-scale structure of the universe and a spectroscopic survey of the Milky Way galaxy. A 9.5-inch refractor permanently mounted on the roof of the A. W. Smith Building is available for use by students. The department also houses a research and instruction computer laboratory, including the Astronomy high-performance computing cluster.

COURSE DESCRIPTIONS

ASTR 151. Doing Astronomy (1)
This course is intended to introduce students to how astronomy is done. The course will focus on the astronomical research process, the scientific community, and on career paths in astronomy. Course activities will include readings and class discussions focusing on various topics in modern astronomy, including ongoing research activity in the department.

ASTR 201. The Sun and its Planets (3)
An overview of the solar system: the planets and other objects that orbit about the Sun and the Sun itself as the dominant mass and the most important source of energy in the solar system. Concepts and the development of our knowledge will be emphasized. Not available for credit to astronomy majors.

ASTR 202. Stars, Galaxies, and the Universe (3)
Stellar structure, energy sources, and evolution, including red giants, white dwarfs, supernovae, pulsars, and black holes. Stellar populations in the Milky Way and external galaxies. The universe and its evolution. Not available for credit to astronomy majors.

ASTR 203. Archaeoastronomy: Calendars, Barrows, and Megaliths (3)
To acquaint the student with the regular cycles of the Sun, Moon, planets, and stars. To show how ancient civilizations (and some not so ancient) have used those cycles to formulate calendars which are evidenced primarily by artifacts and ruins scattered over the entire Earth.

ASTR 204. Einstein’s Universe (3)
This course is intended to introduce the non-scientist to the concepts of modern cosmology—the structure and evolution of the universe. No mathematical background beyond simple algebra is needed.

ASTR 221. Stars and Planets (3)

ASTR 222. Galaxies and Cosmology (3)

ASTR 231. Stellar Physics (3)
Stellar interiors, nuclear processes, and energy generation. The proton-proton chain and the observable properties of stars. Stellar interiors, nuclear processes, and energy generation. Conceptual understanding of the observable properties of stars. Students pursue a project based on experimental, theoretical or teaching research under the supervision of an astronomy faculty member. A departmental capstone project committee must approve all project proposals (by the end of the Fall Semester) and this same committee will receive regular oral and written progress reports. Final results are presented at the end of the semester as a paper in a style suitable for publication in a professional journal as well as an oral report in a public symposium. Prereq: ASTR 222, SAGES Senior Cap

ASTR 311. Stellar Physics (3)
Radiative transfer, atomic and molecular opacities, and the observable properties of stars. Stellar interiors, nuclear processes, and energy generation.

ASTR 310. Astrophysics Seminar II
Selected topics in astronomy not covered ordinarily in courses. Presentation of talks by students.

ASTR 311. Stellar Physics (3)
Radiative transfer, atomic and molecular opacities, and the observable properties of stars. Stellar interiors, nuclear processes, and energy generation. The evolution of stars of varying mass and production of the elements within supernovae explosions. Offered as ASTR 311 and ASTR 411. Prereq: ASTR 222.

ASTR 323. The Local Universe (3)

ASTR 328. Cosmology and the Structure of the Universe (3)

ASTR 351. Astronomy Capstone Project (1–3)
A two semester course (1 hour in the Fall Semester and either 2 or 3 hours in the Spring Semester) for students desiring a Capstone Experience in astronomy. Students pursue a project based on experimental, theoretical or teaching research under the supervision of an astronomy faculty member. A departmental capstone project committee must approve all project proposals (by the end of the Fall Semester) and this same committee will receive regular oral and written progress reports. Final results are presented at the end of the semester as a paper in a style suitable for publication in a professional journal as well as an oral report in a public symposium. Prereq: ASTR 222, SAGES Senior Cap

ASTR 369. Undergraduate Research (1–3)
Supervised research on topics of interest. Can be used as a thesis course if desired. Students may register more than once for a maximum of 9 credits overall (1-3 credits each semester).

ASTR 396. Special Topics in Astronomy (1–3)
Open to astronomy majors only.

ASTR 411. Stellar Physics (3)
Radiative transfer, atomic and molecular opacities, and the observable properties of stars. Stellar interiors, nuclear processes, and energy generation.
The department offers courses leading to the degrees of Bachelor of Science, Bachelor of Science in Systems Biology, Bachelor of Arts, Master of Science, and Doctor of Philosophy. Cooperative programs between the Department of Biology and the Case Western Reserve University School of Medicine, the Cleveland Museum of Natural History, the Cleveland Botanical Garden, the Cleveland Metroparks Zoo, the Holden Arboretum, the Cleveland Institute of Art, and other departments in Case Western Reserve University significantly extend the range of resources available to biology students. Undergraduate students are encouraged to conduct individual supervised research projects with Biology faculty and with faculty in cooperating departments. A supervised research project is required of all students in the B.S. Biology program.

The undergraduate programs in biology provide excellent preparation for graduate or professional schools, including medical, dental, and veterinary schools and the many specialized graduate programs in the biological sciences. A biology degree also prepares students for careers in industry and government. For students interested in biotechnology—a field with growing career opportunities—the department offers elective sequences within the B.A. and B.S. degrees.

BIOCHEMISTRY

The College of Arts and Sciences awards the Bachelor of Arts and Bachelor of Science degrees in biochemistry. The required courses for the majors and minor are offered by the Department of Biochemistry in the School of Medicine. For details about the department’s undergraduate programs, please consult the School of Medicine section of this bulletin.

DEPARTMENT OF BIOLOGY

203 DeGrace Hall
www.case.edu/artsci/biol
Phone: 216-368-3557; Fax: 216-368-4672
Joseph F. Koonce, Chair
E-mail: joseph.koonce@case.edu

The mission of the Department of Biology at Case Western Reserve University is to promote research programs of national and international prominence and to provide strong undergraduate and graduate educational programs that emphasize integrative approaches to biological problems. In doing so, our programs support preparation and professional development for careers related to the biological and health sciences.

The department offers courses leading to the degrees of Bachelor of Science, Bachelor of Science in Systems Biology, Bachelor of Arts, Master of Science, and Doctor of Philosophy. Cooperative programs between the Department of Biology and the Case Western Reserve University School of Medicine, the Cleveland Museum of Natural History, the Cleveland Botanical Garden, the Cleveland Metroparks Zoo, the Holden Arboretum, the Cleveland Institute of Art, and other departments in Case Western Reserve University significantly extend the range of resources available to biology students. Undergraduate students are encouraged to conduct individual supervised research projects with Biology faculty and with faculty in cooperating departments. A supervised research project is required of all students in the B.S. Biology program.

The undergraduate programs in biology provide excellent preparation for graduate or professional schools, including medical, dental, and veterinary schools and the many specialized graduate programs in the biological sciences. A biology degree also prepares students for careers in industry and government. For students interested in biotechnology—a field with growing career opportunities—the department offers elective sequences within the B.A. and B.S. degrees.

DEPARTMENT FACULTY

Joseph F. Koonce, Ph.D. (University of Wisconsin, Madison)
Professor and Chair
Aquatic ecology; systems ecology

Radhika Atit, Ph.D. (University of Cincinnati)
The Warren E. Rupp Distinguished Assistant Professor
Developmental biology and genetics; origin and patterning of skin

Michael F. Benard, Ph.D. (University of California, Davis)
Assistant Professor
Ecology; evolutionary biology

Arnold I. Caplan, Ph.D. (Johns Hopkins University)
Professor; Director, Skeletal Research Center
Developmental biology and biochemistry; molecular and cellular aspects of muscle, cartilage, and bone development

Hillel J. Chiel, Ph.D. (Massachusetts Institute of Technology)
Professor
Neurobiology and animal behavior; cellular dynamics of neuronal computation

Christopher A. Cullis, Ph.D. (University of East Anglia, United Kingdom)
Francis Hobart Herrick Professor of Biology
Plant molecular biology and genetics; modifications of the information content of plant cells

Nancy DiIulio, Ph.D. (The Pennsylvania State University College of Medicine)
Instructor
Cell biology; biochemistry

Richard F. Drushel, Ph.D. (Case Western Reserve University)
Instructor and Executive Officer
Vertebrate anatomy and physiology, kinematic modeling and neural control; autonomous robotics

Stephen E. Haynesworth, Ph.D. (Case Western Reserve University)
Associate Professor; Associate Dean, College of Arts and Sciences
Developmental and aging biology

Valerie Haywood, Ph.D. (University of California, Davis)
Instructor
Plant developmental biology

Emmitt R. Jolly, Ph.D. (University of California, San Francisco)
Assistant Professor
Molecular biology and genetics; developmental biology; parasitology; schistosomiasis

Barbara A. Kuemerle, Ph.D. (Case Western Reserve University)
Instructor
Molecular biology and genetics; developmental neuroscience

Claudia M. Mizutani, Ph.D. (Federal University of Rio de Janeiro, Brazil)
Assistant Professor
Developmental biology and genetics; embryonic body-axis formation

Ronald G. Oldfield, Ph.D. (University of Michigan)
Instructor
Evolutionary ecology of cichlid fishes; ichthyology

Roy E. Ritzmann, Ph.D. (University of Virginia)
Professor
Neurobiology and behavior; physiology

Charles E. Rozeck, Ph.D. (Wayne State University)
Associate Professor; Dean of Graduate Studies

COLLEGE OF ARTS & SCIENCES
Molecular genetics; developmental biology
Robin Snyder, Ph.D.
(University of California, Santa Barbara)
Assistant Professor
Theoretical ecology and epidemiology
Rui S. de Sousa-Neves, Ph.D.
(Federal University of Rio de Janeiro, Brazil)
Instructor
Developmental biology; molecular genetics
Mark A. Willis, Ph.D.
(University of California, Riverside)
Associate Professor
Neurobiology and behavior; sensorimotor control of insect flight; animal behavior
Debra E. Wood, Ph.D.
(Georgia State University)
Assistant Professor
Neurobiology; neural and mechanical correlates of motor pattern generation; animal behavior
James E. Zull, Ph.D.
(University of Wisconsin, Madison)
Professor
Human learning; brain function in education

Secondary Faculty
Darin Croft, Ph.D.
(The University of Chicago)
Assistant Professor of Anatomy
Brian M. McDermott, Ph.D.
(Columbia University)
Assistant Professor, Department of Otolaryngology, University Hospitals of Cleveland
Peter Thomas, Ph.D.
(The University of Chicago)
Assistant Professor of Mathematics

Adjunct Faculty
David J. Burke, Ph.D.
(Rutgers University)
Holden Adjunct Assistant Professor (Holden Arboretum)
Rhizosphere ecology; plant-microbe interactions; molecular microbial ecology; plant ecology
Pam Dennis, Ph.D., D.V.M.
(The Ohio State University; College of Veterinary Medicine, North Carolina State University)
Adjunct Assistant Professor; Clinical Assistant Professor, Cleveland Metroparks Zoo
Veterinary wildlife epidemiology in zoo and free-ranging animal populations
Joe B. Keiper, Ph.D.
(Kent State University)
Adjunct Assistant Professor; Director of Science and Curator of Invertebrate Zoology, Cleveland Museum of Natural History
Biodiversity and population ecology of aquatic insects; forensic entomology; wetlands ecology and conservation
Ana B. Loecci, Ph.D.
(Case Western Reserve University)
Adjunct Assistant Professor
Aquatic ecology and population biology
Kristen E. Lukas, Ph.D.
(Georgia Institute of Technology)
Adjunct Assistant Professor; Curator, Conservation and Science, Cleveland Metroparks Zoo
Effect of designed environment on gorilla and chimpanzee behavior
Nga Nguyen, Ph.D.
(Princeton University)
Adjunct Assistant Professor; Director, Wildlife Endocrinology Lab, and Associate Research Curator, Conservation and Science, Cleveland Metroparks Zoo
Primate behavioral endocrinology and ecology
Kurt Smemo, Ph.D.
(Cornell University)
Holden Adjunct Assistant Professor (Holden Arboretum)
Soil biogeochemistry
Mary Topa, Ph.D.
(Duke University)
Holden Adjunct Professor; Director of Science and Research, Holden Arboretum
Forest ecosystem function
Peter A. Zimmerman, Ph.D.
(Case Western Reserve University)
Associate Professor, Center for Global Health and Diseases, School of Medicine

Lecturers
James Bader, M.S.
(Case Western Reserve University)
Lecturer; Director, Center for Science and Mathematics Education
Aquatic ecology
Deborah L. Harris, M.S.
(Wright State University)
Adjunct Lecturer; Coordinator, Biology Teaching Laboratories
Mycology
Dmitri A. Kourennyi, Ph.D.
(Moscow Institute of Physics and Technology)
Theoretical ecology and epidemiology

Part-time Lecturer
Biophysics; synaptic transmission and networking in the retina

Emeritus Faculty
Morris Burke, Ph.D.
(University of New South Wales, Australia)
Professor Emeritus
Muscle physiology; protein chemistry
Darhl L. Foreman, Ph.D.
(University of Chicago)
Professor Emerita
Reproductive physiology
Martin J. Rosenberg, Ph.D.
(State University of New York, Stony Brook)
Senior Instructor Emeritus
Herpetology; vertebrate biology; human anatomy and physiology
Norman B. Rushforth, Ph.D.
(Cornell University)
Professor Emeritus
Epidemiology; animal behavior; population biology
Joanne Westin, Ph.D.
(Cornell University)
Senior Instructor Emerita
Neurobiology and behavior; physiology

UNDERGRADUATE PROGRAMS

Majors
Major programs share a core of foundation courses and provide options for specialization in a variety of areas, including biotechnology and genetic engineering, molecular and cellular biology, genetics, immunology, chemical biology, physiology and biophysics, neurobiology and animal behavior, developmental biology, population biology, ecology, and environmental science. Theoretical, mathematical, and computational approaches to these fields are emphasized in the Systems Biology B.S. program. Individual research projects form a significant part of the curriculum for many undergraduates in all programs, and are specifically required for students in the Biology B.S. program. Advanced biology majors may register, with permission, for graduate-level courses in the department and in the School of Medicine.

The department offers programs leading to the B.A and B.S degrees. Thirty hours of biology are required for the Biology B.A., 39 hours for the Biology B.S., and 30 hours for the Systems Biology B.S. All students must complete the SAGES seminar and General Education
Requirements (GER) of the College of Arts and Sciences. They may begin their biology program in the freshman year. While some BIOL courses serve as SAGES Departmental Seminars or SAGES Capstones, none of these are required courses for biology degree candidates, with the specific exception of BIOL 388S for the Biology B.S. degree. A Biology B.A. student, for example, is free to take a non-BIOL SAGES Departmental Seminar or SAGES Capstone course, assuming that prerequisites are met (or waived by the instructor).

B.A. PROGRAM IN BIOLOGY

The B.A. degree in biology features a three-semester core of lecture courses, beginning with BIOL 214 (Genes and Evolution) and continuing with BIOL 215 (Cells and Proteins) and BIOL 216 (Organisms and Ecosystems); each of these courses has an associated laboratory (BIOL 214L, 215L, and 216L). The remaining hours include both laboratory and elective courses. The laboratory requirement consists of two additional laboratory courses (excluding BIOL 388, 388S, and 390). The elective requirement must include one elective from two of the following major areas: cell and molecular biology, organismal biology, or population biology/ecology. At least 15 hours of the selected electives and laboratories must be at the 300 level or higher. Students are required to complete one year of calculus (MATH 125, 126), one year of inorganic chemistry with laboratory (CHEM 105, 106, 113), one year of organic chemistry with laboratory (CHEM 223, 224, 233), and one year of physics (PHYS 115, 116).

SUGGESTED SEQUENCE OF COURSES

| BACHELOR OF ARTS DEGREE |
| SUGGESTED SEQUENCE OF COURSES |

<table>
<thead>
<tr>
<th>First Year</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>SAGES First Seminar (4)</td>
<td>SAGES University Seminar (3)</td>
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<tr>
<td>MATH 125 Mathematics I (4)</td>
<td>MATH 126 Mathematics II (4)</td>
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<tr>
<td>CHEM 105 Principles of Chemistry I (3)</td>
<td>CHEM 106 Principles of Chemistry II (3)</td>
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<td>CHEM 113 Principles of Chemistry Laboratory (2)</td>
<td>BIOL 214 Genes and Evolution (3)</td>
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<tr>
<td>BIOL 214L Genes and Evolution Laboratory (1)</td>
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<tr>
<td>Open Elective (3)</td>
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<tr>
<th>Second Year</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>BIOL 215 Cells and Proteins (3)</td>
<td>BIOL 216 Organisms and Ecosystems (3)</td>
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<tr>
<td>BIOL 215L Cells and Proteins Laboratory (1)</td>
<td>BIOL 216L Organisms and Ecosystems Laboratory (1)</td>
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<tr>
<td>CHEM 223 Introductory Organic Chemistry I (3)</td>
<td>CHEM 224 Introductory Organic Chemistry II (3)</td>
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<td>CHEM 233 Organic Chemistry Laboratory (2)</td>
<td>BIOL Elective (3)</td>
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<td>SAGES University Seminar (3)</td>
<td>SAGES Departmental Seminar (3)</td>
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<td>GER Course (3)</td>
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<th>Third Year</th>
<th>Fall</th>
<th>Spring</th>
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<tr>
<td>BIOL Elective (2-4)</td>
<td>BIOL Elective (2-4)</td>
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<tr>
<td>BIOL Laboratory (2-4)</td>
<td>BIOL Laboratory (2-4)</td>
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<tr>
<td>PHYS 115 Introductory Physics I (4)</td>
<td>PHYS 116 Introductory Physics II (4)</td>
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<td>GER Course (3)</td>
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<tr>
<td>Open Elective (3)</td>
<td>Open Electives (6)</td>
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<tr>
<th>Fourth Year</th>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>BIOL Elective or BIOL SAGES Capstone (3)</td>
<td>BIOL SAGES Capstone or BIOL Elective (3)</td>
<td></td>
</tr>
<tr>
<td>Open Electives (12)</td>
<td>Open Electives (12)</td>
<td></td>
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<tr>
<td>Total hours of BIOL courses required: 30</td>
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<tr>
<td>Total credit hours required: 120</td>
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TEACHER LICENSURE OPTION

Students may become eligible for teacher licensure in the field of Life Sciences (Adolescents and Young Adults) by completing content area requirements as well as 35 semester hours in education courses (including student teaching) offered through Case Western Reserve and John Carroll University. For more details, please see the program description for Teacher Licensure elsewhere in this bulletin. Students interested in pursuing this option should consult Dr. Richard F. Drushel, the department’s executive officer.

Subject Area Requirements (56–61 credit hours):

- BIOL 214, 214L, 215, 215L, 216, 216L; one of BIOL 301, 313, 344; one of BIOL 223, 305, 336; one of BIOL 308, 326, 343; one of BIOL 358, 373, 374, 382; CHEM 105, 106, 113, 223, 224, 233; MATH 125, 126; PHYS 115, 116; one of GEOL 101, 110, 115, 117.

B.S. PROGRAM IN BIOLOGY

The Biology B.S. program also includes the three-semester core lecture courses, beginning with BIOL 214 (Genes and Evolution) and continuing with BIOL 215 (Cells and Proteins) and BIOL 216 (Organisms and Ecosystems), plus their associated laboratories (BIOL 214L, 215L, and 216L). The elective requirement must include one elective from two of the following major areas: cell and molecular biology, organismal biology, and population biology/ecology. In addition, students must complete a course in genetics (BIOL 301 or 326); a quantitative biology laboratory (BIOL 300 or 315); one additional laboratory course; and one upper-level advanced lecture course (300- or 400-level).

Biology B.S. students must undertake an undergraduate research project, completing BIOL 388S (Undergraduate Research, SAGES Capstone) and BIOL 390 (Advanced Undergraduate Research, which continues the BIOL 388S project). At least 11 hours of the selected electives and lab must be at the 300 level or higher.

Additional requirements for the Biology B.S. degree consist of the following:

- Mathematics: one year of calculus (MATH 121 and 122, or 125 and 126); one semester of advanced mathematics or statistics (selected from MATH 201, 225, 304; or STAT 207, 312, 313; or BIOL 431)
- Computer Science: computer programming (ENGR 131 or other approved computer programming course)
- Chemistry: one year of inorganic chemistry with laboratory (CHEM 105, 106, 113); one year of organic chemistry with laboratory (CHEM 223 or 323, 224 or 324, and 233); physical chemistry (CHEM 301)
- Physics: one year of physics (PHYS 115, 116)

BACHELOR OF SCIENCES DEGREE IN BIOLOGY SUGGESTED SEQUENCE OF COURSES

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<thead>
<tr>
<th>First Year</th>
<th>Fall</th>
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<tbody>
<tr>
<td>SAGES First Seminar (4)</td>
<td>SAGES University Seminar (3)</td>
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<tr>
<td>MATH 125 Mathematics I (4)</td>
<td>MATH 126 Mathematics II (4)</td>
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<tr>
<td>CHEM 105 Principles of Chemistry I (3)</td>
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<td>CHEM 113 Principles of Chemistry Laboratory (2)</td>
<td>BIOL 214 Genes and Evolution (3)</td>
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<td>BIOL 214L Genes and Evolution Laboratory (1)</td>
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<tr>
<td>BIOL 215 Cells and Proteins (3)</td>
<td>BIOL 216 Organisms and Ecosystems (3)</td>
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<td>BIOL 215L Cells and Proteins Laboratory (1)</td>
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<td>CHEM 223 Introductory Organic Chemistry I (3)</td>
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<td>CHEM 233 Organic Chemistry Laboratory (2)</td>
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<td>SAGES University Seminar (3)</td>
<td>SAGES Departmental Seminar (3)</td>
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<td>GER Course (3)</td>
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<tr>
<td>BIOL Elective (2-4)</td>
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<td>BIOL Laboratory (2-4)</td>
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<tr>
<td>PHYS 115 Introductory Physics I (4)</td>
<td>PHYS 116 Introductory Physics II (4)</td>
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<td>GER Course (3)</td>
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<td>Open Elective (3)</td>
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<th>Fourth Year</th>
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<tr>
<td>BIOL Elective or BIOL SAGES Capstone (3)</td>
<td>BIOL SAGES Capstone or BIOL Elective (3)</td>
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<tr>
<td>Open Electives (12)</td>
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<td>Total hours of BIOL courses required: 30</td>
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<td>Total credit hours required: 120</td>
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B.S. Program in Systems Biology

The Systems Biology B.S. program uses a separate, four-semester core curriculum: BIOL 250 (Introduction to Cell and Molecular Biology Systems), BIOL 251 (Introduction to Organismal and Population Systems), BIOL 300 (Dynamics of Biological Systems I), and BIOL 306 (Dynamics of Biological Systems II).

Additional core requirements are as follows:

- Mathematics: two years of calculus and differential equations (MATH 121, 122, 223, 224)
- Statistics: engineering statistics (STAT 312)
- Chemistry: one year of inorganic chemistry with laboratory (CHEM 105, 106, 113)
- Computer Science: computer programming, data structures, and databases (ENGR 131; EECS 233, 341)
- Physics: one year of physics (PHYS 121, 122)

Students must also complete 12 hours of 300-level biology electives, 6 hours of biology sub specialty electives from one of four tracks (Neuroscience, Genetics, Evolutionary Biology, or Cellular and Molecular Biology), and 6 hours of systems electives (selected from EECS 216, 324, 313, 340; or MATH 201, 234, 304; or BIOL/MATH 319, 378; or OPRE 411A).

**BACHELOR OF SCIENCES DEGREE IN SYSTEMS BIOLOGY SUGGESTED SEQUENCE OF COURSES**

### First Year

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<tr>
<td>SAGES First Seminar (4)</td>
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<tr>
<td>MATH 121 Calculus for Science and Engineering I (4)</td>
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<td>CHEM 105 Principles of Chemistry I (3)</td>
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**Second Year**

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<tr>
<td>BIOL 251 Introduction to Organismal and Population Biology Systems (3)</td>
<td>BIOL 300 Dynamics of Biological Systems I (3)</td>
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<tr>
<td>PHYS 121 General Physics I (4)</td>
<td>PHYS 122 General Physics II (4)</td>
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<td>MATH 223 Calculus for Science and Engineering III (3)</td>
<td>MATH 224 Elementary Differential Equations (3)</td>
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<td>PHYS 115 Introduction to Physics I (4)</td>
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<td>SAGES University Seminar (3)</td>
<td>SAGES Departmental Seminar (3)</td>
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<td>GER Course (3)</td>
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**Third Year**

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<tr>
<td>BIOL 306 Dynamics of Biological Systems II (3)</td>
<td>EECS 341 Introduction to Database Systems (3)</td>
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<td>EECS 233 Introduction to Data Structures (3)</td>
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<td>STAT 312 Basic Statistics for Engineering and Science (3)</td>
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**Fourth Year**

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<tr>
<td>BIOL 3888 Undergraduate Research, SAGES Capstone (3)</td>
<td>BIOL 390 Advanced Undergraduate Research (3)</td>
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<tr>
<td>Open Electives (6)</td>
<td>Open Electives (6)</td>
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Total hours of BIOL courses required: 30
Total credit hours required: 120

All biology majors are required to meet with their departmental advisor at least once each semester to discuss their academic program, receive clearance for electronic course registration, and approve any drops, adds, or withdrawals.

In addition to formal courses for credit, the department offers weekly seminars presenting recent advances in biology. These seminars are held every Thursday afternoon at 4:15 p.m. and are open to the university community.

**Concentrations in Areas of the**
Biological Sciences

Students are encouraged to utilize their elective courses in the biology major to take advantage of concentrations in various specialized areas. These concentrations have been developed between the Biology Department, the basic science departments of the School of Medicine, and other departments. Currently, concentrations have been developed in the following areas: biotechnology and genetic engineering; computational biology; developmental biology; genetics; cell and molecular biology; neurobiology and animal behavior; population biology, ecology and environmental science. Note: these concentrations are informal; they are not declared, and will not appear on the student's diploma at graduation.

DEPARTMENTAL HONORS

To receive a bachelor's degree with honors in biology (formally noted as such on the student's diploma at graduation), the student must meet the following criteria:

1. Maintain a 3.4 overall grade point average, with a 3.6 in biology courses (i.e., listed as BIOL)
2. Carry out a year of research at Case Western Reserve University
3. Write a senior honors thesis with the approval of the faculty supervisor
4. Submit the thesis for review by an ad hoc honors committee
5. Successfully defend the thesis at an oral examination

Minors

Two tracks are available for the minor, each requiring a total of 16 hours of biology courses. One track consists of any two of the three core lectures with their associated laboratory courses (BIOL 214 and 214L, 215 and 215L, 216 and 216L) plus electives. An alternative track consists of BIOL 250 and BIOL 251 plus electives. Suitable minor courses are available for students majoring in the humanities and arts, social and behavioral sciences, health sciences, mathematics, chemistry, physics, astronomy, and geological sciences.

Co-op Program in Biology

The Co-op (Cooperative Education) program offers full-time undergraduate students in good academic standing the opportunity to engage in full-time, paid employment consistent with their major fields of study. Typically students participate in the co-op program for one or two seven-month periods, such as summer-fall and/or spring-summer, beginning after their sophomore or junior year. Although participation in this program extends the time required to achieve a bachelor's degree, students often benefit from higher starting salaries and greater future earnings that can result from the experience acquired in co-op assignments. Co-op employment opportunities may exist at local companies engaged in biotechnology research, pharmaceuticals, or other areas involving the life sciences. Students interested in this program should contact the department office.

GRADUATE PROGRAMS

Master of Science

The Department of Biology offers both thesis and non-thesis Master of Science degree programs. Both programs require a minimum of 30 semester hours of courses at the 300 level or higher. A minimum of 18 semester hours of formal course work is required for the thesis degree, and a minimum of 24 semester hours of formal course work is required for the non-thesis degree. The remaining credits may be research credits (BIOL 601 and 651). Further information is available in the department office.

Doctor of Philosophy

The Doctor of Philosophy degree in biology is granted upon the completion of original research under the guidance of a faculty member in the Department of Biology. Students who are planning to enter the doctoral program should obtain information from the department office.

COURSE DESCRIPTIONS

BIOL 114. Principles of Biology (3)
A basic biology course designed for the non-major. Topics include: molecules of life, cell structure, respiration and photosynthesis, molecular genetics and gene technology, heredity and human genetics, population genetics and evolution, diversity of life, and function of ecosystems. Course includes some applications of biological principles to agricultural, medical, and environmental concerns. BIOL 114 is not open to students with credit for BIOL 214. This course does not count toward the biology major.

BIOL 116. Introduction to Human Anatomy and Physiology I (3)
This course is the first course in a two-semester sequence that covers most systems of the human body. BIOL 116 covers homeostasis, membrane structure and function, membrane transport, tissue types, the integumentary system, neurons and nerves, the central nervous system, the peripheral nervous system, special senses (vision, hearing and equilibrium, taste, smell), and the cardiovascular system. This course is not open to students who have completed either BIOL 216 or BIOL 340 or BIOL 346. Prereq: or Coreq: BIOL 114.

BIOL 117. Introduction to Human Anatomy and Physiology II (3)
This course is the second course in a two-semester sequence that covers most systems of the human body. BIOL 117 covers respiratory system, endocrine system, digestive system, lymphatic system, immune system, urinary system, acid-base regulation, and reproductive systems. This course is not open to students who have completed either BIOL 216 or BIOL 340 or BIOL 346. Prereq: BIOL 114 and BIOL 116.

BIOL 119. Concepts for a Molecular View of Biology I (3)
Introduction to the principles of inorganic and organic chemistry essential to the study of biochemistry, molecular biology, and pharmacology. Topics include: atomic theory, the periodic table, chemical bonds, molecular geometry, ideal gas laws, equilibrium and reaction rates, acids and bases, nuclear chemistry, and nomenclature and reactions of organic compounds (including alkyl, aryl, alcohol, carboxyl, and amino compounds). Problems involving numeric computation are emphasized. This course is not open to students with credit for CHEM 105.

BIOL 121. Concepts for a Molecular View of Biology II (3)
The second semester of a two-course sequence in elementary inorganic, organic, and biochemistry. Topics include: carbohydrates, lipids, proteins, enzymes, enzyme kinetics, metabolic pathways and bioenergetics, DNA and RNA, methods of molecular biology, and nutrition. Applications to human physiology and medicine emphasized. BIOL 121 is not open to students with credit for CHEM 223. Prereq: BIOL 119.

BIOL 214. Genes and Evolution
First in a series of three courses required of the Biology major. Topics include: biological molecules (with a focus on DNA and RNA); basics of cell structure (with a focus on the nucleus and chromosome); cell cycle, mitosis and meiosis; molecular genetics, viruses and gene technology; classical and microbial genetics; population genetics and evolution, diversity resulting from evolution. Prereq: CHEM 105 or CHEM 111.

BIOL 214L. Genes and Evolution Laboratory (1)
First in a series of three laboratory courses required of the Biology major. Topics include: biological molecules (with a focus on DNA and RNA); basics of cell structure (with a focus on the nucleus and chromosome); cell cycle, mitosis and meiosis; molecular genetics, biotechnology; population gen-
BIOL 215. Cells and Proteins (3) Second in a series of three courses required of the Biology major. Topics to include: protein structure-function, enzymes kinetics; cell structure; cellular energetics, respiration and photosynthesis. In addition, membrane structure and transport will be covered. Laboratory and discussion sessions offered in alternate weeks. Prereq or Coreq: BIOL 214 or consent; or CHEM 105 and CHEM 106; or CHEM 111.

BIOL 215L. Cells and Proteins Laboratory (1) Second in a series of three laboratory courses required of the Biology major. Topics to include: protein structure-function, enzymes kinetics; cell structure; cellular energetics, respiration and photosynthesis. In addition, membrane structure and transport will be covered. Laboratory and discussion sessions offered in alternate weeks. This course is not available for students who have taken BIOL 215 as a 4-credit course. Prereq: CHEM 105 and CHEM 106 and BIOL 214. Prereq or Coreq: BIOL 215.

BIOL 216. Organisms and Ecosystems (3) Third in a series of three courses required of the Biology major. Topics include: homeostasis, including endocrine and autonomic controls; function of neurons and nervous systems; function of organ systems involved in circulation, excretion, osmoregulation, gas exchange, feeding, digestion, and temperature regulation; reproduction and development; behavior, population dynamics, community ecology, and function of ecosystems. Prereq: BIOL 214 and either CHEM 105 or CHEM 111.

BIOL 216L. Organisms and Ecosystems Laboratory (1) Third in a series of three laboratory courses required of the Biology major. Students will conduct laboratory experiments designed to provide students with hands-on empirical laboratory experience in order to better understand the complex interactions governing the basic physiology and development of organisms, as well as the functioning of ecosystems. Laboratories and discussion sessions offered in alternate weeks. Prereq or Coreq: BIOL 216.

BIOL 223. Vertebrate Biology (3) A survey of vertebrates from jawless fishes to mammals. Functional morphology, physiology, behavior and ecology as they relate to the groups’ relationships with their environment. Evolution of organ systems. Two lectures and one laboratory per week. The laboratory will involve a study of the detailed anatomy of the shark and catfish as representative vertebrates. Students are expected to spend at least three hours of unscheduled laboratory each week. This course fulfills a laboratory requirement for the biology major. Recommended preparation: BIOL 214.

BIOL 225. Evolution (3) Multidisciplinary study of the course and processes of organic evolution provides a broad understanding of the evolution of structural and functional diversity, the relationships among organisms and their environments, and the phylogenetic relationships among major groups of organisms. Topics include the genetic basis of micro- and macroevolutionary change, the concept of adaptation, natural selection, population dynamics, theories of species formation, principles of phylogenetic inference, biogeography, evolutionary rates, evolutionary convergence, homology, Darwinian medicine, and conceptual and philosophic issues in evolutionary theory. Offered as ANTH 225, BIOL 225, GEOG 225, HSTY 225, and PHIL 225.

BIOL 250. Introduction to Cell and Molecular Biology Systems (3) This course will emphasize an understanding of living organisms at the cellular level from a molecular view point. Topics to be covered will include: unity and diversity of living things, evolutionary relatedness, cells, tissues and organelles, life as a biochemical process, molecular building blocks of life, gene structure and function, use of model organisms and molecular experimental methods. The topics to be covered are relevant to current practices in biotechnology, medicine and agriculture and these connections will be highlighted. This course is not open to students who have received credit for BIOL 214 and/or BIOL 215.

BIOL 251. Introduction to Organismal and Population Systems (3) This course will emphasize an understanding of the regulation of the structure and function of organismal and population systems. Adopting an evolutionary perspective, the course will provide students with a comparative analysis of plant and animal solutions to the problem of multicellularity. Detailed exploration of animals will focus on the development of tissue and organ systems and how these connections will be highlighted. This course will be extended to regulation of ecosystems and abundance of organisms in populations.

BIOL 300. Dynamics of Biological Systems: A Quantitative Introduction to Biology (3) This course will introduce students to dynamic biological phenomena, from the molecular to the population level, and models of these dynamical phenomena. It will describe a biological system, discuss how to model its dynamics, and experimentally evaluate the resulting models. Topics will include molecular dynamics of biological molecules, kinetics of cell metabolism and the cell cycle, physics of excitability, scaling laws for biological systems, biomechanics, and population dynamics. Mathematical tools for the analysis of dynamic biological processes will also be presented. Students will manipulate and analyze simulations of biological processes, and learn to formulate and analyze their own models. This course satisfies a laboratory requirement for the biology major. Offered as BIOL 300 and EBME 300.

BIOL 301. Biotechnology Laboratory: Genes and Genetic Engineering (3) Laboratory training in recombinant DNA techniques. Basic microbiology, growth, and manipulation of bacteriophage, bacteria and yeast. Students isolate and characterize DNA, construct recombinant DNA molecules, and reintroduce them into eukaryotic cells (yeast, plant, animal) to assess their viability and function. Two laboratories per week. Offered as BIOL 301 and BIOL 401. Prereq: BIOL 215.

BIOL 302. Human Learning and the Brain (3) This course focuses on the question, “How does the human brain learn?” Through assigned readings, extensive class discussions, and a major paper, each student will explore personal perspectives on learning. Specific topics include, but are not limited to: the brain’s cycle of learning; neocortex structure and function; emotion and limbic brain; synapse dynamics and changes in learning; images in cognition; symbolic brain (language, mathematics, music); memory formation; and creative thought and brain mechanisms. The major paper will be added to each student’s SAGES writing portfolio. In addition, near the end of the semester, each student will make an oral presentation on a chosen topic. Prereq: BIOL 114 or BIOL 214 or PSCL 101. SAGES Dept Seminar

BIOL 303. Principles of Chemical Biology (4) This is a computer-assisted course and offers a detailed introduction into biological macromolecular structure and function with particular emphasis on proteins. Computer-assisted learning will follow each lecture and will involve either searching the Web for appropriate sources of information covered in the lecture or using spreadsheets and graphics to examine data extracted from the chemical biology and biomedical literature. For example, the protein database (PDB) and Ras-mol software will be used to visualize and measure biological macromolecules and extracted data from the biomedical literature will be analyzed by standard graphical procedures employing the computer. This new format will offer the student the ability to learn to use the information resources on the Web together with the computing ability of the computer to explore the concepts presented in the course. This course satisfies a laboratory requirement for the biology major. Prereq: CHEM 105 and CHEM 106 or CHEM 111 and ENGR 145.

BIOL 305. Herpetology (4) Structure, function, and identification of amphibians and reptiles; emphasis on North American herpetofauna. Evolution, anatomy, zoogeography,
and systematics of the major families of amphibians and reptiles. Physiological ecology, behavior, reproductive and population biology, field survey techniques, and behavioral observations of live animals. Three lectures and one session on special topics per week. Several weekend field trips. The course is offered in the spring semester of odd-numbered years. Prerequisite: BIOL 214.

BIOL 306. Dynamics of Biological Systems II: Tools for Mathematical Biology (3)

Building on the material in Biology 300, this course focuses on the mathematical tools used to construct and analyze biological models, with examples drawn largely from ecology but also from epidemiology, developmental biology, and other areas. Analytic “paper and pencil” techniques are emphasized, but we will also use computers to help develop intuition. By the end of the course, students should be able to recognize basic building blocks in biological models, be able to perform simple analysis, and be more fluent in translating between verbal and mathematical descriptions. Prerequisite: BIOL 300.

BIOL 307. Evolutionary Biology of the Invertebrates (3)

Important events in the evolution of invertebrate life, as well as structure, function, and phylogeny of major invertebrate groups.

BIOL 308. Molecular Biology: Genes and Genetic Engineering (4)

An examination of the flow of genetic information from DNA to RNA to protein. Topics include: nucleic acid structure; mechanisms and control of DNA, RNA, and protein biosynthesis; recombinant DNA; and mRNA processing and modification. Where possible, eukaryotic and prokaryotic systems are compared. Special topics include yeast as a model organism, molecular biology of cancer, and molecular biology of the cell cycle. Current literature is discussed briefly as an introduction to techniques of genetic engineering. Recommended preparation for BIOC 408 and BIOL 408: BIOC 307 or BIOL 214. Offered as BIOC 308, BIOL 308, BIOC 408, and BIOL 408. Prerequisite: BIOL 215 or BIOC 307.

BIOL 309. Introduction to Research in Mathematical Biology (1)

The purpose of this seminar is to introduce students to some of the research being done at Case Western Reserve that explores questions at the intersection of mathematics and biology. Students will explore roughly five research collaborations, spending two weeks with each research group. In the first three classes of each two-week block, students will read and discuss relevant papers, guided by members of that research group, and the two-week period will culminate in a talk in which a member of the research group will present a potential undergraduate project in that area. After the final group’s talk, students will divide themselves into groups of two to four people and choose one project for further exploration. Together, they will write up this project as a research proposal, introducing the problem, explaining how it connects to broader scientific questions, and outlining the proposed work. It is expected that students will use the associated research group as a resource, but the proposal should be their own work. Students will submit a first draft, receive feedback, and then submit a revised draft. Offered as BIOC 309 and MATH 342.

BIOL 312. Environmental Sculpture (3)

This course explores sculptural/architectural possibilities within three environmental realms: the natural, urban, and social/communal. The definition and application of “Sculpture” and “Architecture” may vary dramatically from project to project, where the boundary between sculpture and architecture may be blurred. Throughout, an emphasis on ecological awareness will be maintained, as it relates to environmental impact of structures in the landscape, as well as the materials and pathway of construction. This course satisfies a laboratory requirement for the biology major. SAGES Senior Cap

BIOL 313. Genetics Laboratory (2)

This laboratory exposes students to the methods used to study the genetics of a wide range of organisms. Some of the topics covered are: gene mapping in diploids, tetrad analysis, mutation, complementation, and mitotic recombination. Emphasis is placed on the relationship between the genotype and the biochemical events which determine the phenotype. One laboratory per week. Prerequisite or Corequisite: BIOL 326.

BIOL 314. Animal Cognition and Consciousness (4)

This course examines the notions of intelligence, cognition, reasoning, consciousness, and mental content as they appear in the philosophical views and empirical studies of animals in individual and social contexts. We will review scientific findings that suggest striking likenesses and intriguing differences in the (apparent) thought processes of humans and animals, and ask whether the research techniques that brought us these results are fully adequate to measuring such unobservable entities as conscious experience and thought. Techniques of measurement range from naturalistic observation, to the processing of vocalizations, to memory and problem solving tasks, and the imaging of brain processes through fMRI scans, etc. Students will face the challenges and rewards of practicing these techniques and reworking philosophical theories in the service component of the course. Students will participate in veterinary or shelter work to provide needed animal care while studying animal behavior using cognitive ethological methods. We will compare methods for measuring consciousness and intelligence in animals to those used for human beings, and ask questions about the possibility of machine consciousness and the emergent property of group consciousness. Offered as BIOL 314, COGS 314, PHIL 314 and PHIL 414.

BIOL 315. Quantitative Biology Laboratory (3)

Application of personal computers to biological research. Emphasis on the use of structured programming and flowcharted, use of statistical techniques, analysis of experimental design, modeling strategies. The use of diverse software packages such as spreadsheets, word processing, statistical packages. Continuous interaction with the WWW. Weekly lectures and problem sets posted in the WWW home page. One lecture and one lab per week. During the last 6 weeks of the course, graduate students will have a final project that consists of data analysis and interpretation. Report required for the final project for graduate students. Offered as BIOL 315 and BIOL 415. Prerequisite: BIOL 216.

BIOL 316. Fundamental Immunology (4)

Introductory immunology providing an overview of the immune system, including activation, effector mechanisms, and regulation. Topics include antigen-antibody reactions, immunologically important cell surface receptors, cell-cell interactions, cell-mediated immunity, innate versus adaptive immunity, cytokines, and basic molecular biology and signal transduction in B and T lymphocytes, and immunopathology. Three weekly lectures emphasize experimental findings leading to the concepts of modern immunology. An additional recitation hour is required to integrate the core material with experimental data and known immune mediated diseases. Five mandatory 90 minute group problem sets per semester will be administered outside of lecture and recitation meeting times. Graduate students will be graded separately from undergraduates, and 22 percent of the grade will be based on a critical analysis of a recently published, landmark scientific article. Offered as BIOL 316, BIOL 416, CLBY 416, and PATH 416. Prerequisite: BIOL 215.

BIOL 318. Introductory Entomology (4)

The goal of this course is to discover that, for the most part, insects are not aliens from another planet. Class meetings will alternate; with some structured as lectures, while others are laboratory exercises. Sometimes we will meet at the Cleveland Museum of Natural History, or in the field to collect and observe insects. The 50 minute discussion meeting once a week will serve to address questions from both lectures and lab exercises. The students will be required to make a small but comprehensive insect collection. Early in the semester we will focus on collecting the insects, and later, when insects are gone for the winter, we will work to identify the specimens collected earlier. Students will be graded based on exams, class participation and their insect collections. Offered as BIOL 318 and BIOL 418. Prerequisite: BIOL 214, and BIOL 215, and BIOL 216.

BIOL 319. Applied Probability and Stochastic Processes for Biology (4)

Applications of probability and stochastic processes to biological systems. Mathematical topics
will include: introduction to discrete and continuous probability spaces (including numerical generation of pseudo random samples from specified probability distributions), Markov processes in discrete and continuous time with discrete and continuous sample spaces, point processes including homogeneous and inhomogeneous Poisson processes and Markov chains on graphs, and diffusion processes including Brownian motion and the Ornstein-Uhlenbeck process. Biological topics will be determined by the interests of the students and the instructor. Likely topics include: stochastic ion channels, molecular motors and stochastic ratchets, actin and tubulin polymerization, random walk models for neural spike trains, bacterial chemotaxis, signaling and genetic regulatory networks, and stochastic predator-prey dynamics. The emphasis will be on practical simulation and analysis of stochastic phenomena in biological systems. Numerical methods will be developed using both MATLAB and the R statistical package. Student projects will comprise a major part of the course. Offered as BIOL 319, EECS 319, MATH 319, BIOL 419, EBME 419, and PHOL 419.

**BIOL 325. Cell Biology (3)**
This course will emphasize an understanding of the structure and function of eukaryotic cells from a molecular viewpoint. We will explore cell activities by answering the questions what do cells do and how do they do it. The answers to these questions will be developed using experimental evidence from the literature and explanations from the text. An important part of this course will be appreciation of the experimental evidence which supports our current understanding of cell function. To achieve this aim, students will read papers from the primary literature to supplement the text. Topics will include cell structure, protein structure and function, internal organization of the eukaryotic cell, membrane structure and function, protein sorting, organelle biogenesis, and cytoskeleton structure and function. The course will also cover the life cycles of cells, their interactions and finally use the immune response as a model of cell behavior. Prereq: BIOL 214 and BIOL 215.

**BIOL 326. Genetics (3)**
Transmission genetics, nature of mutation, microbial genetics, somatic cell genetics, recombinant DNA techniques and their application to genetics, human genome mapping, plant breeding, transgenic plants and animals, uniparental inheritance, evolution, and quantitative genetics. Offered as BIOL 326 and BIOL 426. Prereq: BIOL 214.

**BIOL 328. Plant Genomics and Proteomics (3)**
The development of molecular tools has impacted agriculture as much as human health. The application of new techniques to improve food crops, including the development of genetically modified crops, has also become controversial. This course covers the nature of the plant genome and the role of sequenced-based methods in the identification of the genes. The application of the whole suite of modern molecular tools to understand plant growth and development, with specific examples related agronomically important responses to biotic and abiotic stresses, is included. The content of the enormous amounts of data generated by these methods and their storage and analysis (bioinformatics) is also considered. Finally, the impact on both the developed and developing world of the generation and release of genetically modified food crops will be covered. Recommended preparation: BIOL 326. Offered as BIOL 328 and BIOL 428.

**BIOL 334. Structural Biology (3)**
Introduces basic chemical properties of proteins and discusses the physical forces that determine protein structure. Topics include: the elucidation of protein structure by NMR and by X-ray crystallographic methods; the acquisition of protein structures from data bases; and simple modeling experiments based on protein structures. Offered as BIOC 334, BIOL 344, BIOC 443, and BIOL 434.

**BIOL 336. Aquatic Biology (3)**
Physical, chemical, and biological dynamics of lake ecosystems. Factors governing the distribution, abundance, and diversity of freshwater organisms. Prereq: BIOL 216.

**BIOL 338. Ichthyology (3)**
Biology of fishes. Students will first develop fundamental understanding of the evolutionary history and systematics of fishes to provide a context within which they can address diverse aspects of biology including anatomy, physiology (e.g., in species that change sex; osmoregulation in freshwater vs. saltwater), and behavior (e.g., visual, auditory, chemical, electric communication; social structures). Finally, this knowledge will be used to explore the biodiversity of fishes around the world, with emphasis on Ohio species, by examining preserved specimens in class and making two local field trips to (1) observe captive living specimens, and (2) observe, capture, and identify wild fishes in their natural habitats. The course will conclude with an analysis of the current global fisheries crisis that has resulted from human activities. Fishes will be used to address broad topics in ecology and evolutionary biology that transcend the pure study of ichthyology. Recommended preparation for BIOL 338: BIOL 216. Offered as BIOL 338 and BIOL 438. Prereq: BIOL 216.

**BIOL 339. Aquatic Biology Laboratory (2)**
The physical, chemical, and biological limnology of freshwater ecosystems will be investigated. Emphasis will be on identification of the organisms inhabiting these systems and their ecological interactions with each other. This course will combine both field and laboratory analysis to characterize and compare the major components of these ponds. Students will have the opportunity to design and conduct individual projects. Prereq or Coreq: BIOL 336.

**BIOL 340. Human Physiology (3)**
This course will provide functional correlates to the students’ previous knowledge of human anatomy. Building upon the basic principles covered in BIOL 216 and 346, the physiology of organs and organ systems of humans, including the musculoskeletal, nervous, cardiovascular, lymphatic, immune, respiratory, digestive, excretory, reproductive, and endocrine systems, will be studied at an advanced level. The contribution of each system to homeostasis will be emphasized. Prereq: BIOL 216 and BIOL 346.

**BIOL 343. Microbiology (3)**
An introduction to the physiology, genetics, biochemistry, and diversity of microorganisms. The subject will be approached both as a basic biological science that studies the molecular and biochemical processes of cells and viruses, and as an applied science that examines the involvement of microorganisms in human disease as well as in workings of ecosystems, plant symbioses, and industrial processes. The course is divided into four major areas: bacteria, viruses, medical microbiology, and environmental and applied microbiology. Prereq: BIOL 215.

**BIOL 344. Laboratory for Microbiology (3)**
Practical microbiology, with an emphasis on bacteria as encountered in a variety of situations. Sterile techniques, principles of identification, staining and microscopy, growth and nutritional characteristics, genetics, enumeration methods, epidemiology, immunological techniques (including ELISA and T cell identification), antibiotics and antibiotic resistance, chemical diagnostic tests, sampling the human environment, and commercial applications. One lab per week. Prereq or Coreq: BIOL 343.

**BIOL 346. Human Anatomy (3)**
Gross anatomy of the human body. Two lectures and one laboratory demonstration per week. Prereq: BIOL 214.

**BIOL 348. Human Anatomy and Physiology (4–5)**
The anatomy and physiology of the human body. Enrollment is restricted to students majoring in nutrition. Four lectures and one laboratory per week. Offered as BIOL 348 and BIOL 448.

**BIOL 351. Principles of Ecology (3)**
This lecture course explores spatial and temporal relationships involving organisms and the environment at individual, population, and community levels. An underlying theme of the course will be neo-Darwinian evolution through natural selection with an emphasis on organismal adaptations to abiotic and biotic environments. Studies and models will illustrate ecological principles, and there will be some emphasis on the applicability of these principles to ecosystem conservation. Students taking the graduate level course will prepare a grant proposal in which hypotheses will be based...
on some aspect of ecological theory. Recommended preparation: BIOL 216. Offered as BIOL 351 and BIOL 451.

**BIOL 351L. Principles of Ecology Laboratory (2)** Students in this laboratory course will conduct a variety of ecological investigations that are designed to examine relationships involving organisms and the environment at individual, population, and community levels. Descriptive and hypothesis-driven investigations will take place at Case Western Reserve University’s Squire Valleyvue Farm, in both field and greenhouse settings. The course is designed to explore as well as test a variety of ecological paradigms. Students taking the graduate level course will prepare a grant proposal in which hypotheses will be based on a select number of lab investigations. This course satisfies a laboratory requirement for biology majors. Recommended preparation or concurrent enrollment in BIOL 351 or BIOL 451. Offered as BIOL 351L and BIOL 451L.

**BIOL 352. Introduction to Ecology and Field Biology (3)** This course will be an introduction to the field-based study of the interactions that determine the abundance and distribution of organisms. There will be a heavy emphasis on experimentation and data collection in the field as we investigate a diversity of terrestrial and aquatic habitats on the Squire Valleyvue Farm property. Students will have the opportunity to practice important ecological sampling techniques as they study the relationships between individuals, populations, and communities and the environments they live in. This course satisfies a laboratory requirement for the biology major. Offered summer semester only. Prereq: BIOL 216.

**BIOL 353. Ecophysiology of Global Change (3)** Climate changes and natural selection, prior to human activities, have pre-equipped autotrophic organisms with a suite of adaptations to natural abiotic stress. Whether these adaptations are capable of dealing with current and future levels of stress (magnitude, speed) of non-natural abiotic change is of great interest. This course will examine, in detail, the tight physiological interactions between plants and their variable environment. Emphasizing major aspects of indirect (UV-B, global warming, altered precipitation) and direct (CO2, O3, SOx, NOx) anthropogenic pollution, relevant plant cellular processes, and responses of plants to abiotic stress, will be examined. With this foundation, class discussions will explore scaled collective consequences of global change to plant-dominated terrestrial and aquatic ecosystems. Offered as BIOL 353 and BIOL 453. Prereq: BIOL 216.

**BIOL 358. Animal Behavior (4)** Ultimately the success or failure (i.e. life or death) of any individual animal is determined by its behavior. The ability to locate and capture food, avoid being food, acquiring and defending territory, and successfully passing your genes to the next generation, are all dependent on complex interactions between an animal’s design, environment, and behavior. This course will be an integrative approach emphasizing experimental studies of animal behavior. You will be introduced to state-of-the-art approaches to the study of animal behavior, including neural and hormonal mechanisms, genetic and developmental mechanisms and ecological and evolutionary approaches. We will learn to critique examples of current scientific papers, and learn how to conduct observations and experiments with real animals. We will feature guest appearances by the Curator of Research from the Cleveland Metroparks Zoo and visits to working animal behavior research labs here at Case Western Reserve. Group discussions and writing will be emphasized. This course satisfies a laboratory requirement for biology majors. Offered as BIOL 358 and BIOL 458. Prereq: BIOL 114 or BIOL 214.

**BIOL 361. Building an Educational Website: Zebrafish in the Classroom (3)** Students with backgrounds in computer science and biology will work together to build a “Zebrafish in the Classroom” website. The zebrafish model system has many characteristics that make it an excellent tool for teaching: embryos are easy to obtain in large numbers, development can be observed in vivo using simple dissecting microscopes, and mutants can be used to demonstrate principles of development and genetics. Although scientists around the world are using zebrafish in their courses, there is no centralized place for educators and students to share ideas and materials. During this course, students will create content for and build a website that will disseminate ideas for using zebrafish as a teaching tool. In its mature form, the website will contain protocols for using zebrafish in laboratory courses for students at all stages of their education, tours, movies, discussion and question boards, and an on-line journal where students can publish their work. Students enrolling in this course should have background in web design or developmental biology. Prereq: BIOL 362. SAGES Dept Seminar


**BIOL 363. Experimental Developmental Biology (3)** Laboratory will teach concepts and techniques in developmental biology using wildtype, mutant, and transgenic fluorescent zebrafish. Emphasis will be on the mechanisms that pattern the embryo during development and how these mechanisms are explored using molecular, cellular, and genetic approaches. Term research paper required. Students taking the graduate level course will prepare a grant proposal. One laboratory per week. Limit: 10 students. Offered as BIOL 363 and BIOL 463. Prereq: BIOL 216 and BIOL 362.

**BIOL 365. Evo-Devo: Evolution of Body Plans (3)** This discussion-based course offers a detailed introduction to Evolutionary Developmental Biology. The field seeks to explain evolutionary events through the mechanisms of Developmental Biology and Genetics. The course is structured into different modules. First we will look at the developmental genetic mechanisms that can cause variation. Then we focus on how alterations of these mechanisms can generate novel structural changes. We will then examine a few areas of active debate, where Evo-Devo is attempting to solve major problems in evolutionary biology. We will conclude with two writing assignments. Students will be required to present, read, and discuss primary literature in each module. Offered as BIOL 365 and BIOL 465. Prereq: BIOL 225 or BIOL 362. SAGES Dept Seminar

**BIOL 366. Genes, Embryos and Fossils (3)** This multidisciplinary seminar course is designed to help students understand fundamental concepts of development and evolution of biological systems. Because scientists communicate their ideas through journal articles, seminars, and in grant proposals, the course will focus upon reading and synthesizing primary literature. In this discussion-based course, students will also learn to effectively present and write on three topics that are at the exciting intersection of genetics, developmental biology, and evolution. Finally, students will be provided with the technical and intellectual skills which are needed to write a grant proposal and a literature review. Prereq: BIOL 225 or BIOL 362 or BIOL 365. SAGES Dept Seminar

**BIOL 368. Topics in Evolutionary Biology (3)** The focus for this course on a special topic of interest in evolutionary biology will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution. ANAT/ANTH/GEOL/PHIL 467/BIO 468 will require a longer, more sophisticated term paper, and additional class presentation. Offered as ANTH 367, BIOL 368, GEOL 367, PHIL 367, ANAT 467, ANTH 467, BIOL 468, GEOL 467, and PHIL 467.

**BIOL 369. Evolutionary Biology Capstone (3)** This course focuses on a special topic of interest in evolutionary biology that will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution. Students will participate in
discussions and lead class seminars on evolution-ary topics and in collaboration with an advisor or advisors, select a topic for a research paper or proj-ect. Each student will write a major research report or complete a major project and will make a public presentation of her/his findings.
Offered as ANTH 368, BIOL 369, PHIL 368.
SAGES Senior Cap

BIOL 373. Introduction to Neurobiology (3)
How nervous systems control behavior. Biophysical, biochemical, and molecular biological properties of nerve cells, their organization into circuitry, and their function within networks. Emphasis on quantitative methods for modeling neurons and networks, and on critical analysis of the contempo-rary technical literature in the neurosciences. Term paper required for graduate students.
Offered as BIOL 373, BIOL 473, and NEUR 473.
Prereq: BIOL 216.

BIOL 374. Neurobiology of Behavior (3)
In this course, students will examine how neuro-biologists interested in animal behavior study the linkage between neural circuitry and complex behavior. Various vertebrate and invertebrate sys-tems will be considered. Several exercises will be used in this endeavor. Although some lectures will provide background and context on specific neural systems, the emphasis of the course will be on classroom discussion of specific journal articles.
In addition, students will each complete a project in which they will observe some animal behavior and generate both behavioral and neurobiological hypotheses related to it. In lieu of examinations, students will complete three written assignments, including a theoretical grant proposal, a one-page Specific Aims paper related to the project, and a final project paper. These assignments are designed to give each student experience in writing biologically-relevant documents. Classroom discussions will help students understand the content and format of each type document. They will also present their projects orally to the entire class. Recommended preparation: BIOL 216.
Offered as BIOL 374, BIOL 474, and NEUR 474.
SAGES Dept Seminar

BIOL 376. Neurobiology Laboratory (3)
Introduction to the basic laboratory techniques of neurobiology. Intracellular and extracellular recording techniques, forms of synaptic plasticity, patch clamping, immunohistochemistry and confocal microscopy. During the latter weeks of the course students will be given the opportunity to conduct an independent project. One labora-tory and one discussion session per week. Recommended preparation for BIOL 476 and NEUR 476: BIOL 216.
Offered as BIOL 376, BIOL 476 and NEUR 476.
Prereq: BIOL 216.

BIOL 377. Biorobotics Team Research (3)
Many exciting research opportunities cross dis-ciplinary lines. To participate in such projects, researchers must operate in multi-disciplinary teams. The Biorobotics Team Research course offers a unique capstone opportunity for under-graduate students to utilize skills they developed during their undergraduate experience while ac-quiring new teaming skills. A group of eight stu-dents form a research team under the direction of two faculty leaders. Team members are chosen from appropriate majors through interviews with the faculty. They will research a biological mecha-nism or principle and develop a robotic device that captures the actions of that mechanism. Although each student will cooperate on the team, they each have a specific role, and must develop a final pa-per that describes the research generated on their aspect of the project. Students meet for one class period per week and two 2-hour lab periods. Ini-tially students brainstorm ideas and identify the project to be pursued. They then acquire biological data and generate robotic designs. Both are further developed during team meetings and reports. Fi-nal oral reports and a demonstration of the robotic device occur in week 15.
Offered as BIOL 377, EMAE 377, BIOL 477, and EMAE 477.
SAGES Senior Cap

BIOL 378. Computational Neuroscience (3)
Computer simulations and mathematical analysis of neurons and neural circuits, and the computa-tional properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course introduces students to dynamical systems theory for the analysis of neurons and neural learning, models of brain systems, and their relationship to artificial and neural networks. Term project required. Students enrolled in MATH 478 will make arrangements with the instructor to at-tend additional lectures and complete additional assignments addressing mathematical topics re-related to the course. Recommended preparation: MATH 223 and MATH 224 or BIOL 300 and BIOL 306.
Offered as BIOL 378, COGS 378, MATH 378, BIOL 478, EBME 478, EEC 478, MATH 478 and NEUR 478.

BIOL 379. Neuroscience of Communication and Communication Disorders (3)
The course focus is neuroanatomy and neurophysi-ology related to motor control and cognition, par-ticularly aspects of cognition involved in language functions. Topics to be addressed include: princi-ples of neurophysiology and neurochemistry; func-tional neuroanatomy of the central and peripheral nervous systems; neurological and neuropsycholog-ical assessment of communication; neurodiag-nostic methods. In part, the course material will be presented in a problem-based learning format. That is, normal aspects of human neurosence will be discussed in the context of neurological dis-or-ders affecting communication.
Offered as BIOL 379 and COSI 305.

BIOL 382. Drugs, Brain, and Behavior (3)
This course is concerned with the mechanisms un-derlying neurochemical signaling and the impact of drugs on those mechanisms. The first half of the course emphasizes the fundamental mechanisms underlying intra- and extracellar communication of neurons and the basic principles of how drugs interact with the nervous system. The second half of the course emphasizes understanding the neural substrates of disorders of the nervous system, and the mechanisms underlying the therapeutic effects of drugs at the cellular and behavioral levels. This course will consist of lectures designed to give the student necessary background for understanding these basic principles and class discussion. The class discussion will include viewing video exam-ples of behavioral effects of disorders of the ner-vous system, and analysis of research papers. The goal of the class discussions is to enhance the criti-cal thinking skills of the student and expose the student to contemporary research techniques.
Offered as BIOL 382, BIOL 482, and NEUR 482.
Prereq: BIOL 215 and BIOL 216.

BIOL 384. Reading and Writing Like an Ecologist (3)
Students usually learn from textbooks, but scient-ists communicate with each other through journal articles. The purpose of this class is to help you learn to read and write like an ecologist. We will spend our time reading and discussing journal articles about three or four issues in ecology, in-cluding papers from both empirical and theoreti-cal perspectives. In addition to the science, we'll talk about strategies for how to keep reading when you encounter something you don't understand and what makes a paper well or poorly written. At the end of each section, you will synthesize your ideas into a review article. Your initial paper will be submitted to me as hypothetical journal editor. I will send your paper out for review to two fellow classmates, and I'll send their comments back to you along with brief comments of my own. As all scientists know, it is virtually unheard of for a journal to accept a paper for publication without revisions. After this peer review, you will revise your papers and resubmit them to me. Your grade will be based on your participation in class discus-sions, your papers (both drafts) and your work as a reviewer for other students. Recommended prepara-tion: BIOL 216.
SAGES Dept Seminar

BIOL 385. Seminar on Biological Processes in Learning and Cognition (3)
Students will read and discuss research papers on a range of topics relevant to the biological pro cesses that lead to cognition and learning in hu-mans. Sample topics are: cellular and molecular mechanisms of memory; visual sensory detection of images, movement, and color; role of slow neu rotransmitters in synaptic plasticity; cortical dis tribution of cognitive functions such as working memory, decision making, and image analysis; functions of emotion-structures and their role in cognition; brain structures and mechanisms in- volved in language creation; others. Some papers will be assigned and others will be selected by stu-dents. Discussions will focus on the methods used,
the experimental results, and the interpretations of significance. Students will work in groups on a semester project to be presented near the end of the semester.

Prereq: BIOL 302.
SAGES Senior Cap

BIOL 387. Seminar in Population Biology (1–3)
Discussion of major themes in population biology, evolution, and ecology, based on critiquing scientific papers. One discussion per week.

BIOL 388. Undergraduate Research (1–3)
Guided laboratory research under the sponsorship of a biology faculty member. May be carried out within the biology department or in associated departments. May be taken only one semester during the student’s academic career. Appropriate forms must be secured in the biology department office. A written report must be approved by the biology sponsor and submitted to the chair of the biology department before credit is granted.

BIOL 388S. Undergraduate Research - SAGES Capstone (3)
Guided laboratory research under the sponsorship of a biology faculty member. May be carried out within the biology department or in associated departments. May be taken only one semester during the student’s academic career. Appropriate forms must be secured in the biology department office. A written report must be approved by the biology sponsor and submitted to the chair of the biology department before credit is granted. A public presentation is required.
SAGES Senior Cap

BIOL 389. Selected Topics (1–3)
Individual library research projects under the guidance of a biology sponsor. A major paper must be submitted and approved before credit is awarded.

BIOL 389S. Selected Topics in Biology--SAGES Capstone (3)
Individual library research projects under the guidance of a biology sponsor. A major paper must be submitted and approved before credit is awarded. A public presentation is required.
SAGES Senior Cap

BIOL 390. Advanced Undergraduate Research (1–3)
Offered on a credit only basis. Students may carry out research in biology or related departments, but a biology sponsor is required. Does not count toward the 30 hours required for a major in biology, but may be counted toward the total number of hours required for graduation. A written report must be submitted to the chair’s office and approved before credit is granted.

BIOL 394. Seminar in Evolutionary Biology (3)
This seminar investigates 20th-century evolutionary theory, especially the Modern Evolutionary synthesis and subsequent expansions of and challenges to that synthesis. The course encompasses the multidisciplinary nature of the science of evolution, demonstrating how disciplinary background influences practitioners’ conceptualizations of pattern and process. This course emphasizes practical writing and research skills, including formulation of testable theses, grant proposal techniques, and the implementation of original research using the facilities on campus and at the Cleveland Museum of Natural History.
Offered as ANTH 394, BIOL 394, GEOL 394, HSTY 394, PHIL 394, ANTH 494, BIOL 494, GEOL 494, HSTY 494, and PHIL 494.

BIOL 395. Research Discussions (1)
This is a seminar course which provides a forum within which students performing undergraduate research, or who have done so previously, can present and discuss their projects. Discussions will cover all aspects of the students’ research projects: background material, experimental design and methods, results and their analysis and conclusions. At the beginning of the semester, each student will briefly outline his or her project and distribute a few key papers to provide background reading for all participants. After this introductory phase, each student will make a presentation of his/her own research. Graded as pass/fail, based upon attendance and participation.
Prereq: BIOL 388. Prereq or coreq: BIOL 390.

BIOL 396. Undergraduate Research in Evolutionary Biology (3)
Students propose and conduct guided research on an aspect of evolutionary biology. The research will be supervised and supervised by a member of the CASE faculty or other qualified professional. A written report must be submitted to the Evolutionary Biology Steering Committee before credit is granted.
Offered as ANTH 396, BIOL 396, GEOL 396, and PHIL 396.

BIOL 401. Biotechnology Laboratory: Genes and Genetic Engineering (3)
Laboratory training in recombinant DNA techniques. Basic microbiology, growth, and manipulation of bacterial, phage and yeast. Students isolate and characterize DNA, construct recombinant DNA molecules, and reintroduce them into eukaryotic cells (yeast, plant, animal) to assess their viability and function. Two laboratories per week.
Offered as BIOL 301 and BIOL 401.

BIOL 402. Principles of Neural Science (3)
Lecture/discussion course covering concepts in cell and molecular neuroscience, principles of systems neuroscience as demonstrated in the somatosensory system, and fundamentals of the development of the nervous system. This course will prepare students for upper level Neuroscience courses and is also suitable for students in other programs who desire an understanding of neurosciences. Recommended preparation: CBIO 453. Offered as BIOL 402 and NEUR 402.
will be on a critical analysis of a recently published, landmark scientific article. Offered as BIOL 316, BIOL 416, CLBY 416, and PATH 416. Prereq: Graduate standing.

BIOL 417. Cytokines: Function, Structure, and Signaling (3)
Regulation of immune responses and differentiation of leukocytes is modulated by proteins (cytokines) secreted and/or expressed by both immune and non-immune cells. Course examines the function, expression, gene organization, structure, receptors, and intracellular signaling of cytokines. Topic include regulatory and inflammatory cytokines, colony stimulating factors, chemokines, cytokine and cytokine receptor families, intracellular signaling through STAT proteins and tyrosine phosphorylation, clinical potential, and genetic defects. Lecture format using texts, scientific reviews and research articles. Recommended preparation: PATH 416 or equivalent. Offered as BIOL 417, CLBY 417, and PATH 417.

BIOL 418. Introductory Entomology (4)
The goal of this course is to discover that, for the most part, insects are not aliens from another planet. Class meetings will alternate; with some structured as lectures, while others are laboratory exercises. Sometimes we will meet at the Cleveland Museum of Natural History, or in the field to collect and observe insects. The 50 minute discussion meeting once a week will serve to address questions from both lectures and lab exercises. The students will be required to make a small but comprehensive insect collection. Early in the semester we will focus on collecting the insects, and later, when insects are gone for the winter, we will work to identify the specimens collected earlier. Students will be graded based on exams, class participation and their insect collections. Offered as BIOL 318 and BIOL 418. Prereq: BIOL 214, and BIOL 215, and BIOL 216.

BIOL 419. Applied Probability and Stochastic Processes for Biology (3)
Applications of probability and stochastic processes to biological systems. Mathematical topics will include: introduction to discrete and continuous probability spaces (including numerical generation of pseudo random samples from specified probability distributions), Markov processes in discrete and continuous time with discrete and continuous sample spaces, point processes including homogeneous and inhomogeneous Poisson processes and Markov chains on graphs, and diffusion processes including Brownian motion and the Ornstein-Uhlenbeck process. Biological topics will be determined by the interests of the students and the instructor. Likely topics include: stochastic ion channels, molecular motors and stochastic ratchets, actin and tubulin polymerization, random walk models for neural spike trains, bacterial chemotaxis, signaling and genetic regulatory networks, and stochastic predator-prey dynamics. The emphasis will be on practical simulation and analysis of stochastic phenomena in biological systems. Numerical methods will be developed using both MATLAB and the R statistical package. Student projects will comprise a major part of the course. Offered as BIOL 319, EECS 319, MATH 319, BIOL 419, EBME 419, and PHOL 419.

BIOL 426. Genetics (3)
Transmission genetics, nature of mutation, microbial genetics, somatic cell genetics, recombinant DNA techniques and their application to genetics, human genome mapping, plant breeding, transgenic plants and animals, uniparental inheritance, evolution, and quantitative genetics. Offered as BIOL 326 and BIOL 426.

BIOL 427. Neural Development (3)
Topics include cell commitment, regulation of proliferation and differentiation, cell death and trophic factors, pathfinding by the outgrowing nerve fiber, synapse formation, relationships between center and periphery in development and the role of activity. Offered as BIOL 427 and NEUR 427.

BIOL 428. Plant Genomics and Proteomics (3)
The development of molecular tools has impacted agriculture as much as human health. The application of new techniques to improve food crops, including the development of genetically modified crops, has already become controversial. This course covers the nature of the plant genome and the role of sequenced-based methods in the identification of the genes. The application of the whole suite of modern molecular tools to understand plant growth and development, with specific examples related agronomically important responses to biotic and abiotic stresses, is included. The impact of the enormous amounts of data generated by these methods and their storage and analysis (bioinformatics) is also considered. Finally, the impact on both the developed and developing world of the generation and release of genetically modified food crops will be covered. Recommended preparation: BIOL 326. Offered as BIOL 328 and BIOL 428.

BIOL 431. Statistical Methods I (3)
Application of statistical techniques with particular emphasis on problems in the biomedical sciences. Basic probability theory, random variables, and distribution functions, Point and interval estimation, regression, and correlation. Problems whose solution involves using packaged statistical programs. First part of year-long sequence. Offered as ANAT 431, BIOL 431, EPBI 431, and MPH 431.

BIOL 432. Statistical Methods II (3)
Methods of analysis of variance, regression and analysis of quantitative data. Emphasis on computer solution of problems drawn from the biomedical sciences. Design of experiments, power of tests, and adequacy of models. Offered as BIOL 432, EPBI 432, and MPH 432. Prereq: EPBI 431 or equivalent.

BIOL 434. Structural Biology (3)
Introduces basic chemical properties of proteins and discusses the physical forces that determine protein structure. Topics include: the elucidation of protein structure by NMR and X-ray crystallographic methods; the acquisition of protein structures from data bases; and simple modeling experiments based on protein structures. Offered as BIOL 434, BIOL 438, and BIOL 443.

BIOL 436. Advanced Aquatic Biology (3)
Physical, chemical, and biological dynamics of lakes and ecosystems. Factors governing the distribution, abundance, and diversity of freshwater organisms.

BIOL 438. Ichthyology (3)
Biology of fishes. Students will first develop fundamental understanding of the evolutionary history and systematics of fishes to provide a context within which they can address diverse aspects of biology including anatomy, physiology (e.g., in species that change sex; osmoregulation in freshwater vs. saltwater), and behavior (e.g., visual, auditory, chemical, electric communication; social structure). Finally, this knowledge will be used to explore the biodiversity of fishes around the world, with emphasis on Ohio species, by examining preserved specimens in class and making two local field trips to (1) observe captive living specimens, and (2) observe, capture, and identify wild fishes in their natural habitats. The course will conclude with an analysis of the current global fisheries crisis that has resulted from human activities. Fishes will be used to address broad topics in ecology and evolutionary biology that transcend the pure study of ichthyology. Recommended preparation for BIOL 438: BIOL 216. Offered as BIOL 338 and BIOL 438.

BIOL 443. Advanced Microbiology (3)
The physiology, genetics, biochemistry, and diversity of microorganisms. The subject will be approached both as a basic biological science that studies the molecular and biochemical processes of cells and viruses, and as an applied science that examines the involvement of microorganisms in human disease as well as in the workings of ecosystems, plant symbioses, and industrial processes. The course is divided into four major areas: bacteria, viruses, medical microbiology, and environmental and applied microbiology. Recommended preparation: BIOL 215 or consent of instructor.

BIOL 448. Human Anatomy and Physiology (4–5)
The anatomy and physiology of the human body. Enrollment is restricted to students majoring in nutrition. Four lectures and one laboratory per week. Offered as BIOL 438 and BIOL 448.

BIOL 451. Principles of Ecology (3)
This course explores spatial and temporal relationships involving organisms and the environment at individual, population, and community
levels. An underlying theme of the course will be neo-Darwinian evolution through natural selection with an emphasis on organismal adaptations to abiotic and biotic environments. Studies and models will illustrate ecological principles, and there will be some emphasis on the applicability of these principles to ecosystem conservation. Students taking the graduate level course will prepare a grant proposal in which hypotheses will be based on some aspect of ecological theory. Recommended preparation: BIOL 216.

Offered as BIOL 351 and BIOL 451.

BIOL 451L. Principles of Ecology Laboratory (2)
Students in this laboratory course will conduct a variety of ecological investigations that are designed to examine relationships involving organisms and the environment at individual, population, and community levels. Descriptive and hypothesis-driven investigations will take place at Case Western Reserve University’s Squire Valley Farm, in both field and greenhouse settings. The course is designed to explore as well as test a variety of ecological paradigms. Students taking the graduate level course will prepare a grant proposal in which hypotheses will be based on a selected number of lab investigations. This course satisfies a laboratory requirement for biology majors. Recommended preparation or concurrent enrollment in BIOL 351 or BIOL 451.

Offered as BIOL 351L and BIOL 451L.

BIOL 453. Ecophysiology of Global Change (3)
Climate changes and natural selection, prior to human activities, have pre-prepared autotrophic organisms with a suite of adaptations to natural abiotic stress. Whether these adaptations are capable of dealing with current and future levels (magnitude, speed) of non-natural abiotic change is of great interest. This course will examine, in detail, the tight physiological interactions between plants and their variable environment. Emphasizing major aspects of indirect (UV-B, global warming, altered precipitation) and direct (CO2, O3, SOx, NOx) anthropogenic pollution, relevant plant cellular processes, and responses of plants to abiotic stress, will be examined. With this foundation, class discussions will explore scaled collective consequences of global change to plant-dominated terrestrial and aquatic ecosystems.

Offered as BIOL 353 and BIOL 453.

BIOL 455. Coexistence in a Variable Environment (3)
The question of what maintains biodiversity is a central question of ecology. Over the last decade or so, researchers have come to realize that spatial and temporal environmental variability can play a key role in maintaining species coexistence, but the literature in this area is often confusing and can be difficult to synthesize into a unified understanding. Much of the research in this area has mathematical underpinnings, and so the difficulty is compounded when students are uncomfortable reading mathematically-based papers. This class will help students come to terms with an important and growing segment of the ecological literature and will help them learn how to read mathematically-based papers even if they do not use mathematical modeling in their own research.

BIOL 457. Proteins and Nucleic Acids (3)
The goal of this course is to provide a basic working knowledge of protein structure/function and molecular biology. The course begins with a discussion of protein structure and enzyme catalysis followed by protein purification and characterization. The course then addresses concepts relating to the application of modern molecular biology techniques. Students are taught how to clone genes and use these clones in animal and cell-based studies.

The overall goal is to provide students with an understanding of proteins and genetic approaches that can be used in experimental work and to facilitate comprehension of the scientific literature.

Offered as BIOL 457 and PHOL 456.

BIOL 458. Animal Behavior (4)
Ultimately the success or failure (i.e., life or death) of any individual animal is determined by its behavior. The ability to locate and capture food, avoid being food, acquiring and defending territory, and successfully passing your genes to the next generation, are all dependent on complex interactions between an animal’s design, environment, and behavior. This course will be an integrative approach emphasizing experimental studies of animal behavior. You will be introduced to state-of-the-art approaches to the study of animal behavior, including neural and hormonal mechanisms, genetic and developmental mechanisms, and ecological and evolutionary approaches. We will learn to critique examples of current scientific papers, and learn how to conduct observations and experiments with real animals. We will feature guest appearances by the Curator of Research from the Cleveland Metroparks Zoo and visits to working animal behavior research labs here at Case Western Reserve. Group discussions and writing will be emphasized. This course satisfies a laboratory requirement for biology majors.

Offered as BIOL 358 and BIOL 458.

BIOL 462. Advanced Principles of Developmental Biology (3)
Same as BIOL 362 except the required term paper is an NIH format research proposal. Recommended preparation: BIOL 216.

Offered as ANAT 462 and BIOL 462.

BIOL 463. Experimental Developmental Biology (3)
Laboratory will teach concepts and techniques in developmental biology using wildtype, mutant, and transgenic fluorescent zebrafish. Emphasis will be on the mechanisms that pattern the embryo during development and how these mechanisms are explored using molecular, cellular, and genetic approaches. Term research paper required. Students taking the graduate level course will prepare a grant proposal. One laboratory per week. Limit: 10 students.

BIOL 465. Evo-Devo: Evolution of Body Plans (3)
This discussion-based course offers a detailed introduction to Evolutionary Developmental Biology. The field seeks to explain evolutionary events through the mechanisms of Developmental Biology and Genetics. The course is structured into different modules. First we will look at the developmental genetic mechanisms that can cause variation. Then we focus on how alterations of these mechanisms can generate novel structural changes. We will then examine a few areas of active debate, where Evo-Devo is attempting to solve major problems in evolutionary biology. We will conclude with two writing assignments. Students will be required to present, read, and discuss primary literature in each module.

Offered as BIOL 365 and BIOL 465.

BIOL 467. Biorobotics Team Research (3)
Many exciting research opportunities cross disciplinary lines. To participate in such projects, researchers must operate in multi-disciplinary teams. The Biorobotics Team Research course offers a unique capstone opportunity for undergraduate students to utilize skills they developed during their undergraduate experience while acquiring new teaming skills. A group of eight students form a research team under the direction of two faculty leaders. Team members are chosen from appropriate majors through interviews with the faculty. They will research a biological mechanism or principle and develop a robotic device that captures the actions of that mechanism. Although each student will cooperate on the team, they each have a specific role, and must develop a final paper that describes the research generated on their aspect of the project. Students meet for one class period per week and two 2-hour lab periods. Initially students brainstorm ideas and identify the project to be pursued. They then acquire biological data and generate robotic designs. Both are further developed during team meetings and reports. Final oral reports and a demonstration of the robotic device occur in week 15.

Offered as BIOL 377, EMAE 377, BIOL 477, and EMAE 477.

BIOL 468. Topics in Evolutionary Biology (3)
The focus for this course on a special topic of interest in evolutionary biology will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution, ANAT/ANTH/GEOL/PHIL 467/BIOL 468 will require a longer, more sophisticated term paper, and additional class presentation.

Offered as ANTH 367, BIOL 368, GEOL 367, PHIL 367, ANAT 467, ANTH 467, BIOL 468, GEOL 467, and PHIL 467.

BIOL 473. Introduction to Neurobiology (3)
How nervous systems control behavior. Biophysical, biochemical, and molecular biological proper-
ties of nerve cells, their organization into circuitry, and their function within networks. Emphasis on quantitative methods for modeling neurons and networks, and on critical analysis of the contemporary technical literature in the neurosciences. Term paper required for graduate students. Offered as BIOL 373, BIOL 473, and NEUR 473.

BIOL 474. Neurobiology of Behavior (3)
In this course, students will examine how neurobiologists interested in animal behavior study the linkage between neural circuitry and complex behavior. Various vertebrate and invertebrate systems will be considered. Several exercises will be used in this endeavor. Although some lectures will provide background and context on specific neural systems, the emphasis of the course will be on classroom discussion of specific journal articles. In addition, students will each complete a project in which they will observe animal behavior and generate both behavioral and neurobiological hypotheses related to it. In lieu of examinations, students will complete three written assignments, including a theoretical grant proposal, a one-page Specific Aims paper related to the project, and a final project paper. These assignments are designed to give each student experience in writing biologically-relevant documents. Classroom discussions will help students understand the content and format of each type document. They will also present their projects orally to the entire class. Recommended preparation: BIOL 216. Offered as BIOL 374, BIOL 474, and NEUR 474.

BIOL 476. Neurobiology Laboratory (3)
Introduction to the basic laboratory techniques of neurobiology. Intracellular and extracellular recording techniques, forms of synaptic plasticity, patch clamping, immunohistochemistry and confocal microscopy. During the latter weeks of the course students will be given the opportunity to conduct an independent project. One laboratory and one discussion session per week. Recommended preparation for BIOL 476 and NEUR 476: BIOL 216. Offered as BIOL 376, BIOL 476 and NEUR 476.

BIOL 477. The Dynamics of Adaptive Behavior (3)
Introduction to embodied, situated, and dynamical approaches to the design and analysis of autonomous agents and animals. Topics include recurrent neural networks, coupled neural/body/environment systems, and evolution and analysis of neural circuits. Behavior studied include examples from motor control, perception, learning, and cognition. Recommended preparation: ENGR 131 and MATH 224. Offered as BIOL 477 and EEC 477.

BIOL 478. Computational Neuroscience (3)
Computer simulations and mathematical analysis of neurons and neural circuits, and the computational properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course introduces students to dynamical systems theory for the analysis of neurons and neural learning, models of brain systems, and their relationship to artificial and neural networks. Term project required. Students enrolled in MATH 478 will make arrangements with the instructor to attend additional lectures and complete additional assignments addressing mathematical topics related to the course. Recommended preparation: MATH 223 and MATH 224 or BIOL 300 and BIOL 306. Offered as BIOL 378, COGS 378, MATH 378, BIOL 478, EBME 478, EEC 478, MATH 478 and NEUR 478.

BIOL 479. Seminar in Computational Neuroscience (3)
Readings and discussion in the recent literature on computational neuroscience, adaptive behavior, and other current topics. Offered as BIOL 479, EBME 479, EEC 479, and NEUR 479.

BIOL 480. Physiology of Organ Systems (3)
This course presents an advanced introduction to the fundamental physiological principles governing the major organ systems in mammals. The function of the nervous, endocrine, digestive, muscular, circulatory, respiratory, and urinary systems are discussed. At the conclusion of the semester, integrative aspects of the major organ systems will be illustrated through consideration of exercise and high altitude physiology. Offered as BIOL 480 and PH 480.

BIOL 482. Drugs, Brain, and Behavior (3)
This course is concerned with the mechanisms underlying neurochemical signaling and the impact of drugs on those mechanisms. The first half of the course emphasizes understanding the neural substrates of disorders of the nervous system, and the mechanisms underlying the therapeutic effects of drugs at the cellular and behavioral levels. This course will consist of lectures designed to give the student necessary background for understanding these basic principles and class discussion. The class discussion will include viewing video examples of behavioral effects of disorders of the nervous system, and analysis of research papers. The goal of the class discussions is to enhance the critical thinking skills of the student and expose the student to contemporary research techniques. Offered as BIOL 382, BIOL 482, and NEUR 482.

BIOL 491. Contemporary Biology and Biotechnology for Innovation I (3)
The first half of a two-semester sequence providing an understanding of biology as a basis for successfully launching new high-tech ventures. The course will examine physical limitations to present technologies and the use of biology to identify potential opportunities for new venture creation. The course will provide experience in using biology in both identification of incremental improvements and as the basis for alternative technologies. Case studies will be used to illustrate recent commercially successful (and unsuccessful) biotechnology-based venture creation and will illustrate characteristics for success.

BIOL 492. Contemporary Biology and Biotechnology for Innovation II (3)
Continuation of BIOL 491 with an emphasis on current and prospective opportunities for Biotechnology Entrepreneurship. Longer term opportunities for Biotechnology Entrepreneurship in emerging areas including (but not limited to) applications of DNA sequence information in medicine and agriculture; energy and the environment; biologically-inspired robots. Recommended preparation: BIOL 491 or consent of department.

BIOL 493. Feasibility and Technology Analysis (3)
This course provides the tools scientists need to determine whether a technology is ready for commercialization. These tools include (but are not limited to) financial analysis, market analysis, industry analysis, technology analysis, intellectual property protection, the entrepreneurial process and culture, an introduction to entrepreneurial strategy and new venture financing. Deliverables will include a technology feasibility analysis on a possible application in the student’s scientific area. Offered as BIOL 493, CHEM 493, and PHYS 493.

BIOL 494. Seminar in Evolutionary Biology (3)
This seminar investigates 20th-century evolutionary theory, especially the Modern Evolutionary synthesis and subsequent expansions of and challenges to that synthesis. The course encompasses the multidisciplinary nature of the science of evolution, demonstrating how disciplinary background influences practitioners’ conceptualizations of pattern and process. This course emphasizes practical writing and research skills, including formulation of testable theses, grant proposal techniques, and the implementation of original research using the facilities on campus and at the Cleveland Museum of Natural History. Offered as ANTH 394, BIOL 394, GEOL 394, HSTY 394, PHIL 394, BIOL 494, GEOL 494, HSTY 494, and PHIL 494.

BIOL 530. Seminar in the Rhizosphere (1–2)
The rhizosphere is the dynamic zone of soil that surrounds plant roots. Chemical and physical processes in the rhizosphere are controlled by the interaction between plants and a diverse soil microbiota. This graduate-level seminar course will explore these processes and interactions as they affect nutrient cycling and the fertility of natural systems. Each week one student will present and lead the discussion on a seminal or current key scientific article dealing with one of the following general topics: Rhizosphere biogeochemistry, diversity and function of the rhizosphere biota, in-
teraction of organisms inhabiting the rhizosphere, influence of rhizospheric processes in plant fitness and ecosystem function.

**BIOL 531. Seminar in Experimental Ecology (1–3)**

**BIOL 536. Seminar in Great Lakes Issues (1–3)**

BIOL 536. Seminar in Great Lakes Issues (1–3)

Selected topics related to Great Lakes basin studies: research problems, scientific processes, classic research papers, current events, policy issues, and legislative initiatives. Course content will vary depending on interests of students and faculty. Offered as BIOL 536 and GEOL 536.

**BIOL 541. Topics in Integrative Biology (1–3)**

The goal of this course is to encourage graduate students to think about any question in biology from a broad-based perspective, focusing on the integration of three major themes: 1) evolution and its effects, 2) the cellular basis of life, and 3) systems level control. Each semester, the course may focus on a different topic, but it will be examined from the perspectives of these three focus areas. One faculty instructor with strength in each of these areas will present a few introductory lectures to provide the class with a basic understanding of the topic as it is studied in their area. Then, each student will research a subject covered that semester and develop and present this subject to the class with an explicit evolutionary, cellular or systems level approach. Students will be graded on the quality of their presentations and the overall level of their participation in class.

**BIOL 550C. Seminar: Experimental Biology (1–3)**

**BIOL 552. Seminar in Developmental Biology (1–3)**

Topics pertaining to the field of development, such as regeneration and induction, which address both vertebrate and invertebrate forms.

**BIOL 561. Statistical Methods for Scientific Research (3)**

This course will introduce students to traditional and novel statistical methods useful for experimental scientists. The emphasis will be on understanding theory and techniques that are used in research. We shall consider problems from astronomy, biology and particle-astro physics. The course will also cover topics of interest to engineers. Current collaborative research problems of the instructor will motivate some of the advanced statistical techniques. Topics to be covered include: Measuring uncertainty and probability distributions (low and high dimensional); point and interval estimation; curve fitting; likelihood and score type tests required for an experiment; posterior probabilities; dealing with small samples (which arise in search experiments); over- and under-coverage using confidence belts; and Monte Carlo simulation methods for planning experiments and evaluating the statistical significance of the results. “GGobi” and “R” open source software will be used for visualization (via dynamic and interactive graphics) and exploring high-dimensional data. Offered as BIOL 561 and PHYS 561.

**BIOL 569. Advanced Seminar in Developmental Biology (1–3)**

Participants prepare and present seminars on subjects of contemporary interest and importance in developmental biology.

**BIOL 599. Advanced Independent Study for Graduate Students (1–3)**

Independent study of advanced topics in biology under the supervision of a biology faculty member. Registration requires submission of a proposal for a project or study and approval of the department.

**BIOL 601. Research (1–9)**

**BIOL 651. Thesis M.S. (1–9)**

**BIOL 701. Dissertation Ph.D. (1–9)**

**BIOL 801. Biotechnology Workshop (2)**

The course will cover the topics of DNA structure and isolation, restriction enzyme digests, the fractionation of DNA by gel electrophoresis, Southern blotting, hybridization and the nature of restriction fragment length polymorphisms, the cloning of DNA in various vectors and the identification of recombinant molecules, the use of the polymerase chain reaction to amplify DNA and its use in DNA fingerprinting. The ethical issues arising from the implementation of recombinant DNA technology and the advances in the human genome project will also form part of the course. The laboratory exercises include DNA extraction from pea seeds, digestion with restriction enzymes and gel electrophoresis followed by Southern blotting and hybridization. A fragment of bacteriophage lambda will be cloned in a plasmid vector and recombinant molecules isolated. A fingerprint of the participants’ own DNA will be developed using the polymerase chain reaction.

**BIOL 802. Terrestrial and Aquatic Ecology for High School Teachers (2)**

A 2-week summer ecology course to take place at the Case Western Reserve Farm in Hunting Valley, OH. It is designed for teachers of grades 6-12 in both public and private schools who have an interest in current ecological problems. Participants will learn field sampling techniques and identification of a diversity of living organisms, both plant and animal. They will study the distribution and abundance of terrestrial and aquatic organisms. Field work in the varied habitats of Case Western Reserve University Farm will be an integral part of the program. Data will be analyzed and interpreted using personal computers. Participants will receive supplies, field guides, and detailed laboratory exercises that are designed specifically for the classroom. The course will be offered during the last two weeks of June and is limited to 12 participants.

**BIOL 803. Autonomous Robotics for High School Science Teachers (2)**

A 2-week, 10-day summer course in designing, building, and programming computer-controlled robots which are able to function autonomously in complex, real-world environments. LEGO Technology components are used for sensory integration and behavioral control. Participants work in groups of two per workstation. Detailed written documentation and laboratory exercises will be provided. Topics include: mechanical design with LEGO, sensors and feedback control, C programming, multi-tasking control strategies, and an end-of-course robot competition. Eligibility: high school (grades 9-12) science teachers; those in the biological sciences preferred. Limit 10.

**DEPARTMENT OF CHEMISTRY**

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www.case.edu/artssci/chem
Phone: 216-368-3620; Fax: 216-368-3006
Mary D. Barkley, Chair
E-mail: mary.barkley@case.edu

The Department of Chemistry is the largest department representing the chemical sciences at Case Western Reserve University. It consists of 21 faculty members, 11 associated faculty, 10 postdoctoral associates, about 80 graduate students, and over 100 undergraduate students majoring in chemistry. The department offers undergraduate and graduate degree programs leading to the Bachelor of Arts, Bachelor of Science, Master of Science, and Doctor of Philosophy.

The general focus of chemistry is on (1) understanding the basic properties of matter, and (2) employing this knowledge in the design, synthesis, and characterization of materials with novel and useful properties. The various degree programs strive to develop all aspects of the student’s chemical knowledge through a broad range of lecture and laboratory courses.

Chemical research is an integral part of the department’s activities; over $3 million of federal, state, and private research support flows into the department each year. State-of-the-art research facilities are available to both graduate and undergraduate students. Undergraduates are encouraged to participate in research projects with individual faculty members in order to expand their hands-on training, problem-solving skills, and understanding of the scientific method as applied.
in chemical research. These research projects typically involve interchange and collaboration across all levels of experience and may also involve scientists from other departments and institutions.

Chemistry is often referred to as "the central science" because of its key role in interdisciplinary studies. Correspondingly, a degree in chemistry affords a broad range of employment opportunities. Chemists can direct their talents to specialized problems of applied research, or they can choose to delve into fundamental investigations. A degree in chemistry can cover the spectrum of chemical specialties, from biochemistry to interstellar chemistry. The degree also provides valuable preparation for other professions, such as medicine, dentistry, and law.

The American Chemical Society, with more than 160,000 members, is the major professional society in the United States for practicing chemists. Both undergraduate and graduate students may join the society.

DEPARTMENT FACULTY

Mary D. Barkley, Ph.D.
(University of California, San Diego)
M. Roger Clapp University Professor of Arts & Sciences and Chair
Biophysical chemistry; fluorescence spectroscopy; tryptophan fluorescence; HIV reverse transcriptase

Alfred B. Anderson, Ph.D.
(Johns Hopkins University)
Professor
Pure and applied theoretical chemistry: surface science, catalysis, electrocatalysis and properties of doped diamond

Clemens Burda, Ph.D.
(University of Basel, Switzerland)
Associate Professor
Physical chemistry of nanostructures; molecular electronics; femtosecond laser spectroscopy

James D. Burgess, Ph.D.
(Virginia Commonwealth University)
Associate Professor
Physical chemistry of platinum-based anticancer drugs; electrode-supported bilayer membranes; electron transfer enzymes

Carlos E. Crespo Hernández, Ph.D.
(University of Puerto Rico)
Assistant Professor
Ultrafast spectroscopy; organic photochemistry and photophysics; environmental chemistry; computational chemistry

Robert C. Dunbar, Ph.D.
(Stanford University)
Professor
Gas phase ions and ion-neutral interactions: ion-molecular reaction kinetics, computational chemistry

Thomas G. Gray, Ph.D.
(Harvard University)
Frank Hovorka Assistant Professor of Chemistry
Inorganic and organometallic chemistry; metalloclusters as nanorods; biomineralization scaffolds; luminescence imaging agents

Malcolm E. Kenney, Ph.D.
(Cornell University)
Hurlbut Professor of Chemistry
Photodynamic therapy; porphyrin-like compounds; organosilicon compounds; flue gas desulfurization

Michael J. Kenney, Ph.D.
(Iowa State University)
Senior Instructor and John Teagle Professorial Fellow in Chemistry
Chemical education

Irene Lee, Ph.D.
(Pennsylvania State University)
Associate Professor
Biochemistry; enzymology

Anthony J. Pearson, Ph.D.
(University of Aston, Birmingham, England)
Rudolph and Susan Rense Professor of Chemistry
Natural products; organometallics; organic synthesis

John D. Protasiewicz, Ph.D.
(Cornell University)
Professor and Associate Chair
Inorganic chemistry; organometallic reaction mechanisms; catalyzed oxidations

Robert G. Salomon, Ph.D.
(University of Wisconsin, Madison)
Professor
Chemical biology; lipid oxidation and disease; organic synthesis and reaction mechanisms

Genevieve Sauve, Ph.D.
(California Institute of Technology)
Assistant Professor
Organic electronics; alternative energy; synthesis of polymers and inorganic complexes; transistor and solar cell devices

Lawrence M. Sayre, Ph.D.
(University of California, Berkeley)
Frank Hovorka Professor of Chemistry
Bioorganic and bioinorganic chemistry; redox enzyme mechanisms; protein oxidation/ modification; lipid oxidation; neurotoxicology

Daniel A. Scherson, Ph.D.
(University of California, Davis)
Charles Frederic Mabery Professor of Research in Chemistry
Electrochemistry; electrode kinetics; electrocatalysis; in-situ spectroscopic methods in electrochemistry

John E. Stuehr, Ph.D.
(Case Western Reserve University)
Professor
Physical chemistry, chemical education

Gregory P. Tochtrop, Ph.D.
(Washington University Medical School)
Assistant Professor
Chemical biology: microarrays; biosynthesis and biomimetic synthesis; total synthesis of natural products

Michael G. Zagorski, Ph.D.
(Case Western Reserve University)
Professor
Organic chemistry; nuclear magnetic resonance; structure of peptides

Secondary Faculty

Paul Carey, Ph.D.
(University of Sussex, UK)
Professor of Biochemistry, School of Medicine
Raman spectroscopy; proteins and protein-ligand interactions

John W. Crabb, Ph.D.
(University of Kansas Medical Center)
Professor of Molecular Medicine
Clinic Lerner College of Medicine, Case Western Reserve University
Proteomics of the visual cycle and age-related ocular diseases

Thomas Gerken, Ph.D.
(Case Western Reserve University)
Professor of Pediatrics, School of Medicine
Biochemistry of glycoproteins; NMR

Thomas Kelley, Ph.D.
(University of Notre Dame)
Associate Professor of Pediatrics, School of Medicine
Biochemistry; cell signaling and cholesterol processing in cystic fibrosis

238 CASE WESTERN RESERVE UNIVERSITY
John J. Mieyal, Ph.D.
(Case Western Reserve University)
Professor of Pharmacology, School of Medicine
Reactive oxygen species and sulfur biochemistry; enzymatic reaction mechanisms of intracellular sulfhydryl homeostasis and redox signal transduction

Stuart J. Rowan, Ph.D.
(University of Glasgow, UK)
Professor of Macromolecular Science and Engineering, Case School of Engineering
Synthetic chemistry; supramolecular polymerization; reversible “dynamic” chemistry; chemical sensors; biomaterials; nanotechnology

Witold K. Szurewicz, Ph.D.
(University of Lodz, Poland)
Professor of Physiology and Biophysics, School of Medicine
Protein aggregation and the pathogenesis of aging-related diseases; prion protein; protein folding and protein-membrane interaction

Yannning Wang, Ph.D.
(ETH Zürich, Switzerland)
Associate Professor of Radiology; Director of Radiopharmaceutical Division, Case Center for Imaging Research, School of Medicine
Organic synthesis; molecular probes for in vivo imaging

Christoph Weder, Dr. sc. nat.
(ETH Zürich, Switzerland)
F. Alex Nason Professor of Macromolecular Science and Engineering, Case School of Engineering
Design, synthesis, structure-property relationships, and application of novel functional polymers; polymers for advanced optic and electronic applications; stimuli-responsive polymers; supramolecular chemistry

Adjunct Faculty
M. Cather Simpson, Ph.D.
(University of New Mexico)
Senior Lecturer in Chemistry and Physics; Associate Director, Dan Wallis Centre for Pure and Applied Optics, University of Auckland, New Zealand
Biophysical chemistry; spectroscopic studies of biologically significant processes

FACILITIES
The department’s facilities for experimental and theoretical research are modern and extensive. They include diverse major instruments for use by faculty and students, as well as specialized equipment serving individual research groups. Shared instrumentation includes 400- and 600-MHz NMR spectrometers, ultrahast laser systems in the Center for Chemical Dynamics, and a cyber-enabled x-ray crystallographic facility.

Other departmental instrumentation includes equipment for laser Raman spectroscopy, GC-MS and LC-MS/MS mass spectrometers, stopped-flow kinetics instrumentation, a circular dichroism spectrometer, an analytical ultracentrifuge, and equipment for electrochemical measurements. Access to very high-field NMR instrumentation is available on campus at the Cleveland Center for Structural Biology (CCSB), which is equipped with numerous 500- to 900-MHz NMR spectrometers for solution and solid-state measurements. The chemistry department’s computers are part of the campus-wide fiber optic communications network operated by Information Technology Services, and the entire University Circle area offers wireless access. In addition to the full complement of software, Internet, and library database services offered by the university, connections to off-site databases, such as SciFinder and Ohio Supercomputer Center, are available to departmental users.

The department uses some of the foremost equipment available in high-resolution nuclear magnetic resonance spectroscopy and in tunable laser spectroscopy. Work on various aspects of chemistry as studied by these techniques is recognized throughout the world.

UNDERGRADUATE PROGRAMS

Majors
The Department of Chemistry offers two curricula for undergraduate chemistry majors, leading to a Bachelor of Science (B.S.) or Bachelor of Arts (B.A.) degree.

BACHELOR OF SCIENCE PROGRAM
The B.S. program is designed for students who seek professional careers in the chemical sciences and is certified by the American Chemical Society. The B.S. curriculum provides a rigorous background in chemistry, yet offers considerable flexibility in the senior year in the choice of electives, allowing B.S. majors to pursue areas of chemistry of particular interest to them in greater depth. At least three credit hours of research (CHEM 397/398) are required and up to nine hours of research may be credited toward the degree. B.S. majors who plan to go on to graduate study may elect to take advanced courses in inorganic chemistry (CHEM 412, 413), organic chemistry (CHEM 421, 422, 435), physical chemistry (CHEM 406, 407, 446), or other graduate offerings. Interdisciplinary strengths can be achieved by selecting technical electives in biochemistry, biomedical engineering, chemical engineering, macromolecular science, and materials science as well as in biology, geological sciences, mathematics, physics, and statistics.

BACHELOR OF ARTS PROGRAM
The B.A. program is intended for pre-professional students who plan careers in medicine, dentistry, veterinary medicine, and pharmacy or in other fields for which a baccalaureate degree in chemistry provides appropriate training. B.A. majors may supplement their required courses with additional chemistry courses or may utilize the curriculum’s flexibility to develop an interdisciplinary program of their choice. Many B.A. majors participate in undergraduate research within the Department of Chemistry (CHEM 397/398) or in other science departments, including those in the medical school.

Departmental Honors
Chemistry majors who have excellent academic records may participate in the Honors in Chemistry program. To graduate with honors in chemistry, a student must satisfy the following requirements:

1. A combined grade point average of 3.50 in chemistry, physics, and mathematics and an overall grade point average of 3.20
2. A minimum of six credit hours of CHEM 397, or chemical research done under another course number with departmental approval
3. A thesis approved by the department’s undergraduate affairs committee based on the level of research, quality of the manuscript, and chemical content

Teacher Licensure in Physical Science (Chemistry and Physics)
An option is available within the B.A. program for students to become eligible for licensure as teachers of physical science (chemistry and physics) in secondary schools (grades 9–12). Students interested in this option should contact Professor Michael Kenney. A total of 57 credit hours in the subject area are required for teacher licensure, as well as a 35-hour sequence in professional education (including...
student teaching) taken here and at John Carroll University. For more information, see the program description for Teacher Licensure elsewhere in this bulletin.

Subject area requirements for students majoring in chemistry:
ASTR 201 or BIOL 101 or GEOL 110; PHYS 121, 122, 196, 221; CHEM 105, 106, 113, 223, 224 (or 323, 324); PHYS 331; ENGR 131; MATH 125, 126; CHEM 301, 302, 304, 305, PHYS 310, 324; PHYS 315 or 316.

Course requirements for students majoring in physics and seeking physical science teacher licensure are listed under the Department of Physics.

Minor
Students may complete a minor in chemistry, defined as one year of freshman chemistry (including laboratory); two additional three-hour lecture courses; and two additional laboratory or approved courses. A recommended sequence would include CHEM 105, 106, and 113; CHEM 223, 224 or 323, 324; and CHEM 233, 234. Other sequences may be followed after consultation with the Department of Chemistry.

GRADUATE PROGRAMS

Master of Science Programs
The M.S. degree in chemistry may be obtained by completing (1) a program that includes the preparation of a master’s thesis, or (2) a program involving only course work. Both programs require a minimum of 27 credit hours, of which up to six credit hours may be for the master’s thesis. Course work for the master’s degree may be taken on a part-time basis, but thesis research can be undertaken only by full-time graduate students. Thus, only the master’s degree without thesis can be earned entirely on a part-time basis.

The Science and Technology Entrepreneurship Program (STEP) is a three- or four-semester professional M.S. degree offered in chemistry as well as in biotechnology, mathematics, statistics, and physics. Students enter the Chemistry Entrepreneurship program with a bachelor’s, master’s, or Ph.D. degree in a chemistry-related field. The program consists of advanced courses in chemistry, business, and technology innovation and an entrepreneurial project with technical content in an existing company or new venture.

Doctor of Philosophy Program
The Ph.D. degree in chemistry is granted to those students who have shown an extensive knowledge of advanced chemistry and the ability to do original research. The program usually requires four years of full-time study after the bachelor’s degree. Besides advanced courses, the program consists of cumulative and oral examinations, seminars and colloquia, and an original research project. At least twelve months must be spent in residence on campus while fulfilling the Ph.D. thesis research requirement.

Full-time graduate students who maintain satisfactory academic performance while pursuing the Ph.D. degree in chemistry normally receive a stipend for teaching and/or research, which includes full tuition and a monthly amount sufficient to cover living expenses.

RESEARCH
The Department of Chemistry is noted for research programs in chemical biology and energy. These range from synthetic studies of important bioactive substances, including antibiotics and DNA-binding substances, to a detailed examination of the surface properties of materials used in batteries and electrolytic cells. Studies are being performed with molecules as simple as oxygen and as complicated as those which describe the active centers of enzymes or the protein core of insoluble aggregates which deposit in neurodegenerative disease. Efforts are being made to understand the basic chemical properties leading to reactive mediators generated from physiological lipids. Other research is aimed at developing new drugs for photodynamic therapy and at understanding the mechanism of action of drugs for antiretroviral therapy. The influence of metal ions in modifying reactivity is a common interest of several members of the faculty, as is the development of organometallic compounds for materials and catalysis. Chemical surfaces are being studied, as are various applications of nanoparticles, from cells to the environment. Studies designed to characterize electrode-electrolyte interfaces, the electrochemical properties of new semiconductors, and single-cell microelectrodes are also ongoing. These efforts are complemented by theoretical studies on the interfacial structure and bonding of composite materials.

Case Western Reserve University ranks among the leading universities internationally in its strengths in electrochemistry and has brought these strengths together in the Yeager Center for Electrochemical Studies (YCES). The interdisciplinary nature of electrochemistry involves the interaction of electrochemists in the chemistry and chemical engineering departments with metallurgists, surface physicists, inorganic and organic chemists, polymer membrane chemists, and electrical engineers. Such interactions, lacking on most campuses, are promoted at Case Western Reserve University through YCES. Graduate students in the chemistry department have the opportunity to specialize in the area of electrochemistry with one of the most extensive course and research programs in the United States.

COLLOQUIA AND SEMINARS
The department sponsors a rich program of colloquia and seminars on recent advances in chemical research. Most notable among these is the Frontiers in Chemistry Lecture Series, in which scientists of international distinction lecture on major discoveries and developments in chemistry. In addition, a weekly colloquium series provides lectures by invited speakers in a variety of fields of chemical investigation. Both of these programs are addressed to an audience of faculty, graduate students, and other chemical scientists in the university and the Cleveland area, and are a vital means to broaden current knowledge. Numerous other seminars and meetings are held on a more specialized and informal level. Most individual research groups conduct weekly discussions to evaluate their progress.

COURSE DESCRIPTIONS

CHEM 105. Principles of Chemistry I (3)
Atomic structure; thermochemistry; periodicity; bonding and molecular structure; intermolecular forces; properties of solids; liquids, gases and solutions. Recommended preparation: One year of high school chemistry.

CHEM 106. Principles of Chemistry II (3)
Thermodynamics; chemical equilibrium; acid/base chemistry; oxidation and reduction; kinetics; spectroscopy; introduction to nuclear, organic, inorganic, and polymer chemistry. Prereq: CHEM 105 or equivalent.

CHEM 111. Principles of Chemistry for Engineers (4)
A first course in University Chemistry emphasizing chemistry of materials for engineering students. Atomic theory and quantitative relationships; gas laws and kinetic theory; solutions, acid-base properties and pH; thermodynamics and equilibrium; kinetics, catalysis, and mechanisms; molecular structure and bonding. Recommended preparation: One year of high school chemistry or permis-
CHEM 113. Principles of Chemistry Laboratory (2)
A one semester laboratory based on quantitative chemical measurements. Experiments include analysis, synthesis and characterization, thermochromy and chemical kinetics. Computer analysis of data is a key part of all experiments. Prerequisite or Corequisite: CHEM 105 or CHEM 106 or CHEM 111 or ENGR 145.

CHEM 114. Chemistry Frontiers Laboratory (2)
An introduction to laboratory techniques and computer-based methods for chemical research for the chemistry major. Scientific information databases, structural chemistry, experimental design and data handling, chemical synthesis and characterization. Prerequisite: CHEM 105 or CHEM 111, and CHEM 113. Corequisite: CHEM 106.

CHEM 223. Introductory Organic Chemistry I (3)
Introductory course for science majors and engineering students. Develops themes of structure and bonding along with elementary reaction mechanisms. Includes treatment of hydrocarbons, alkyl halides, alcohols, and ethers as well as an introduction to spectroscopy. Prerequisite: CHEM 106 or CHEM 111.

CHEM 224. Introductory Organic Chemistry II (3)
Continues and extends themes of structure and bonding from CHEM 223 and continues spectroscopy and more complex reaction mechanisms. Includes treatment of aromatic rings, carbonyl compounds, amines, and selected special topics. Prerequisite: CHEM 223 or CHEM 323.

CHEM 233. Introductory Organic Chemistry Laboratory I (2)
An introductory organic laboratory course emphasizing microscale operations. Synthesis and purification of organic compounds, isolation of natural products, and systematic identification of organic compounds by physical and chemical methods. Prerequisite: CHEM 106 or CHEM 111 and CHEM 113 or equivalent. Corequisite: CHEM 223 or CHEM 323.

CHEM 234. Introductory Organic Chemistry Laboratory II (2)
A continuation of CHEM 233, involving multistep organic synthesis, peptide synthesis, product purification and analysis using sophisticated analytical techniques such as chromatography and magnetic resonance spectroscopy. Prerequisite: CHEM 233. Corequisite: CHEM 224.

CHEM 290. Chemical Laboratory Methods for Engineers (3)
Techniques of chemical synthesis, analysis, and characterization. Uses students’ backgrounds in general and organic chemistry, but requires no background in chemical laboratory operations. Prerequisite or Corequisite: CHEM 223 or CHEM 323.

CHEM 301. Introductory Physical Chemistry Laboratory I (3)
First of a two-semester sequence covering principles and applications of physical chemistry, intended for chemistry and engineering majors and other students having primary interests in biochemical, biological or life-sciences areas. States and properties of matter. Thermodynamics and its application to chemical and biochemical systems. Chemical equilibrium. Electrochemistry. Recommended preparation: a year each of physics and calculus, preferably including partial derivatives. Prerequisite: CHEM 106 or equivalent.

CHEM 302. Introductory Physical Chemistry II (3)
Continuation of CHEM 301. Chemical kinetics and catalysis. Introductory quantum chemistry. Spectroscopy. Statistical thermodynamics. Prerequisite: CHEM 301 or CHEM 335.

CHEM 304. Quantitative Analytical Chemistry (4)
A one-semester laboratory course involving quantitative chemical measurements, error analysis and advanced concepts in ionic equilibria. Electrogravimetric and volumetric analysis; separation techniques, metal complexation. Basic chemical instrumentation. Prerequisite: CHEM 106 and CHEM 113.

CHEM 305. Introductory Physical Chemistry Laboratory (3)
A one-semester laboratory course focusing on the principles and quantitative characterization of chemical and biochemical systems. Experiments include, chemical equilibrium kinetics, spectroscopy, and the use of computers for the statistical analysis of experimental data. Seminar discussions and disciplinary writing of results. Prerequisite: CHEM 301 and CHEM 304 or CHEM 335. Or Prerequisite or Corequisite: CHEM 302 or CHEM 336. SAGES Dept Seminar.

CHEM 310. Instrumental Analytical Chemistry (3)
Principles and applications of analytical instrumentation including optical spectroscopy (UV-vis, IR, Raman), photoelectron and ion bombardment spectrometry, NMR and magnetic resonance imaging. Recommended preparation for CHEM 410: Two semesters of undergraduate physical chemistry. Offered as CHEM 310 and CHEM 410. Prerequisite: CHEM 301 and CHEM 302 or CHEM 335 and CHEM 336.

CHEM 311. Inorganic Chemistry I (3)
Fundamentals of inorganic chemistry. Topics include molecular structure, molecular shape and symmetry, structure of solids, d-metal complexes, oxidation and reduction, and acids and bases. Prerequisite or Corequisite: CHEM 301 or CHEM 335.

CHEM 312. Inorganic Chemistry II (3)
Continuation of CHEM 311. Fundamentals of inorganic chemistry. Topics include electronic spectra of complexes, structures and properties of solids, organometallic compounds, and descriptive chemistry of representative elements. Prerequisite: CHEM 311.

CHEM 322. Laboratory Methods in Organic Chemistry (3)
Experimental approach to the synthesis, purification and characterization of organic compounds. Nuclear magnetic resonance (NMR) and infrared (IR) spectroscopies; chromatographic techniques. Prerequisite: CHEM 304 and CHEM 223 or CHEM 323. Prerequisite or Corequisite: CHEM 224 or CHEM 324.

CHEM 323. Organic Chemistry I (3)
Relationships between molecular structure and chemical reactivity and development of sophisticated problem-solving skills in the context of organic reaction mechanisms and multi-step synthesis. Homolytic and heterolytic substitution, elimination, oxidation and reduction reactions; topics in stereochemistry and spectroscopy. Recommended for chemistry, biochemistry, and related majors. Prerequisite: CHEM 106 or equivalent.

CHEM 324. Organic Chemistry II (3)
Continuation of CHEM 323. Introduces the chemistry of carbylons, aromatic and amino functional groups, and develops the concepts of conjugation and resonance, molecular orbital theory and pericyclic reactions. Prerequisite: CHEM 223 or CHEM 323.

CHEM 325. Physical Methods for Determining Organic Structure (3)
Structure determination of organic compounds using mass spectrometry and modern instrumental techniques such as infrared, ultraviolet, visible, and nuclear magnetic resonance spectroscopy. Recommended preparation: Two semesters of organic chemistry. Offered as CHEM 325 and CHEM 425.

CHEM 328. Introductory Biochemistry (3)
A survey of biochemistry with a strong emphasis on the chemical logic underlying metabolic pathways and the evolution of biomolecules. Cellular architecture. Amino acids and protein structure, purification, analysis, and synthesis. DNA, RNA, the flow of genetic information, and molecular biological technology. Enzyme kinetics, catalysis, and regulatory strategies. Sugars, complex carbohydrates, and glycoproteins. Lipids and cell membranes. Glycolysis, gluconeogenesis, carbon fixation through the “dark reactions” of photosynthesis, aerobic catabolism through the citric acid cycle, and glycogen metabolism. Biosynthesis and degradation of fatty acids, amino acids, and pro-
and states of molecules. Perturbation theory, spectroscopy.

CHEM 337. Quantum Mechanics I (3)

CHEM 395. Chemistry Colloquium Series (1)
Course content provided by Thursday chemistry Department colloquia (or Frontiers in Chemistry lectures). Discussion sessions review previous lectures and lay foundation for forthcoming lectures.

CHEM 397. Undergraduate Research (1–6)
Independent research project within a research group in the chemistry department or, by petition, within a research group in another Case Western Reserve department. Arrangements should be made with the faculty member selected and the Senior Capstone Committee of the chemistry department. Open to all chemistry majors and other qualified students; required for Honors in Chemistry. A written report is required each semester.

CHEM 398. Undergraduate Research/Senior Capstone Project (3–6)
Independent research project within a research group in the chemistry department or, by petition, within a research group in another Case Western Reserve department. Arrangements should be made with the faculty member selected and the Senior Capstone Committee of the chemistry department. Open to all chemistry majors and other qualified students. Satisfies the research requirement for Honors in Chemistry. A written report and public oral presentations are required.

CHEM 406. Chemical Kinetics (3)
Theory and characterization of chemical rate processes. Recommended preparation: Two semesters of undergraduate physical chemistry.

CHEM 407. Chemical Thermodynamics (3)
Thermodynamics and statistical thermodynamics and their application to chemical problems. Recommended preparation: Two semesters of undergraduate physical chemistry.

CHEM 408. Advanced Physical Chemistry (3)
Topics in physical chemistry, intended for entering graduate students, giving background tools appropriate for graduate research in areas of chemistry other than physical chemistry. Illustrations from the contemporary chemical research literature will be emphasized. Thermodynamics and statistical mechanics, quantum chemistry and computation, spectroscopy, and chemical kinetics and dynamics. Recommended preparation: One year of undergraduate physical chemistry.

CHEM 410. Instrumental Analytical Chemistry (3)
Principles and applications of analytical instrumentation including optical spectroscopy (UV-vis, IR, Raman), photoelectron and ion bombardment spectrometry. NMR and magnetic resonance imaging. Recommended preparation for CHEM 410: Two semesters of undergraduate physical chemistry.

CHEM 411. Advanced Physical Chemistry I (3)
Chemistry of inorganic systems. Spectroscopy, magnetism, and stereochemistry of transition metal compounds. Recommended preparation: One semester of undergraduate inorganic chemistry and two semesters of physical chemistry.

CHEM 412. Advanced Inorganic Chemistry II (3)
Topics in mechanisms of inorganic reactions including ligand substitution, electron transfer, stereochemical interconversions, and catalytic pathways: supramolecular inorganic complexes and molecular devices. Prereq: CHEM 412 or equivalent.

CHEM 414. Organometallic Reactions and Structures (3)
Bonding, structure, and mechanistic aspects of organometallic chemistry and the relevance of organometallic species to chemical catalysis. Recommended preparation: One semester of undergraduate inorganic chemistry.

CHEM 415. Chemical Applications of Group Theory (3)
Treatment of structure, bonding and spectroscopy in chemical systems based on a presentation of relationships and the theory of point and space groups. Prereq: CHEM 412.

CHEM 421. Advanced Organic Chemistry I (3)

CHEM 422. Advanced Organic Chemistry II (3)

Structure determination of organic compounds using mass spectrometry and modern instrumental techniques such as infrared, ultraviolet, visible, and nuclear magnetic resonance spectroscopy. Recommended preparation: Two semesters of organic chemistry. Offered as CHEM 325 and CHEM 425.

CHEM 428. Introductory Biochemistry (3)

CHEM 332. Laboratory Methods in Physical Chemistry (3)
Modern techniques of physicochemical measurement, including, kinetics, spectroscopy, and electrochemistry and the use of statistical methods for the analysis of experimental data. Seminar discussions and disciplinary writing of results. Prereq: CHEM 304. Prereq or Coreq: CHEM 336. SAGES Dept Seminar

CHEM 335. Physical Chemistry I (3)

CHEM 336. Physical Chemistry II (3)

CHEM 337. Quantum Mechanics I (3)
A survey of biochemistry with a strong emphasis on the chemical logic underlying metabolic pathways and the evolution of biomolecules. Cellular architecture. Amino acids and protein structure, purification, analysis, and synthesis. DNA, RNA, the flow of genetic information, and molecular biological technology. Enzyme kinetics, catalytic, and regulatory strategies. Sugars, complex carbohydrates, and glycoproteins. Lipids and cell membranes. Glycolysis, gluconeogenesis, carbon fixation through the "dark reactions" of photosynthesis, aerobic catabolism through the citric acid cycle, and glycogen metabolism. Biosynthesis and degradation of fatty acids, amino acids, and proteins. Recommended preparation: Two semesters of organic chemistry. One semester of physical chemistry recommended. Offered as CHEM 328 and CHEM 428.

CHEM 429. Chemical Aspects of Living Systems (3)

CHEM 446. Quantum Mechanics I (3)

CHEM 447. Quantum Mechanics II (3)
Continuation of CHEM 446. Ab initio and semi-empirical methods, configuration interactions, time dependent phenomena, and introduction to band theory of solids. Prereq: CHEM 446.

CHEM 450. Molecular Spectroscopy (3)
Translation, rotation, vibration, and electronic transitions of molecules. Prereq: CHEM 446.

CHEM 455. Protein Biophysics (3)
This course focuses on in-depth understanding of the molecular biophysics of proteins. Structural, thermodynamic and kinetic aspects of protein function and structure-function relationships will be considered at the advanced conceptual level. The application of these theoretical frameworks will be illustrated with examples from the literature and integration of biophysical knowledge with description at the cellular and systems level. The format consists of lectures, problem sets, and student presentations. A special emphasis will be placed on discussion of original publications. Offered as BIOC 455, CHEM 455, PHOL 475, PHRM 475, and NEUR 475.

CHEM 491. Modern Chemistry for Innovation I (3)
The first half of a two-semester sequence providing an understanding of chemistry as a basis for successfully launching new high-tech ventures. The course will examine physical limitations to present technologies and the use of chemistry to identify potential opportunities for new venture creation. The course will provide experience in using chemistry for both identification of incremental improvements and as the basis for alternative technologies. Case studies will be used to illustrate recent commercially successful (and unsuccessful) venture creation and will illustrate characteristics for success. Admission to this course requires consent of the department.

CHEM 492. Modern Chemistry for Innovation II (3)
Continuation of CHEM 491, with an emphasis on current and prospective opportunities for Chemistry Entrepreneurship. Longer term opportunities for Chemistry Entrepreneurship in emerging areas, including (but not be limited to) biomaterials, pharmacogenomics, biocatalysis, and drug discovery. Prereq: CHEM 491.

CHEM 493. Feasibility and Technology Analysis (3)
This course provides the tools scientists need to determine whether a technology is ready for commercialization. These tools include (but are not limited to): financial analysis, market analysis, industry analysis, technology analysis, intellectual property protection, the entrepreneurial process and culture, an introduction to entrepreneurial strategy and new venture financing. Deliverables will include a technology feasibility analysis on a possible application in the student's scientific area. Offered as BIOL 493, CHEM 493, and PHYS 493.

CHEM 501. Special Topics in Inorganic Chemistry (1–6)
(Credit as arranged.) Lectures on advanced topics in inorganic chemistry presented by staff or visiting lecturers. Course title, content, and credit change from year to year.

CHEM 502. Special Topics in Inorganic Chemistry (1–6)
(Credit as arranged.) Lectures on advanced topics in inorganic chemistry presented by staff or visiting lecturers. Course title, content, and credit change from year to year.

CHEM 503. Special Topics in Organic Chemistry (1–6)
(Credit as arranged.) Lectures on advanced topics in organic chemistry presented by staff or visiting lecturers. Course title, content, and credit change from year to year.

CHEM 504. Special Topics in Organic Chemistry (1–6)
(Credit as arranged.) Lectures on advanced topics in organic chemistry presented by staff or visiting lecturers. Course title, content, and credit change from year to year.

CHEM 505. Special Topics in Physical Chemistry (1–6)
(Credit as arranged.) Lectures on advanced topics in physical chemistry presented by staff or visiting lecturers. Course title, content, and credit change from year to year.

CHEM 506. Special Topics in Physical Chemistry (1–6)
(Credit as arranged.) Lectures on advanced topics
COLLEGE OF ARTS & SCIENCES
in physical chemistry presented by staff or visiting lecturers. Course title, content, and credit change from year to year.

CHEM 507. Special Readings in Chemistry (1–6)
Detailed study of a special topic in chemistry under the guidance of a faculty member.

CHEM 508. Special Readings in Chemistry (1–6)
Detailed study of a special topic in chemistry under the guidance of a faculty member.

CHEM 509. Special Topics in Analytical Chemistry (1–6)

CHEM 511. Electrochemistry II (3)
Selected topics from electrocatalysis, semiconductor electrochemistry and photoelectrochemistry, and electrochemical impedance methods, as well as battery and fuel cell systems. Prereq: CHEM 445.

CHEM 601. Research (1–18)
(Credit as arranged.) Special research in an area of chemistry under the guidance of a faculty member.

CHEM 605. Chemistry Colloquium Series (1)
Course content provided by Thursday chemistry department colloquia (or Frontiers in Chemistry lectures). Discussion sessions review previous lectures and lay foundation for forthcoming lectures.

CHEM 651. Thesis M.S. (1–18)
(Credit as arranged.)

CHEM 701. Dissertation Ph.D. (1–18)
(Credit as arranged.) Prereq: Predoctoral research consent or advanced Ph.D. candidacy milestone.

CHILDHOOD STUDIES PROGRAM
614A Crawfard Hall
www.case.edu/artsci/childstudies
Phone: 216-368-0540
Jill E. Korbin and Elizabeth J. Short, Directors
E-mail: jill.korbin@case.edu; elizabeth.shor@case.edu

The Childhood Studies program is an educational opportunity for undergraduate students interested in a wide array of issues concerning children and the experience of childhood. This interdisciplinary minor focuses on the life stages of infancy through adolescence and provides opportunities for student involvement in research, education, and policy, including externships with local nonprofits.

PROGRAM ADVISORY COMMITTEE
Jill E. Korbin, Ph.D., Professor of Anthropology; Co-Director, Childhood Studies Program; Director, Schubert Center for Child Studies
Elizabeth J. Short, Ph.D., Professor of Psychology; Co-Director, Childhood Studies Program; Associate Director, Schubert Center for Child Studies
Eileen Anderson-Fye, Ed.D., Assistant Professor of Anthropology; Associate Director, Schubert Center for Child Studies
Molly Irwin, M.P.H., Adjunct Lecturer in Anthropology; Director, Child Policy Initiative, Schubert Center for Child Studies

UNDERGRADUATE PROGRAMS
Minor
The undergraduate minor in childhood studies is built on a foundation in the social sciences. It is also suited, however, to students interested in exploring childhood from the perspectives of the natural sciences, the humanities, or the arts.

The minor requires a minimum of 15 hours of course work; the courses must be taken in at least two different departments. Students may count up to six of these hours toward a major in another field. If they are pursuing more than one major, they may count up to six hours toward each one.

COURSE DESCRIPTIONS

CHST 301. Child Policy (3)
This course introduces students to issues in child policy. Local, state and federal child policy will be considered, and topics will include, for example, policies related to child poverty, schooling, child welfare, and children’s physical and mental health. Students will learn how policy is developed, how research informs policy and vice versa. Recommended preparation: One social sciences course or consent. Offered as ANTH 305 and CHST 301.

CHST 302. Experiential Learning in Child Policy (3–6)
Focus on state and federal legislation impacting children, youth, and families. Course includes an experiential learning component at the state or federal level and a travel experience to either Columbus, OH or Washington, D.C. to learn firsthand how policy is formed. Students may take this course twice for credit. Offered as ANTH 307 and CHST 302. Prereq: CHST 301.

CHST 398. Child Policy Externship (3)
This course provides students with externships in child policy. These externships give students an opportunity to work directly with professionals who design and implement policies that impact the lives of children and their families. Agencies involved are active in areas such as childcare, education, juvenile justice, and physical and mental health. Students apply for the externship. Selected students are placed in a local child policy agency. An individualized learning plan is developed in consultation with the Childhood Studies Program faculty, the supervisor in the agency, and the student. This course is a 3 credit-hour course and may be taken twice for a total of 6 credit hours. Offered as ANTH 308 and CHST 398. Prereq: CHST 301.

CHST 398C. Child Policy Externship and Capstone (3)
This course provides students with externships in child policy. These externships give students an opportunity to work directly with professionals who design and implement policies that impact the lives of children and their families. Agencies involved are active in areas such as childcare, education, juvenile justice, and physical and mental health. Students apply for the externship. Selected students are placed in a local child policy agency. An individualized learning plan is developed in consultation with the Childhood Studies Program faculty, the supervisor in the agency, and the student. Offered as ANTH 398C, CHST 398C, PSCL 398C, SAGES Senior Cap

CHST 399. Independent Study (1–6)
Students propose topics for independent reading and research.

DEPARTMENT OF CLASSICS
464 Mather House
www.case.edu/artsci/cics
Phone: 216-368-2348; Fax: 216-368-4681
Martin Helzle, Chair
E-mail: martin.helzle@case.edu

The Department of Classics introduces stu-
students to the culture, life, and legacy of ancient Greece and Rome through courses in the Greek and Latin languages and literatures, in ancient history and archaeology, and in the visual and material cultures of the ancient Mediterranean world. The department also offers courses in the classical tradition in Europe and beyond. The department faculty represents a range of academic disciplines and is committed, where appropriate, to an interdisciplinary approach in teaching and research.

The core purpose of the department is to offer the opportunity for study of the ancient classical languages, as a crucial point of entry into the conceptual worlds of Greece and Rome. Students are also exposed to the various facets of antiquity that made the ancient Mediterranean world the progenitor of the modern West, not least in its mingling of cultures and belief systems. Further, we study major moments of the revival of antiquity, and the various lenses through which subsequent eras understood or appropriated the past.

Knowledge of classical antiquity constitutes the backbone of a liberal education. It also provides an excellent basis for further professional training in whatever field a student may ultimately earn a livelihood. Such knowledge is also a valuable source of enrichment for the student’s leisure. A major in classics, or even a minor, may be (as it often has been) profitably combined with programs aimed toward law, medicine, management, diplomatic service, banking, journalism, library science, or politics; religious, philosophic, literary, or historical studies; careers in the fine arts (visual or performing); or museum or archival work.

DEPARTMENT FACULTY

Martin Helze, Ph.D.  
(Cambridge University)  
Professor and Chair  
Latin language and literature; Augustan and Silver poetry: paleography; textual criticism

Florin Berindeanu, Ph.D.  
(University of Georgia)  
Instructor  
European literature; literary and semiotic theory; mysticism

Charles Burroughs, Ph.D.  
(Warburg Institute, University of London)  
Elise B. Smith Professor of Liberal Arts  
Art and architecture in the classical tradition; Italian Renaissance; early modern urbanism; landscapes in Europe and the Americas

Paul A. Iversen, Ph.D.  
(Ohio State University)  
Assistant Professor  
Greek and Roman New Comedy; Greek and Latin epigraphy; Hellenistic culture and society

Rachel Hall Sternberg, Ph.D.  
(Bryn Mawr College)  
Associate Professor  
Greek language and literature; Greek social history; history of emotion; reception of the classical tradition in the age of Jefferson

Secondary Faculty

Jenifer Neils, Ph.D.  
(Princeton University)  
Ruth Coulter Heede Professor of Art History  
Ancient art and classical archaeology

Visiting Faculty

Andrea U. De Giorgi, Ph.D.  
(Bryn Mawr College)  
Visiting Assistant Professor  
Roman and Late Antique social history; landscape archaeology; literature of the Greek East

Timothy Wutrich, Ph.D.  
(Tufts University)  
Visiting Assistant Professor  
Greek and Roman drama; classical tradition in literature and art; philosophical approaches to literature and art; Roman civilization

UNDERGRADUATE PROGRAMS

Major

The core of the classics major is the study of the languages and literatures of ancient Greece and Rome and the societies that spoke Greek and Latin until the end of the ancient world (usually taken as the 5th century of the common era). The major uniquely offers exposure to a range of approaches: literary, philological, historical, archaeological, art historical, philosophical, and anthropological. Further, the scope of the department has expanded to embrace the classical tradition in and beyond Europe, with courses on literature and art and architecture up to the 20th century.

The classics major leading to the Bachelor of Arts degree requires 36 hours of departmental offerings. In addition, each student completing the classics major is strongly advised to choose a related minor selected in consultation with and approved by the departmental advisor. In the major, the courses from the Department of Classics (36 hours) must include: Eight courses (24 hours) in either Greek or Latin or a combination of both, provided that at least three courses are at the 300 level; four classics courses (12 hours), with at least two at the 300 level. The department strongly recommends four to six additional courses outside the Department of Classics (12 to 18 hours): these should be in a closely related field such as anthropology, art history, philosophy, comparative literature, history, theater, or English. A second major or a minor in one of these fields will normally satisfy this recommendation.

Departmental Honors

Departmental honors are given to students who earn the grade of “A” for their senior dissertation in GREK 382 or LATN 382.

Teacher Licensure in Latin

The Department of Classics offers a teacher licensure program for students who wish to teach Latin in Ohio or in any state that accepts Ohio licensure. Students earn a Bachelor of Arts degree in classics while completing 35 hours in psychology and education course work at Case Western Reserve and at John Carroll University. (For details about course requirements in education, see the program description for Teacher Licensure elsewhere in this bulletin.)

SUBJECT AREA REQUIREMENTS:

1. Required courses (18 hours):

   LATN 101 and 102  
   Elementary Latin I and II  
   (may be waived if appropriate)

   LATN 305  
   Literature of the Republic

   LATN 306  
   Survey of Latin Literature

   LATN 380  
   Advanced Topics in Latin: Prose Composition

   CLSC 304  
   Ancient Rome: Republic & Empire

2. Elective LATN courses (15 hours):

   Choose five courses from the following:

   LATN 201, 202, 307 or 352, 308, 309, 351, 353, 354, 356, 381, 395

3. Elective CLSC courses (9 hours):

   Choose three courses, one of which must be at the 300 level

Minor

A minor in classics is designed to acquaint the student with aspects of the ancient civilizations of Greece and Rome by means of 15 hours of course work. These 15 hours may be

GENERAL BULLETIN 2009-2011
CLSC 111. Greek Civilization (3)
This course constitutes the first half of a year-long sequence on classical civilization. It examines the enduring significance of the Greeks studied through their history, literature, art, and philosophy. Lectures and discussion. (For the second course in the sequence, see CLSC 112.)
Offered as CLSC 111 and HSTY 111.

CLSC 112. Roman Civilization (3)
The enduring significance of the Romans studied through their history, literature, art, and philosophy. Lectures and discussion.
Offered as CLSC 112 and HSTY 110.

CLSC 201. The Ancient World (3)
Ancient Western history from the origins of civilization in Mesopotamia to the dissolution of the Roman Empire in the West.
Offered as CLSC 201 and HSTY 200.

CLSC 202. Classical Mythology (3)
The myths of Classical Greece and Rome, their interpretation and influence.

CLSC 203. Gods and Heroes in Greek Literature (3)
This course examines major works of Greek literature and sets them in their historical and cultural context. Constant themes are war, wandering, tyranny, freedom, community, family, and the role of men and women within the household and the ancient city-state. Parallels with modern life and politics will be explored. Lectures and discussions.
Offered as CLSC 203 and WLIT 203.

CLSC 204. Heroes and Hustlers in Latin Literature (3)
This course constitutes the second half of a sequence on Classical literature. Its main themes are heroism vs. self-promotion, love vs. lust, and the struggle between democracy and tyranny. These topics are traced in a variety of literary genres from the period of the Roman republic well into the empire. Parallels with modern life and politics will be drawn.
Offered as CLSC 204 and WLIT 204.

CLSC 210. Byzantine World 300-1453 (3)
Development of the Byzantine empire from the emperor Constantine's conversion to Christianity and founding of the eastern capital at Constantinople to the fall of Constantinople to Turkish forces in 1453.
Offered as CLSC 210 and HSTY 210.

CLSC 211. Building on Antiquity (3)
This course will provide orientation in the architectural orders and in most periods of European and Euro-American architectural history as well as, to an extent, criticism. Students will learn how to research buildings from different historical epochs, how to work with relevant databases and a range on on-line resources, and with the print resources available. Students will gain some familiarity with the conventions of architectural representation as these become established over centuries. There will be an important writing component, and a considerable amount of group work involving oral presentation and classroom discussion. The issue of the meaning(s) of architecture will be central; we will consider the blatant political uses of architecture and of imagery associated with architecture, more elusive and/or ambiguous cases, and the phenomenon of meanings changing from one era to another or according to audience. We will consider the relationship of the relatively formal “language” of classical architecture (the orders, especially as endowed with gender associations in the Vitruvian tradition) and the more subtle, ad hoc ways that buildings project meaning or mood.
Offered as ARTH 211 and CLSC 211.

CLSC 226. Introduction to Greek and Roman Art (3)
Classical art from the 6th century B.C. to the fourth century A.D.; the major developments in the architecture, sculpture, and painting of ancient Greece, Etruria, and Rome.
Offered as ARTH 226 and CLSC 226.

CLSC 227. Ancient Cities and Sanctuaries (3)
A selection of cities and sanctuaries from the ancient Near East, Egypt, the Aegean, Greece, Etruria, and Rome; their political and religious institutions and the relationship to contemporary art forms.
Offered as ARTH 227 and CLSC 227.

CLSC 228. Ancient Greek Athletics (3)
Exploration of the role of athletics in the ancient, primarily Greek world, and their reflection in the art of the period.
Offered as ARTH 228 and CLSC 228.

CLSC 295A. Greek and Latin Elements in English: The Basic Course (1.5)
A self-paced, computer-assisted course in the classical foundations of modern English in which the student learns the basic principles on which roots, prefixes, and suffixes combine to give precise meanings to composite words.

CLSC 295B. Greek and Latin Elements in English: Biomedical Terminology (1.5)
(See CLSC 295A.) Advanced section that is oriented especially toward scientific and medical terminology.
Prereq or Coreq: CLSC 295A.

CLSC 301. Ancient Philosophy (3)
Western philosophy from the early Greeks to the Skeptics. Emphasis on the pre-Socratics, Plato and Aristotle. Recommended preparation: PHIL 101 and consent of department.
Offered as CLSC 301 and PHIL 301.

CLSC 302. Ancient Greece: Archaic, Classical, and Hellenistic Periods (3)
The rise of Hellenic thought and institutions from the eighth to the third centuries B.C., the rise of the polis, the evolution of democracy at Athens, the crises of the Persian and Peloponnesian Wars, fifth century historiography, the growth of individualism, and the revival of monarchy in the Hellenistic period.
Offered as CLSC 302 and HSTY 302.

CLSC 304. Ancient Rome: Republic and Empire (3)
Growth and development of the Roman state from the unification of Italy in the early third century B.C. to the establishment of the oriental despotism under Diocletian and Constantine. The growth of empire in the Punic Wars, the uncertain steps toward an eastern hegemony, the crisis in the Republic from the Gracchi to Caesar, the new regime of Augustus, the transformation of the leadership class in the early Empire, and the increasing dominance of the military over the civil structure.
Offered as CLSC 304 and HSTY 304.

CLSC 305. Sanskrit Religious Texts (3)
Introduction to the Sanskrit language and culture through the reading of selected texts taken from the ancient religions of South Asia.
Offered as CLSC 305 and RLGN 305.

CLSC 309. Advanced Sanskrit Religious Texts (3)
This class is a continuation of RLGN 305/CLSC 305, the introduction to the Sanskrit language and culture. In RLGN 309/CLSC 309 students will learn advanced Sanskrit grammar and syntax. Previous knowledge of Sanskrit is required. We will finish the lessons from Devavanipravesika that we began in the introductory course. We will then translate sections for the Bhagavad Gita.
Offered as CLSC 309 and RLGN 309.

CLSC 311. Rome: City and Image (3)
This course studies the architectural and urban history of Rome from the republican era of the ancient city up to the eighteenth century using the city itself as the major “text.” The emphasis will be placed on the extraordinary transformations wrought in the city, or at least in key districts, by powerful rulers and/or elites, especially in the ancient empire and in the Renaissance and baroque eras. In a larger perspective, the great construction projects exerted a far-reaching effect within and beyond Europe, but we will study them in relation to their topographical situation, their functions, and their place in a long history of variations on prestigious themes since many of the artworks and the urban settings featured in the course carry the mark of the Long history of the city itself. Recommended preparation: At least one 200-level course.
in ANTH, ARTH, CLSC, ENGL, HSTY, or RLGN.
Offered as ARTH311/411 and CLSC 311.

CLSC 312. Women in the Ancient World (3)
The course offers a chronological survey of women’s lives in Greece, Hellenistic Egypt, and Rome. It focuses on primary sources as well as scholarly interpretations of the ancient record with a view to defining the construction of gender and sexuality according to the Greco-Roman model. Additionally, the course aims to demonstrate how various methodological approaches have yielded significant insights into our own perception of sex and gender. Specific topics include matriarchy and patriarchy; the antagonism between male and female in myth; the legal, social, economic, and political status of women; the ancient family; women’s roles in religion and cult; ancient theories of medicine regarding women; paederasty and homosexuality. Offered as CLSC 312 and WGST 312.

CLSC 314. Love Poetry from Sappho to Shakespeare (3)
Introduction to the love poetry of ancient Greece and Rome and its impact on the later European tradition in such poets as Petrarch, Chaucer, and Shakespeare. Readings will focus especially on questions of generic convention, audience expectation, and the social setting of love poetry in the different ages under consideration. No knowledge of the original languages required.
Offered as CLSC 314 and WLIT 324.

CLSC 316. Greek Tragedy (3)
This course provides students the opportunity to read a significant number of ancient Greek tragedies in modern English translations. We shall read, study, and discuss selected works by Aeschylus, Sophocles, and Euripides, and attempt to understand the plays as literature composed for performance. We shall study literary elements within the plays and theatrical possibilities inherent in the texts. As we read the plays, we shall pay close attention to the historical context and look for what each play can tell us about myth, religion, and society in ancient Athens. Finally, we shall give occasional attention to the way these tragic dramas and the theater in which they were performed have continued to inspire literature and theater for thousands of years. Lectures will provide historical background on the playwrights, the plays, the mythic and historical background, and possible interpretation of the texts as literature and as performance pieces. Students will discuss in class the plays that they read. The course has three examinations and a final project that includes a short essay and a group presentation. Offered as CLSC 316, WLIT 316, WLIT 416.

CLSC 328. Greek Sculpture (3)
Greek sculpture from the Archaic period through the Hellenistic; style, the development of specific types, and the uses of architectural sculpture. Offered as ARTH 328, CLSC 328, and ARTH 428.

CLSC 332. Art and Archaeology of Ancient Italy (3)
The arts of the Italian peninsula from the 8th century B.C. to the 4th century A.D., with emphasis on recent archaeological discoveries. Lectures deal with architecture, sculpture, painting, and the decorative arts; supplemented by gallery tours at the Cleveland Museum of Art.
Offered as ARTH 332, CLSC 332, and ARTH 432.

CLSC 333. Greek and Roman Painting (3)
Greek vase painting, Etruscan tomb painting and Roman wall painting. The development of monumental painting in antiquity. Offered as ARTH 333, CLSC 333, and ARTH 433.

CLSC 334. Art and Archaeology of Greece (3)
A survey of the art and architecture of Greece from the beginning of the Bronze Age (3000 B.C.) to the Roman conquest (100 B.C.) with emphasis on recent archaeological discoveries. Lectures deal with architecture, sculpture, painting, and the decorative arts, supplemented by gallery tours at the Cleveland Museum of Art.
Offered as ARTH 334, CLSC 334, and ARTH 434.

CLSC 395. Directed Readings (1–3)
Readings in English on a topic of interest to the student and acceptable to the instructor. Designed and completed under the supervision of the instructor with whom the student wishes to work.

CLSC 416. Greek Tragedy (3)
This course provides the opportunity to read a significant number of ancient Greek tragedies in modern English translations. We shall read, study, and discuss selected works by Aeschylus, Sophocles, and Euripides, and attempt to understand the plays as literature composed for performance. We shall study literary elements within the plays and theatrical possibilities inherent in the texts. As we read the plays, we shall pay close attention to the historical context and look for what each play can tell us about myth, religion, and society in ancient Athens. Finally, we shall give occasional attention to the way these tragic dramas and the theater in which they were performed have continued to inspire literature and theater for thousands of years. Lectures will provide historical background on the playwrights, the plays, the mythic and historical background, and possible interpretation of the texts as literature and as performance pieces. Students will discuss in class the plays that they read. The course has three examinations and a final project that includes a short essay and a group presentation. Offered as CLSC 316, WLIT 316, WLIT 416.

CLSC 481. Special Studies (1–6)
Subject matter varies according to need.

Grek 101. Elementary Greek I (3)
Beginning course in Greek language, covering grammar (forms and syntax) and the reading of elementary selections from ancient sources. Makes a start toward reading Greek authors. (Both GREK 101 and 102 must be completed to obtain credit.)

Grek 102. Elementary Greek II (3)
Beginning course in Greek language, covering grammar (forms and syntax) and the reading of elementary selections from ancient sources. Makes a start toward reading Greek authors. (Both GREK 101 and 102 must be completed to obtain credit.) Prereq: GREK 101 or equivalent.

Grek 201. Greek Prose Authors (3)
Readings from authors such as Plato, Lyssias, Xenophon, and Herodotus. Prereq: GREK 102 or equivalent.

Grek 202. Introduction to Greek Poetry (3)
Primarily readings from Homer, Hesiod, and theocritus. Selections from Greek lyric may be introduced at the instructor’s discretion. Prereq: GREK 201 or equivalent.

Grek 305. Readings in Ancient Philosophy: Plato (3)
Reading and interpretation of selected dialogues by Plato or other philosophical works. Prereq: GREK 202 or equivalent.

Grek 306. Tragedy (3)
Reading and interpretation of selected plays of Aeschylus, Euripides, and Sophocles. Prereq: GREK 202 or equivalent.

Grek 307. History (3)
Extensive reading in Thucydides’ History of the Peloponnesian War, especially Books VI and VII, the expedition against Syracuse. Prereq: GREK 202 or equivalent.

Grek 308. Comedy (3)
Origin, ambition, and development of Greek Old Comedy and persisting characteristics of the genre. Translation of selected plays from Greek into English. Prereq: GREK 202 or equivalent.

Grek 311. Homer (3)
Reading and translation of extensive selections from the Odyssey. Introduction to epic meter, to Homeric Greek, and to the poet’s style. Consideration of evidences of oral composition and discussion of the heroic tradition. Prereq: GREK 202 or equivalent.

Grek 320. Departmental Seminar: Alexander the Great (3)
This writing-intensive seminar offers Classics students a firm grounding in the discipline with an emphasis on the diverse materials, methods, and approaches that can be brought to bear on the study of Greco-Roman antiquity. Students will read and discuss contemporary scholarship on Alexander the Great drawn from various sub-fields of classics including history, archaeology, art his-
COLLEGE OF ARTS & SCIENCES

tory, gender studies, inscriptions and reception criticism. Considerable class time will be devoted to writing instruction, sometimes via workshops in which students respond to and critique professional writings as well as one another’s work. The two intertwining strands of the seminar—research and writing—should enable each student to produce a strong junior thesis on a chosen topic that need not have anything to do with Alexander. This seminar will lay the groundwork for the senior thesis. Throughout, students will be encouraged to approach English with the same rigor and precision they use in translating Greek and Latin. Offered as GREK 320 and LATN 320. SAGES Dept Seminar

GREK 370. Greek Prose Composition (3)

This course introduces students to the principles and practice of composing continuous passages of Greek prose. It is designed to review and to strengthen students’ command of Attic forms while becoming more aware of the ways Greek syntax was employed to express thought. Via practice at writing Greek prose, the ultimate goal is for the students to become more proficient and sensitive readers of ancient Greek. Prereq: GREK 202.

GREK 380. Advanced Topics in Greek Literature (3)

Study and discussion of important authors, works, and topics not covered regularly. Content will reflect particular interests of students and faculty and timeliness of the topics. Prereq: GREK 202 or equivalent.

GREK 381. Senior Seminar (3)

The purpose of this course is to introduce graduating seniors to ancillary disciplines for the study of Greek and Latin literature and history. These include, but are not limited to paleography, epigraphy, numismatics and textual criticism. A major component of this course will inevitably be unseen translation since ancient sources do not only have to be deciphered but also understood. The course can be offered or taken as either a Greek or Latin course, depending on student or instructor preference. Offered as GREK 381 and LATN 381. SAGES Senior Cap

GREK 382. Senior Dissertation (3)

A course of independent study and research culminating in the preparation of a thesis on a topic approved by the supervising faculty member. Enrollment in this course must be approved by the Chair of the Department. Offered as GREK 382 and LATN 382. Prereq: GREK 381 or LATN 381.

GREK 395. Directed Readings (1–3)

Readings in Greek of authors selected to serve the individual interests and needs of undergraduate students. Each program planned and completed under the supervision of the instructor with whom the student wishes to work.

LATN 101. Elementary Latin I (3)

An introduction to the elements of Latin; pronunciation, forms, syntax, vocabulary, and reading. (Both LATN 101 and 102 must be completed to obtain credit.)

LATN 102. Elementary Latin II (3)

An introduction to the elements of Latin; pronunciation, forms, syntax, vocabulary, and reading. (Both LATN 101 and 102 must be completed to obtain credit.) Prereq: LATN 101 or equivalent.

LATN 201. Latin Prose Authors (3)

Reading and discussion of such prose authors as Cicero, Caesar, Livy or Pliny. Prereq: LATN 102 or equivalent.

LATN 202. Vergil (3)

Primarily readings from The Aeneid; selections from Vergil’s other work may be introduced at instructor’s discretion. Recommended preparation: LATN 201 or equivalent.

LATN 305. Literature of the Republic (3)

A reading course in prose and poetry of the Roman Republic. Extensive selections from Cicero and Catullus, and one comedy of Terence. Prereq: LATN 202 or equivalent.

LATN 306. Survey of Latin Literature (3)

Reading and discussion of selections from the various genres of Latin literature of the Roman Republic and Empire such as historical narrative, lyric and elegiac poetry, comic drama, forensic rhetoric, philosophical dialogue, didactic literature, letters, and epigrams. Prereq: LATN 202 or equivalent.

LATN 307. Livy (3)

Readings in Books I and XXI, with other selections from this major Augustan historian. Prereq: LATN 202 or equivalent.

LATN 308. Horace: Odes and Epodes (3)

Readings and discussion of extensive selections from the poetry of Horace; consideration of Horace as exemplifying the spirit of the Augustan Age. Prereq: LATN 202 or equivalent.

LATN 309. Medieval Latin (3)

Reading and interpretation of Latin texts from the Middle Ages. Material selected according to the needs and interests of students. Prereq: LATN 202 or equivalent.

LATN 320. Departmental Seminar: Alexander the Great (3)

This writing-intensive seminar offers Classics students a firm grounding in the discipline with an emphasis on the diverse materials, methods, and approaches that can be brought to bear on the study of Greco-Roman antiquity. Students will read and discuss contemporary scholarship on Alexander the Great drawn from various sub-fields of classics including history, archaeology, art history, gender studies, inscriptions and reception criticism. Considerable class time will be devoted to writing instruction, sometimes via workshops in which students respond to and critique professional writings as well as one another’s work. The two intertwining strands of the seminar—research and writing—should enable each student to produce a strong junior thesis on a chosen topic that need not have anything to do with Alexander. This seminar will lay the groundwork for the senior thesis. Throughout, students will be encouraged to approach English with the same rigor and precision they use in translating Greek and Latin. Offered as GREK 320 and LATN 320. SAGES Dept Seminar

LATN 351. Latin Didactic Literature (3)

Readings from didactic poetry such as Lucretius and Seneca’s Epistles. Parodies like Ovid’s Ars Amatoria or prose treatises may also be introduced. Prereq: LATN 202 or equivalent.

LATN 352. History (3)

Works of the Roman historian Cornelius Tacitus: his Annals I-VI dealing with his portrait of Emperor Tiberius and the Empire after the death of Augustus. Prereq: LATN 202 or equivalent.

LATN 353. Epic (3)

Extensive readings in Latin epic poetry, including Catullus, Vergil’s Aeneid, Lucan, Statius or other “silver” epics. Particular attention to the artistic and literary qualities of the works and to the development of Latin epic tradition. Prereq: LATN 202 or equivalent.

LATN 354. Drama (3)

Reading of at least one play each by Plautus and Terence. Attention to the history of Latin and Greek New Comedy, and the contrasting styles of the two authors. Prereq: LATN 202 or equivalent.

LATN 356. Elegiac Poetry (3)

Translation and interpretation of selected elegies by Catullus, Tibullus, Propertius, and Ovid. Prereq: LATN 202 or equivalent.

LATN 370. Latin Prose Composition (3)

This course is designed to strengthen students’ active command of Latin grammar and idiomatic prose style. At a basic level, students are trained to pay attention to details and thus write grammatically correct. Going beyond this, the course teaches Latin Idioms. Finally, it aims to develop students’ intuitive feeling for the Latin language. The ultimate goal is to write in a Ciceronian prose style. Prereq: LATN 202.

LATN 380. Advanced Topics in Latin Literature (3)

Study and discussion of important authors, works, and topics not covered regularly. Content will re-
reflect particular interests of students and faculty and timeliness of topics.
Prereq: LATN 202 or equivalent.

LATN 381. Senior Seminar (3)
The purpose of this course is to introduce graduating seniors to ancillary disciplines for the study of Greek and Latin literature and history. These include, but are not limited to paleography, epigraphy, numismatics and textual criticism. A major component of this course will inevitably be unseen translation since ancient sources do not only have to be deciphered but also understood. The course can be offered or taken as either a Greek or Latin course, depending on student or instructor preference.
Offered as GREK 381 and LATN 381.
Prereq: Any 300-level GREK or LATN course.
SAGES Senior Cap

LATN 382. Senior Dissertation (3)
A course of independent study and research culminating in the preparation of a thesis on a topic approved by the supervising faculty member. Enrollment in this course must be approved by the Chair of the Department.
Offered as GREK 382 and LATN 382.

LATN 395. Directed Readings (1–3)
Directed readings in Latin of authors selected to serve the individual interests and needs of undergraduate students. Each program planned and completed under the supervision of the instructor with whom the student wishes to work.

DEPARTMENT OF COGNITIVE SCIENCE
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Todd Oakley, Chair
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Cognitive science is the scientific study of the mind in a transdisciplinary framework. The Department of Cognitive Science at Case Western Reserve University is specifically dedicated to the study of human higher cognition, including language, gesture, advanced social cognition, mathematical invention, scientific discovery, art, religion, music, literature, advanced tool use and advanced technology, theater and dance, fashions of dress, sign systems, creativity, and culture. The department draws on methods of research in the biological sciences, the social sciences, and the humanities. Its educational mission is to provide students with the best possible opportunity to integrate a wide variety of approaches and apply them to the study of human higher cognition.

The department provides basic training in core disciplines, as well as a range of philosophical, evolutionary, linguistic, and computational issues bearing on cognitive science. It seeks to place cognitive science in a wider, more ecologically valid context than traditional programs in this field have typically allowed, so as to broaden our theories of those high-end cognitive capacities that mark human beings as distinctive.

The department offers an undergraduate major and minor in cognitive science and a master’s degree in cognitive linguistics. By developing wide-ranging expertise in at least two or three relevant disciplines, our students can prepare for a variety of career options. Training in several disciplines will also provide increased choices for postgraduate study.

DEPARTMENT FACULTY
Faculty research interests are listed on the department’s Web site.

Todd Oakley, Ph.D.  
(University of Maryland)  
Associate Professor and Chair

Per Aage Brandt, Docteur d’Etat (Sorbonne I)  
Professor; Emile B. de Saxeé Professor of Modern Languages and Literatures

Anthony Jack, Ph.D.  
(University College London)  
Assistant Professor

Fey Parrill, Ph.D.  
(University of Chicago)  
Assistant Professor; Robson Junior Professor

Yanna Popova, D. Phil (Oxford University)  
Assistant Professor; Clineo Junior Professor

Mark Turner, Ph.D.  
(University of California, Berkeley)  
Institute Professor

Lecturer
Vera Tobin, Ph.D.  
(University of Maryland)

Secondary Faculty
James C. Alexander, Ph.D.  
(Johns Hopkins University)  
Professor of Mathematics

Richard J. Boland, Jr., Ph.D.  
(Case Western Reserve University)  
Professor of Information Systems, Weatherhead School of Management

Patrizia Bonaventura, Ph.D.

(Ohio State University)  
Assistant Professor of Communication Sciences

Richard E. Boyatzis, Ph.D.  
(Harvard University)  
Professor of Organizational Behavior, Weatherhead School of Management

Charles Burroughs, Ph.D.  
(The Warburg Institute)  
Elsie B. Smith Professor of Liberal Arts; Professor of Classics

Daniela Calvetti, Ph.D.  
(University of North Carolina, Chapel Hill)  
Professor of Mathematics

Angela Ciccia, Ph.D.  
(Case Western Reserve University)  
Assistant Professor of Communication Sciences

Fred Collopy, Ph.D.  
(Wharton School of the University of Pennsylvania)  
Professor of Information Systems, Weatherhead School of Management

William E. Deal, Ph.D.  
(Harvard University)  
Severance Professor of the History of Religion  
Professor of Religious Studies

Heath A. Demaree, Ph.D.  
(Virginia Institute of Technology)  
Associate Professor of Psychology

Robert L. Greene, Ph.D.  
(Yale University)  
Professor of Psychology

Sandra Russ, Ph.D.  
(University of Pittsburgh)  
Professor of Psychology

Peter Thomas, Ph.D.  
(University of Chicago)  
Assistant Professor of Mathematics

Peter J. Whitehouse, M.D., Ph.D.  
(Johns Hopkins University)  
Professor of Neurology

James Zull, Ph.D.  
(University of Wisconsin)  
Professor of Biology

Adjunct Faculty
Merlin W. Donald, Ph.D.  
(McGill University)

Yohannes Haile-Selassie, Ph.D.  
(University of California, Berkeley)  
Curator and Head of Physical Anthropology, Cleveland Museum of Natural History
the purpose of pursuing the M.A., or for a degree program in cognitive linguistics, with a major in Cognitive Science—Gilles Fauconnier, “The Phenomenology of Cognitive Linguistics.” What has been applied to wide ranges of nonlinguistic approaches that come from anthropology, archaeology, and literary theory. In this course, you’ll get a basic introduction to some of the topics that are central to human cognition, such as intelligence, categorization, language, and creativity. We’ll ask what can be gained by taking an integrated, cognitive scientific approach to these topics.

COGS 101. Human Cognition in Evolution and Development (3)
This course introduces students to the field of cognitive science. Cognitive scientists are interested in the nature of the human mind—basically, we ask how humans think. This is a huge question, and has been addressed in one way or another by pretty much every academic field. Cognitive science tries to unite work from many different fields, including computer science, neuroscience, psychology, linguistics, philosophy, music, art, and literary theory. In this course, you’ll get a basic introduction to some of the topics that are central to human cognition, such as intelligence, categorization, language, and creativity. We’ll ask what can be gained by taking an integrated, cognitive scientific approach to these topics.

COGS 201. Human Cognition in Evolution and Development (3)
This course covers mind unfolding in time, including the fundamental methods, findings, and theories that attempt to understand the human mind from a neuroscientific standpoint. The course provides the student with background knowledge of brain processes underlying such psychological phenomena as consciousness, sensation, perception, thought, language, and voluntary action. Since many fields of neuroscience have contributed to cognitive neuroscience, the approach of this course is cross-disciplinary. It introduces theories and data from clinical and experimental neuropsychology, brain imaging, neuromodulatory and neuromagnetic brain activity, the neuroscience of language, and behavioral neuroscience, among other fields.

COGS 202. Human Cognition Viewed from a Cultural Perspective (3)
This course studies the human mind in its natural environment: culture. It covers the fundamental methods, findings, and theories that attempt to understand the growth and evolution of cognition from either a social science or humanistic standpoint. It provides the student with background knowledge of theories of human cultural evolution and change, of the relationship between the cognizing individual and larger social-cognitive structures, and of such phenomena as distributed networks, cooperative mental work, and the phenomenology of human experience. Many disciplines have contributed to this knowledge; hence the approach of this course is cross-disciplinary, including ideas from cultural anthropology, literary studies, art and art history, musicology, philosophy, and the history of technology, among others.

COGS 204. Cognition and Computation (3)
This course explores possible uses of computational technology in the study of cognition. (1) The human or animal mind-supporting brain is not in any technical sense “just” a computer, but it is relevant to stimulate various cognitive phenomena by computation in order to model their formal properties. From perception to conception, images schemas, categories, and meanings found in linguistic semantics and syntax, and from bodily motion to the processes of abstraction, intentional orientation, and spatial navigation, computational modeling can help us understand mental architecture, the interrelations between iconicity and symbolization in mental representations, and the constraints and indeterminacies at work in social cognitive networks (distributed cognition). (2) It also is relevant in this course to analyze the cognitive roles of actual computation as a social and communication technology, mirroring certain of our mental routines on the screens we interact with and with which we program to manifest symbolic and iconic behaviors in ever-changing patterns of “Interface” communication, while the underlying systems control our social and technical environment. (3) Recent developments in Cognitive Robotics finally invite for an integration of semantic stimulation and the elaboration and implementation of language-based and motion-based competencies in mobile robots. Computation serves, in this perspective, the construction of a dynamic model of meaning linked to interaction (human-machine, machine-machine, and human to human).

COGS 205. Cognition and Design (3)
Urbanism is design; architecture is design; of course, the aesthetic shaping of artifacts (such as computers, cars, and coffee machines) is design. Configuring surfaces, volumes, and portions of space in special ways, creating and changing formats for things and places that allow cultural practices to unfold while delimiting them, are essential “designing” endeavors of human civilization and are, necessarily, activities based on the cognitive capacities and constraints of our species. We “cognize” the human world in terms and frames of ‘designed’ surroundings. Design is a basic expressive activity, by which we interact with our artificial and natural surroundings and create ‘interfaces’ between mind and reality, thus upholding and
interpretable world. Landscapes and cityscapes, work spaces of all sorts, buildings and parks, exteriors and interiors of homes, factories, institutions, and temples; furniture, artifacts such as machines, tools, weapons, symbolic objects, even the configuration (‘building’) of our own bodies, are design. An inquiry into cultural cognition, aiming to understand how humans as socio-cultural beings think and feel, therefore needs to explore this dimension of spatial expressivity and to acknowledge it as a constitutive fact of human meaning production; it needs to study the aesthetic and pragmatic, political and historical, philosophical and religious, and simply everyday practical, semiotic aspects of this basic form of human creativity. This course will focus on spatial expressivity—design—in several primary keys and scales, including design for learning; design for verbal and technical communication, interaction, and commerce; design for expressions of authority and deliberation; and design for emotional display.

COGS 206. Introduction to Cognitive Linguistics (3)
This course is both an exposure to the technical field of cognitive linguistics—suitable in itself as part of a liberal education—and a gateway to advanced study of cognitive linguistics, leading to special topics and capstone experiences inside the cognitive science major. This course focuses on the methods that have been developed in cognitive linguistics in the last ten to twenty years for the study of grammar, semantics, and their relations to cognition.

COGS 272. Morality and Mind (3)
Recent research in cognitive science challenges ethical perspectives founded on the assumption that rationality is key to moral knowledge or that morality is the product of divine revelation. Bedrock moral concepts like free will, rights, and moral agency also have been questioned. In light of this critique, how can we best understand moral philosophy and religious ethics? Is ethics primarily informed by nature or by culture? Or is ethics informed by both? This course examines 1) ways in which cognitive science—and related fields such as evolutionary biology—impact traditional moral perspectives, and 2) how the study of moral philosophy and comparative ethics forces reconsideration of broad cognitive science theories about the nature of ethics. The course examines the concept of free will as a case study in applying these interpretive viewpoints. Interdisciplinary readings include literature from moral philosophy, religious ethics, cognitive science, and evolutionary biology. Offered as COGS 272, RLGN 272.

COGS 301. Special Topics in Cognitive Science (3)
This course offers instructors the opportunity to cover a more advanced and specialized topic in the field of cognitive science for third and fourth year students. Topics will vary from year to year.

COGS 302. SAGES Departmental Seminar: Methods and Theories in Cognitive Science (3)
This course takes a look at the discipline of cognitive science by exploring the methods that cognitive scientists use in their research. We’ll discuss how different methods reflect different approaches and traditions of thought and how they provide different answers to particular questions. We’ll also discuss the process of translating research into writing and talk about how different kinds of writing reflect the many different methods used in cognitive science. Recommended preparation: COGS 101, COGS 102, COGS 201, COGS 202.

SAGES Dept Seminar

COGS 303. SAGES Departmental Seminar: Current Controversies in Cognitive Science (3)
This course takes a look at the discipline of cognitive science by exploring the current controversies that impact cognitive scientists in their research. We’ll discuss how different controversies affect different approaches and traditions of thought and how they elicit different answers to particular questions. We’ll also discuss the process of translating research into writing and talk about how different kinds of writing reflect the many different controversial issues presented in cognitive science. Recommended preparation: COGS 101, COGS 102, COGS 201, and COGS 202.

SAGES Dept Seminar

COGS 304. Conceptual Integration (3)
Conceptual Integration, otherwise known as “blending,” is a defining feature of higher-order human cognition, indispensable for all behaviors typically taken as distinctive to human beings. This course presents the cognitive mechanisms of conceptual integration, the constraints on its operation, and its deployment and expression in a range of human behaviors such as learning, invention, mathematical and scientific discovery, language, art, music, gesture, social understanding, institutional performance, reasoning, decision, judgment, choice, design, and engineering. A student in the class will work on an individual research project in any of a variety of fields, including engineering (e.g. designing with blends), computer science, the arts, the humanities, the social sciences, cognitive neuroscience, and linguistics. Only one of COGS 304 and COGS 404 can be taken for credit within any degree program.

Offered as COGS 304 and COGS 404.

COGS 315. Mental Space Theory (3)
This course will study the ways in which the presence of mental space relates to cognition and the semiotics of language, in which cognition is characterized by the same imagining and imaginary properties as artistic literature. It is an attempt to identify and analyze procedures as aesthetically interesting and generally relevant forms of human thinking, feeling, imagining, fantasizing, and conceptualizing. The course introduces current theories of literature in relation to language and mind, and it presents and discusses practical applications in critical reading and text analysis, using examples from modern literature in the main genres. A student may earn credit for either COGS 315 or COGS 415, but not both.

Offered as COGS 315 and COGS 415.

COGS 325. Cognitive Approaches to Literature (3)
This course approaches literature as a window into language, in which cognition is characterized by the same imagining and imaginary properties as artistic literature. It is an attempt to identify and analyze procedures as aesthetically interesting and generally relevant forms of human thinking, feeling, imagining, fantasizing, and conceptualizing. The course introduces current theories of literature in relation to language and mind, and it presents and discusses practical applications in critical reading and text analysis, using examples from modern literature in the main genres. A student may earn credit for either COGS 325 or COGS 425 but not both.


Offered as COGS 325 and COGS 425.

COGS 326. Cognitive Approaches to Music (3)
This course will study the ways in which the presence of music relates to cognitively observable semiotics of inter-subjective communication at large—the emergence of language, gesture, and symbolization of time. Topics of interests include: the ways that
specific works of musical art invite semantic interpretation; how intelligible musical structure relates to meaning; how musical activities correspond to brain activity; and how music relates to and/or induces emotion. Recommended preparation: COGS 101, COGS 202. Offered as COGS 326 and COGS 426.

COGS 327. Gesture in Cognition and Communication (3)
Most people never notice that when they are talking, they’re also gesturing. Why do we produce gestures? Why do we produce gestures while speaking? What can we learn from gestures? What is the relationship between gestures and speech? This course surveys scientific research on gesture, exploring topics such as the role of gesture in communication, cross-cultural differences in gesture, and the relationship between gesture and signed languages. The course will focus on gestures produced with speech, but will cover symbolic and ritualized gesture in the visual arts and in dance. Offered as COGS 327 and COGS 427 and MLIT 327.

COGS 328. Cognition and Visual Aesthetic Experience (3)
This course is offered as a reciprocal exchange between new research on the mind/brain and existing theories of visual aesthetics. It would appeal to students from diverse majors, ranging from art, language or philosophy, to psychology, computer science or pre-med. The material covered links a traditional approach to philosophical aesthetics with a most-up-to-date research on visual perception and brain functioning. Recommended preparation: COGS 101, COGS 202.

COGS 329. Performance and the Embodied Mind (3)
In the past twenty years, cognitive scientists working in neuroscience, psychology, linguistics, philosophy, and related fields have made great progress in understanding perception, empathy, the human mind’s sense of space and movement, emotions, meaning-making, and many other cognitive areas that are crucial to producing, enacting, and responding to performances on stage. This course will look at ways of incorporating many of the insights of cognitive science into the existing work of theatre and performance scholarship. The course will thus link a more traditional approach to the body in theatre and dance studies, where it has commonly been considered one of the main means of communication, to a most-up-to-date research on embodied cognition. Observation of live and pre-recorded dance and theatre performances will be used to supplement the theoretical discussion. Recommended preparation: COGS 101, COGS 202.

COGS 352. Language, Cognition, and Religion (3)
This course utilizes theoretical approaches found in cognitive semantics—a branch of cognitive linguistics—to study the conceptual structures and meanings of religious language. Cognitive semantics, guided by the notion that conceptual structures are embodied, examines the relationship between conceptual systems and the construction of meaning. We consider such ideas as conceptual metaphor theory, conceptual blending, image schemas, cross-domain mappings, metonymy, mental spaces, and idealized cognitive models. We apply these ideas to selected Christian, Buddhist, and Chinese religious texts in order to understand ways in which religious language categorizes and conceptualizes the world. We examine both the universality of cognitive linguistic processes and the culturally specific metaphors, conceptual blends, image schemas, and other cognitive operations that particular texts and traditions utilize. Course Offered as RLGN 352/RLGN 452 and COGS 352/452.

COGS 363. Philosophy and Social Neuroscience (3)
A philosophical examination of recent research in human cognition and emotion at the intersection of the social sciences and neurological sciences. The course provides the student with background knowledge of brain processes underlying such social and cultural phenomena as bonding, aggression, imitation, mind-attribution, language, sexual behavior, moral action, and creativity. The approach of this course is at once scientific (comparing methods, findings and questions as they arise in clinical and experimental neuropsychology, brain imaging, neurolinguistics, and behavioral neuroscience) and humanistic, asking critical questions about the nature and methods of a science of cognition, and surveying moral responses from a neurologic and philosophic perspective. Recommended preparation: PHIL 101 or COGS 201. Offered as COGS 363 and PHIL 363.

COGS 365. Advanced Topics in Cognitive Neuroscience (3)
This course focuses on specific areas of research in cognitive neuroscience in some depth. The first half of the semester covers basics and fundamental research areas (e.g., perception, attention) and examines the (sometimes controversial) theoretical issue of what cognitive neuroscience techniques tell us about the mind. The second half of the semester is dedicated to examining selected research topics of interest to students. Students research and write ‘grant proposals’ for cognitive neuroscience experiments. The class culminates with students and invited faculty simulating a funding panel, and deciding which grants to ‘fund’ from a limited budget. Prereq. COGS 102.

COGS 366. Functional Magnetic Resonance Imaging (3)
fMRI is the workhorse of cognitive neuroscience research. This course will take an in-depth look at this methodology, including hands on experience analyzing imaging data. The course will address the following issues: How do MRI and fMRI work? What does fMRI actually measure and how does that relate to cognition? What are the standard steps involved in processing and analyzing fMRI data to help answer specific questions? The course culminates in the production of a report of a novel analysis of imagining data that the students have performed (in small groups), including a brief description of what that analysis reveals about the neural basis of cognition. Prereq. COGS 102 and COGS 365.

COGS 373. Intelligence and Cognition (3)
This course will focus on the notion and meaning of intelligence. What is intelligence? How is it measured, and are these measures adequate to the task? Is there more than one kind of intelligence? What is the relationship between individuals, genetic factors, biological factors, and socio-cultural-economic factors in the development of intelligence? How are language and thought related to intelligence? What is the difference between intelligence and talent? Intelligence seems to be necessary for culture, art, religious belief, the creation of theories and the quest for knowledge, truth and morality; thus intelligence is a necessary condition for the study of itself. To attempt to understand intelligence is an undertaking in which we will ask questions about the self and the common nature of humanity, while simultaneously examining the abilities of animals and machines. What is the mark of intelligence? Recommended preparation: PHIL 101 or COGS 201. Offered as COGS 373 and PHIL 373.

COGS 381. Philosophy and Cognitive Neuroscience (3)
This course will focus on the various methodologies used in the cognitive neurosciences, and explore their strengths and weaknesses from scientific and philosophical standpoints. We will begin by examining baseline measures (including IQ tests, tasks of cognitive flexibility, verbal and visual memory, causal/sequential thinking and narrative tasks) and their experimental design. Lesion methods will follow, with an eye toward understanding the strength of inferences that can be drawn from such data. The course will also focus on imaging techniques (CAT, PET, SPECT, fMRI, TMS, etc.) as well as means of electrical activity such as EEG and single-cell recordings. Students will become familiar with many fundamental assumptions necessary for the implementation of each method, and philosophical questions associated with these endeavors and their potential impact on our knowledge and society. Recommended preparation: PHIL 101 or COGS 201. Offered as COGS 381 and PHIL 381.

COGS 383L. Vocalization and Cognition Lab (1)
This is a laboratory section intended to provide hands-on training and experience with sound processing and analysis of animal vocalizations in the context of cognitive science, philosophy, and biology. Students will ask and answer questions surrounding language, meaning, mind, mental states, animal and human cognition. How does a science of content and language actually proceed? How do we measure behavior for use as an indicator of cognition? What pragmatic constraints are
research project, a literature review, or some other. The research may be in the form of an independent supervised original research on a topic in cognitive science, culminating in a public presentation. The research may be in the form of an independent research project, a literature review, or some other form of cognitive semiotics. COGS 390. Workshop in Cognitive Linguistics II (3)

The second course in a two-course sequence (408 & 409) designed to provide experience in research methods in cognitive linguistics at the MA level. A workshop in which students read examples of cognitive linguistics research, develop their own topics (theoretical or empirical), and work on them to produce a final paper.

Prereq: COGS 408 or consent of instructor.

COGS 413. Special Topics in Cognitive Linguistics (3)

This course covers special topics in the field of cognitive linguistics. Topics will vary from semester to semester.

Offered as COGS 313 and COGS 413.

COGS 415. Mental Space Theory (3)

This course covers theory of mental spaces and methodology of mental space analysis, with special emphasis on the use of mental space theory to analyze human performance in various areas of cognition, including reasoning, judgment, decision, counterfactual thought, inference, planning, communication and language, gesture, social cognition, cognitive design and engineering, representation, learning, humor, symbol systems, and invention. It includes a consideration of experimental methods that have arisen under the influence of mental space theory. A student may earn credit for either COGS 315 or COGS 415, but not both.

Offered as COGS 315 and COGS 415.

COGS 425. Cognitive Approaches to Literature (3)

This course approaches literature as a window into language, in which cognition is characterized by the same imaging and imaginary properties as artistic literature. It is an attempt to identify and analyze procedures as aesthetically interesting and generally relevant forms of human thinking, feeling, imagining, fantasizing, and conceptualizing.

The course introduces current theories of literature in relation to language and mind, and it presents and discusses practical applications in critical reading and text analysis, using examples from modern literature in the main genres. A student may earn credit for either COGS 325 or COGS 425 but not both. Recommended preparation: COGS 101, COGS 202.

Offered as COGS 325 and COGS 425.

COGS 426. Cognitive Approaches to Music (3)

This course will study the ways in which the presence of music relates to cognition and the semiotics of inter-subjective communication at large—the emergence of language, gesture, and symbolization of time. Topics of interests include: the ways that specific works of musical art invite semantic interpretation; how intelligible musical structure relates to meaning; how musical activities correspond to brain activity; and how music relates to and/or induces emotion. Recommended preparation: COGS 101, COGS 202.
COGS 427. Gesture in Cognition and Communication (3)
Most people never notice that when they are talking, they’re also gesturing. Why do we produce these gestures? What can studying them tell us about the human mind? This course surveys scientific research on gesture, exploring topics such as the role of gesture in communication, cross-cultural differences in gesture, and the relationship between gesture and signed languages. The course will focus on gestures produced with speech, but will cover symbolic and ritualized gesture in the visual arts and in dance.
Offered as COGS 327 and COGS 427 and MLIT 327.

COGS 452. Language, Cognition, and Religion (3)
This course utilizes theoretical approaches found in cognitive semantics—a branch of cognitive linguistics—to study the conceptual structures and meanings of religious language. Cognitive semantics, guided by the notion that conceptual structures are embodied, examines the relationship between conceptual systems and the construction of meaning. We consider such ideas as conceptual metaphor theory, conceptual blending, image schemas, cross-domain mappings, metonymy, mental spaces, and idealized cognitive models. We apply these ideas to selected Christian, Buddhist, and Chinese religious texts in order to understand ways in which religious language categorizes and conceptualizes the world. We examine both the universality of cognitive linguistic processes and the culturally specific metaphors, conceptual blends, image schemas, and other cognitive operations that particular texts and traditions utilize.
Course Offered as RLGN 352/RLGN 452 and COGS 352/452.

COGS 499. Independent Studies (1–3)
This course is a face-to-face seminar between students and instructor, aiming at letting and helping the students independently develop original research on well-defined topics in the field of cognitive linguistics. Themes can vary within the wide area of cognition and culture.

DEPARTMENT FACULTY
Stephen E. Haynesworth, Ph.D.
(Case Western Reserve University)
Interim Chair; Associate Professor of Biology
Patrizia Bonaventura, Ph.D.
(The Ohio State University)
Assistant Professor
Simulation of speech production and biomechanical modeling of the vocal tract; motor control mechanisms in normal and disordered speech production; speech technology applications

Angela Hein Ciccia, Ph.D.
(Case Western Reserve University)
Assistant Professor
Neuroscience of communication and communication disorders in adolescents/adults, with focus on traumatic brain injury

Barbara Lewis, Ph.D.
(Case Western Reserve University)
Associate Professor
Familial and genetic bases of speech/language

Kathryn (Kyra) Rothenberg, Ph.D.
(Bowling Green State University)
Instructor
Health communication

Lecturers
Patricia O. Carothers, M.S., CCC-A
(Ithaca College)
Fluency disorders
Kathryn (Kay) McNeal, M.S., CCC-SLP
(Purdue University)
Clinical Program Director
Speech-language pathology
Tonia Kates Stewart, Ph.D.
(Kent State University)
Health communication

Adjunct Faculty
Laura Brady, M.A., CCC-A
(Kent State University)
Adjunct Instructor; Cleveland Hearing and Speech Center
Audiology
Michelle Burnett, M.A., CCC-SLP
(Michigan State University)
Adjunct Instructor; Cleveland Hearing and Speech Center
Speech-language pathology
Margaret Duff, M.A., CCC-SLP
(Kent State University)
Adjunct Instructor; Cleveland Hearing and Speech Center
Speech-language pathology

Bernard P. Henri, Ph.D.
(Northwestern University)
Adjunct Associate Professor; Cleveland Hearing and Speech Center
Fluency disorders; professional issues in speech-language pathology; health care management

Douglas Hicks, Ph.D.
(Vanderbilt University)
Adjunct Professor; Cleveland Clinic Foundation
Voice disorders

Karen Kantzes, Au.D., CCC-A
(A. T. Still University)
Adjunct Instructor; Cleveland Hearing and Speech Center
Audiology

Darlene Moenter, Ph.D.
(Ohio State University)
Adjunct Assistant Professor; Louis Stokes VA
Cleveland Medical Center
Auditory potentials

Jean Nisenboum, M.A.
UNDERGRADUATE PROGRAMS

Major
The major in communication sciences leads to the Bachelor of Arts degree. For many students, a B.A. in communication sciences is a pre-professional degree in preparation for graduate study in speech-language pathology or audiology. The undergraduate course work emphasizes the basic processes and acquisition of normal communication in children and adults. Graduate study then focuses on the study of disordered communication. (Please see the description of the Integrated Graduate Studies program below.)

Students pursuing the B.A. are required to take 45 credit hours of course work which includes study in communication sciences and disorders, psychology, and English/linguistics, as well as in statistics and research design. A recommended course sequence is shown below. Please note, however, that an individual student’s sequence may differ from this one. For example, undergraduate students may elect to take 400- or 500-level graduate courses with departmental/instructor permission.

SUGGESTED SEQUENCE OF REQUIRED COURSES FOR THE BACHELOR OF ARTS DEGREE (45 CREDITS)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>PSCL 101 General Psychology (3)</td>
<td>COSI 109 Introduction to Communication Disorders (3)*</td>
</tr>
<tr>
<td>Senior</td>
<td>COSI 352 Introduction to Clinical Practice in Speech-Language Pathology (3)</td>
<td>COSI 345 Communication and Aging (3)</td>
</tr>
</tbody>
</table>

*COSI 109 is offered in the fall and spring semesters. All other COSI courses are offered only one semester per year, as indicated above.

**ENGL 301 is offered in alternate years (spring semester) and thus may be taken in either the sophomore or junior year.

Departmental Honors
Juniors with a 3.0 overall grade point average and a 3.25 average in communication sciences are encouraged to apply to the honors program. The honors program consists of one three-credit course, COSI 395, in which the student carries out an independent project in an area of interest, under the direction of a COSI faculty member. Satisfactory completion of the project qualifies the student to receive the Bachelor of Arts degree with Departmental Honors noted on the transcript. Admission to the Honors Program is by faculty approval. STAT 201 or PSCL 282 and PSCL 375 are prerequisites to COSI 395. Additional information is available from the academic advisor.

Integrated Graduate Studies
The Integrated Graduate Studies program is intended for undergraduate students who are interested in obtaining a graduate degree in communication disorders (speech-language pathology). Qualified students may be accepted for admission to the School of Graduate Studies after completing 90 hours of undergraduate course work.

Typically, a master’s degree requires two additional years of study beyond the bachelor’s degree. Through the IGS program, however, a student can complete an undergraduate degree in communication disorders and a master’s degree in communication disorders in five years. The recommended undergraduate sequence for students interested in the IGS program is somewhat different from the recommended sequence presented above. Students should consult their academic advisor for additional information concerning IGS requirements.

Minors

MINOR IN COMMUNICATION SCIENCES
The minor in communication sciences requires a minimum of 15 credit hours. It focuses on normal processes of speech, language, and hearing, as well as on the speech, language, and hearing disorders that result from breakdowns in these processes. Interested students should meet with an advisor for specific course requirements.

MINOR IN HEALTH COMMUNICATION
The minor in health communication offers introductory and advance study in theoretical and practical application of communication within a health context. It includes a variety of additional courses that students can choose according to their specific areas of interest. The course work is designed to appeal to students in such fields as premed, nursing, prelaw, public policy, public health, communication disorders, gerontological studies, nutrition, health management, and social work.

The minor requires 15 credit hours of course work, of which 9 credit hours come from required courses: COSI 101, COSI 109, and COSI 340. The remaining 6 credit hours are chosen from a list of elective courses: COSI 200, COSI 260, COSI 280, COSI 332, COSI
GRADUATE PROGRAMS

Master of Arts

The principal goal of the Master of Arts program is to develop clinical scientists who are skilled in the management of individuals with speech and language disorders. The master’s program is accredited by the Council on Academic Accreditation of the American Speech-Language-Hearing Association (ASHA). Upon successful completion of the Master of Arts degree, students will also meet the academic and clinical practicum requirements for certification by ASHA and licensure in the State of Ohio. Students may also elect to obtain Ohio Teacher Licensure in speech-language pathology.

Degree requirements include completion of 36 credit hours of course work and a clinical practicum in communication disorders. In addition, students must satisfactorily complete written and oral comprehensive exams or write a master’s thesis. Specific course requirements are determined according to the student’s undergraduate background and academic and career goals. The following courses are required for all students: COSI 497 (Methods of Research) and four semesters of COSI 452 (Graduate Clinical Practicum).

CLINICAL OPPORTUNITIES IN SPEECH, LANGUAGE, AND HEARING DISORDERS

The department is affiliated with, and located in, the Cleveland Hearing and Speech Center (CHSC), a nonprofit agency that serves children and adults with communication disorders. The CHSC is an ASHA-accredited professional service program and serves as the primary training site for graduate students enrolled in the speech-language pathology curriculum. The personnel and facilities of the CHSC provide exceptional clinical experiences for students seeking clinical certification in speech-language pathology.

The department also draws upon clinical resources in University Circle and the Greater Cleveland area. In addition to clinical practicum experiences at the CHSC, graduate students complete at least two externships at sites including University Hospitals of Cleveland, Rainbow Babies and Children’s Hospital, MetroHealth Medical Center, Cuyahoga County Board of Mental Retardation and Developmental Disabilities, Cleveland Clinic Center for Autism, Legacy Health Services, and Western Reserve Speech and Language Partners.

DOCTOR OF PHILOSOPHY

The Doctor of Philosophy is awarded in recognition of (1) mastery, at an advanced level, of a body of knowledge in the disciplines of communication sciences and speech-language pathology, and (2) a demonstrated ability to perform independent research and communicate the results of that research. With the major advisor, the student designs an individual plan of study based on his/her professional goals and previous experience. Doctoral students choose a content area (such as communication and aging, medically based speech disorders, or child language development and disorders) as their primary focus of study. However, they are also encouraged to enhance their scholarly preparation by completing course work outside of their primary content area.

In addition to course work within the department, doctoral students may choose courses from graduate programs in other departments of the College of Arts and Sciences, as well as from several professional schools at the University, including the School of Medicine (e.g., neuroscience, genetics), the Case School of Engineering (e.g., biomedical engineering), the School of Dental Medicine, the Weatherhead School of Management, and the Mandel School of Applied Social Sciences. Additional information about graduate studies and research opportunities is available at the department’s Web site.

Requirements for the doctoral program include course work, research rotations, a supervised classroom teaching experience, written and oral comprehensive examinations, and a dissertation.

- A minimum of 36 credit hours of course work is required, including 9 credit hours in statistics and research design and 3 credit hours of directed study and research. Fifteen credit hours in the primary content area are required.
- Two research rotations are required. One rotation is completed in the primary content area with the major advisor. The second rotation is completed with a faculty member other than the major advisor. The dissertation research is not included in either of the two research rotations.
- A supervised classroom teaching experience (COSI 690) is completed under the guidance of a faculty member in the department.
- Written and oral examinations are taken after all course work and research rotations are completed.
- A dissertation prospectus is prepared under the guidance of a committee consisting of the dissertation advisor and two additional faculty members. A defense of the dissertation prospectus is required prior to commencing the dissertation study.
- An oral defense of the dissertation takes place at the end of the doctoral program.

COURSE DESCRIPTIONS

COSI 101. Introduction to Health Communication (3)

An introductory examination of the influences associated with the functions of human life, communication processes, and research related to health and the health care industry from interpersonal, cultural, and organizational communication perspectives. The course will include a review of the history and development of health communication and the understanding and application of communication theories.

COSI 109. Introduction to Communication Disorders (3)

Forty-two million Americans have some type of communication disorder. How does a person with a communication disorder cope with the challenges of daily living? This course will examine the characteristics of communication disorders via first hand and fictionalized accounts in books, films, and simulated communication disorders experiences. Topics will include disorders of speech, language, and hearing in children and adults. Effects of communication disorders on families.

COSI 200. Interpersonal Communication (3)

Communication is a primary means of initiating, maintaining, and dissolving relationships. Managing interpersonal relationships is a human concern across several contexts. Interpersonal communication is a highly interactive course whereby participants investigate the foundations, processes, and issues associated with communication in relationships. The student will become sensitized to theories and processes via traditional lectures and textbook readings. The student is also expected to participate in group discussions. The result is a continuous dialogue with others about communication processes, and outcomes. The goal of this course is to provide a forum for both investigation and increased competence.

COSI 211. Phonetics and Phonology (3)

Theoretical and applied study of the speech sounds of language. The use of the international phonetic alphabet as a tool for characterizing normal and deviant sound patterns. The linguistic structure and function of speech sound systems of both the adult and developing child.
COSI 220. Introduction to American Sign Language I (3)
This course offers basic vocabulary training and conversational interaction skills in American Sign Language. Syntactic and semantic aspects of American Sign Language will be addressed.

COSI 221. Introduction to American Sign Language II (3)
This class is taught without voice, using functional, whole language approaches and in situ experiences, emphasizing communicative competency. It emphasizes sentence structure development, classifiers, and conversational regulating behaviors. It also covers inflection, role shifting, adversarial nonmanual behaviors, temporal aspects, sequencing, and includes a brief introduction to ASL, English diglossia and biolinguistic aspects. There will be opportunities for discussion of deaf culture. Prereq: COSI 220.

COSI 260. Multicultural Aspects of Human Communication (3)
Introduces intercultural/interracial communication by discussing specific communication principles and by putting theory into practice by exploring differences in perception, and verbal and nonverbal communication messages. Course emphasizes relationship between communication, race, culture; nature of race and culture; and how they influence the communication process. Various theories and approaches to study of intercultural/interracial communication will be discussed, along with significant concepts, processes and considerations. Practical outcomes of intercultural/interracial encounters also will be discussed. Global & Cultural Diversity

COSI 280. Organizational Communication (3)
This course includes a review of the development of organizational communication theories and how application of theories enhances our understanding of various types of organizations. COSI 280 addresses the communication challenges faced by contemporary organizational leaders and members. Knowledge of the theories and development of analytical skills should improve students' chances for successful interactions in diverse organizational situations and cultures.

COSI 300. Theories of Human Communication (3)
An introduction to theories and scholarship of communication. Addresses development and evaluation of theories. The focus is on explaining communication phenomena from a variety of perspectives and philosophies. Communication theories are presented via text, seminal articles, lectures, and discussion. Through discussion and case studies students discover new dimensions in their communicative lives, both personal and professional. Recommended preparation: COSI 100.

COSI 305. Neuroscience of Communication and Communication Disorders (3)
The course focus is neuroanatomy and neurophysiology related to motor control and cognition, particularly aspects of cognition involved in language functions. Topics to be addressed include: principles of neurophysiology and neurochemistry; functional neuroanatomy of the central and peripheral nervous systems; neurological and neuropsychological assessment of communication; neurodiagnostic methods. In part, the course material will be presented in a problem-based learning format. That is, normal aspects of human neuroscience will be discussed in the context of neurological disorders affecting communication.
Off ered as BIOL 379 and COSI 305.

COSI 310. Nonverbal Communication (3)
Most people are familiar with the idea of "body language," but fewer realize the intricacy and potential of nonverbal messages. Nonverbal communication is rule governed, culturally determined, and dependent on encoding and decoding ability. Studying nonverbal communication sensitizes the student to a channel of communication vital to accomplishing shared meaning. Because nonverbal communication is closely related to emotional processes, this course also addresses basic ideas surrounding communication and emotion. Students will read seminal and current literature, make naturalistic observation, and report their findings throughout the semester. Students who take COSI 310 may not receive credit for USSO 204. Students who take USSO 204 may not receive credit for COSI 310. Offered as COSI 310 and USSO 204.

COSI 313. Language Development (3)
Language acquisition theory and stages of development of syntax, semantics, pragmatics, and phonology in children. Contributions of biological, social, cognitive and environmental factors to process of language development. Information on language variation in multicultural populations. Open to majors and non-majors. Recommended prerequisite: Child Psychology. Offered as COSI 313 and COSI 413.

COSI 320. Speech and Hearing Science (3)
The course will focus on the aspects of normal speech production and perception and hearing perception. The purpose of this course is to provide a foundation in normal aspects of oral communication that will prepare students for advanced study in the assessment and management of disorders of speech and hearing perception. Topics to be covered include motor speech control, aeromechanics, basic acoustics, phonatory acoustics, speech and hearing acoustics, psychoacoustics, and speech and hearing perception. Recommended preparation: COSI 325.
Offered as COSI 321 and COSI 421.

COSI 325. Anatomy and Physiology of Speech and Hearing Mechanism (3)
The course will focus on normal anatomy and physiology of the body systems involved in the processes of speech, language, hearing, and swallowing including the following: the auditory, spiroatory, phonatory, articulatory, resonatory, and nervous systems. In part, the course material will be presented in a problem-based learning format. That is, normal aspects of human anatomy and physiology will be discussed in the context of the disorders that affect the processes of human communication and swallowing.

COSI 326. Anatomy and Physiology of Singing Voice (1)
For music students with interest in the use of the vocal mechanism in singing. The systems and processes that contribute to a normal voice for speaking and singing. Focus on normal respiration and phonation, with consideration of disorders resulting from vocal abuse.

COSI 332. Persuasion (3)
This survey course explores the history, theories, and dynamics of persuasion. There is an extensive focus on theoretical models of attitude change. Persuasion also plays a strong role in everyday aspects of our culture. Along these lines, we will investigate persuasion activities in everyday life from compliance gaining to media campaigns. Learning is conveyed through lecture, activities, and observation of the student's everyday life. At the end of the semester, the astute student will be literate in a variety of persuasion strategies and dynamics.

COSI 340. Health Communication (3)
Various communication processes assume a central role in the acquisition and enactment of health care. This course examines communication activity across a broad range of health care contexts. Attention will be given to provider-client communication, communication, and ethical concerns, persuasive health promotion efforts, media impact on health, and basics in health communication methodology and research. Students will consider source, message, and receiver aspects of health communication as well as cultural and illness-specific issues. Prerequisite of COSI 101 for 300 - level only. Offered as COSI 340 and COSI 440. Prereq: COSI 101.

COSI 345. Communication and Aging (3)
The normal and abnormal psychobiological changes that occur during aging and their effects on communication are addressed, as are communicative interaction styles, disordered communication, and rehabilitation practices. Graduate students are given an opportunity to incorporate information from their own disciplines in a special project, where appropriate. Offered as COSI 345 and COSI 445. SAGES Dept Seminar

COSI 352. Introduction to Clinical Practice in Speech-Language Pathology (3)
Clinical assessment and teaching procedures as well as the role of research/theory in clinical practice. Procedures to observe, measure, analyze communication skills. Practical application through case studies. Students complete 25 hours of observation
Various communication processes assume a central role in the acquisition and enactment of health care. This course examines communication activity across a broad range of health care contexts. Attention will be given to provider-client communication, communication, and ethical concerns, persuasive health promotion efforts, media impact on health, and basics in health communication methodology and research. Students will consider source, message, and receiver aspects of health communication as well as cultural and illness-specific issues. Prerequisite of COSI 101 for 300-level only. Offered as COSI 340 and COSI 440.

**COSI 445. Communication and Aging (3)**
The normal and abnormal psychobiological changes that occur during aging and their effects on communication are addressed, as are communication interaction styles, disordered communication, and rehabilitation practices. Graduate students are given an opportunity to incorporate information from their own disciplines in a special project, where appropriate. Offered as COSI 345 and COSI 445.

**COSI 452A. Graduate Clinical Practicum I: Case Management (1)**
Addresses professional issues in speech-language pathology including case management, clinical effectiveness, counseling and working with families from diverse backgrounds. Four to ten hours of clinic contact per week at the Cleveland Hearing and Speech Center. (Maximum of 2 credits.) Recommended preparation: COSI 352 and COSI 413.

**COSI 452B. Graduate Clinical Practicum II: Professional Issues (1)**
Addresses professional issues in speech-language pathology including case management, managed health care, ethics and interviewing. Four to ten hours of clinic contact per week at the Cleveland Hearing and Speech Center. (Maximum of 2 credits.) Recommended preparation: COSI 352, COSI 413, COSI 452A, and COSI 453.

**COSI 452C. Graduate Clinical Practicum III: Special Populations (1)**
Addresses professional issues in speech-language pathology including case management, special clinical populations, collaborating with other professionals, teaming, leadership, and use of technology. Fifteen to thirty hours of clinic contact per week at area skilled nursing facilities, hospitals. (Maximum of 2 credits.) Recommended preparation: COSI 352, COSI 452A, COSI 452B, COSI 452C, COSI 453, and COSI 456.

**COSI 453. Articulation and Phonology Disorders (3)**
Overview of normal speech sound development and characterization of children with speech sound disorders. Distinctions between phonology and articulation are drawn. Theoretical as well as assessment and treatment issues are addressed.

**COSI 455. Fluency Disorders (3)**
Stuttering and related disorders of rhythm and prosody in terms of the symptomatology, etiology, measurement, and treatment of nonfluent speaking behavior.

**COSI 456. Child Language Disorders (3)**

**COSI 463. Language and Literacy Across Content Areas (3)**
This course focuses on research-based theories of reading, cognition, language, and learning. The student will use the content of their area (art, music, or speech-language pathology) as the target for organizing explicit instruction and strategies for word skills, reading comprehension, oral expression, vocabulary, and written language development as they apply to the culturally and linguistically diverse populations present in today’s schools. Curriculum planning and assessment strategies for instructional purposes are addressed. Federal legislation pertaining to the education of children with disabilities is included.

**COSI 464. Case Studies in Communication Disorders: Diagnosis and Treatment (3)**
Diagnosis as a clinical skill involving scientific hypothesis testing with clinical problem solving. The course includes academic learning combined with diagnostic clinic experiences. Overview of psychometric principles, survey of psychological communication tests, and measurements. Section on non-biased assessment. Instruction and practice in effective family interviewing techniques. Prerequisite: COSI 453 and COSI 456.

**COSI 470. Introduction to Audiology (3)**
Disorders of hearing, assessment of hearing; including behavioral and objective measures; intervention strategies; and identification programs. Offered as COSI 370 and COSI 470. Prerequisite: COSI 325.

**COSI 497. Methods of Research (3)**
and apraxia will be discussed. The speech production system, diseases and acquired and congenital neuropsychological conditions that affect motor processes and resulting speech disorders of phonation, articulation, resonance and prosody will be reviewed. Also covered will be the speech, language and hearing disorders stemming from craniofacial anomalies; cleft lip and palate. Principles and methods of assessment and treatment within an interdisciplinary rehabilitation framework will be reviewed for both types of disorders.

Prereq: COSI 405 or equivalent.

COSI 560. Medical Aspects of Speech Pathology I: Voice Disorders (3)

Aspects of normal and abnormal voice production, evaluation and management of various voice and resonance disorders.

COSI 561. Med Aspects of Speech Pathology II: Neuromotor and Craniofacial Anomalies (3)

Speech disorders resulting from conditions acting on motor speech production including dysarthria and apraxia will be discussed. The speech production system, diseases and acquired and congenital neuropsychological conditions that affect motor process and resulting speech disorders of phonation, articulation, resonance and prosody will be reviewed. Also covered will be the speech, language and hearing disorders stemming from craniofacial anomalies; cleft lip and palate. Principles and methods of assessment and treatment within an interdisciplinary rehabilitation framework will be reviewed for both types of disorders.

Prereq: COSI 405 or equivalent.

COSI 562. Medical Aspects of Speech Pathology III: Dysphagia (2)

Survey of clinical problems involving dysphagia in medical speech pathology. Normal swallowing, pediatric dysphagia, adult dysphagia, the clinical swallowing assessment, the modified barium swallow study, and therapeutic intervention for dysphagia for both adults and children will be addressed.

COSI 580. Aural Rehabilitation (3)

The effects of hearing impairment, especially related to speech perception and language processing. Remediation and intervention strategies for hearing impaired children and adults, including speech reading, auditory training, and the use of hearing aids.

COSI 600. Special Problems and Topics (1–3)

Topics and instructors by arrangement of the department chair.

COSI 601. Directed Study and Research (1–6)

Individual study and research under the direction of a faculty member.

COSI 651. Thesis M.A. (1–6)

COSI 690. Supervised Classroom Teaching (3)

Required of all doctoral students. Teaching of an undergraduate course planned in conjunction with a supervising faculty member. Follows the doctoral student’s earlier experience of observing and assisting a faculty member in classroom teaching.

COSI 701. Dissertation Ph.D. (1–18)

Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

COMPUTER SCIENCE

The College of Arts and Sciences awards the Bachelor of Arts degree in computer science. The required courses for the major and minor are offered by the Department of Electrical Engineering and Computer Science in the Case School of Engineering.

For details about the department’s undergraduate programs, please consult the Case School of Engineering section of this bulletin.

DEPARTMENT OF ECONOMICS

The College of Arts and Sciences awards the Bachelor of Arts degree in economics. The required courses for the major and minor are offered by the Department of Economics in the Weatherhead School of Management.

For details about the department’s undergraduate programs, please consult the Weatherhead School of Management section of this bulletin.

DEPARTMENT OF ENGLISH

106 Guilford House
www.case.edu/artsci/engl
Phone: 216-368-2364; Fax: 216-368-4367
William R. Siebenschu, Chair
E-mail: william.siebenschu@case.edu

The Department of English offers courses of study leading to the Bachelor of Arts, Master of Arts, and Doctor of Philosophy degrees. Included among the department’s offerings are literary and cultural studies, linguistics, film, journalism, creative writing, rhetoric and professional writing.

Combining the intellectual resources of a major research university with a scale and a set of values more typical of a liberal arts college, the department puts great stress on class discussion, individual conferences or tutorials, and other opportunities for students and faculty to work closely together. Likewise, the curriculum is deliberately flexible enough to respond to student needs and interests and to encourage close cooperation with the faculty in planning a course of study.

An undergraduate major in English prepares one first and foremost to be a thoughtful, responsible person and a lifelong learner. A major in English also prepares one for various sorts of careers. Three paths are common:

• English leads readily to careers that put a premium on writing skills and on the ability to analyze complex human situations. In addition to the fields that have often been of first interest to English majors (writing and publishing, journalism, advertising, the film industry, public relations, and teaching), significant opportunities exist in the corporate world, in government, and in nonprofit organizations such as those devoted to social service, the environment, or the arts.

• The B.A. in English is usually essential to anyone expecting to do graduate work in English or to pursue a career as a teacher or a scholar in the field.

• The B.A. in English traditionally has been an important steppingstone to success in professional school, and many of our English majors choose this path. A significant number go on to law school, many to medical or business school, and some to nursing, journalism, social work, or library school, as well as directly into the business world.

DEPARTMENT FACULTY

William R. Siebenschu, Ph.D.
(University of California, Berkeley)
Professor and Chair
18th- and 19th-century British literature; biography and autobiography

Kimberly Emmons, Ph.D.
(University of Washington)
Assistant Professor
Rhetoric; composition; gender and language

Christopher Flint, Ph.D.
(University of Pennsylvania)
Associate Professor; Director of Graduate Studies
18th-century English literature; history of the book

T. Kenneth Fountain, Ph.D.
(University of Minnesota)
Assistant Professor
Scientific and technical communication; vi-
sual rhetoric
Mary Grimm, M.A.
(Cleveland State University)
Associate Professor
Creative writing (fiction); contemporary literature

Megan Swihart Jewell, Ph.D.
(Duquesne University)
Instructor; Director, Writing Resource Center
19th-century American literature; poetics

Kurt Koenigsberger, Ph.D.
(Vanderbilt University)
Associate Professor; Associate Director, Society for Critical Exchange
19th- and 20th-century British literature; post-colonial literature

James Kuzner, Ph.D.
(Johns Hopkins University)
Assistant Professor
Renaissance literature: Shakespeare

William H. Marling, Ph.D.
(University of California, Santa Barbara)
Professor
American literature; modernism

John M. Orlock, M.E.A.
(Pennsylvania State University)
Samuel R. and Virginia C. Knight Professor of Humanities
Playwriting; screenwriting

Judith Oster, Ph.D.
(Case Western Reserve University)
Professor
The teaching of English; American literature; poetry

Robert Spadoni, Ph.D.
(University of Chicago)
Assistant Professor
Film studies

Gary Lee Stonum, Ph.D.
(Johns Hopkins University)
Osiiatt Professor
American literature; literary theory

Thirty Umrigar, Ph.D.
(Kent State University)
Associate Professor
Creative writing (fiction and memoir); journalism; African-American literature

Athena Vrettos, Ph.D.
(University of Pennsylvania)
Associate Professor
19th-century English literature, women’s studies

Martha Woodmansee, Ph.D.
(Stanford University)
Professor
Literary theory; 18th- and 19th-century literature; comparative literature; intellectual property

FACILITIES
In Strosacker Auditorium, the Film Society maintains facilities capable of projecting 35mm and 16mm films. In addition to manuscript and rare-book holdings in the Special Collections Division, Kelvin Smith Library has strengths in Renaissance literature, 18th- and 19th-century English literature, and American literature. The library also houses an outstanding collection of several thousand films and other audiovisual materials, supported in part by English department endowment funds. In the library’s Freedman Center, students have access to video cameras, state-of-the-art digital editing software, and stations where it is possible to view audiovisual materials from the library collection.

UNDERGRADUATE PROGRAMS
Major
The major in English includes two tracks. The primary track consists of at least 30 semester hours in English above the 100 level (including 15 hours at the 300 level or above). The required courses are ENGL 300 (English Literature to 1800); either ENGL 302 (English Literature since 1800) or ENGL 308 (American Literature); ENGL 380 (Departmental Seminar); ENGL 395 (Senior Capstone); and one course from the following list of courses dealing with literature before 1800: ENGL 310 (History of the English Language), ENGL 312 (Chaucer), ENGL 320 (Renaissance Literature), ENGL 323 (Milton), ENGL 324 (Shakespeare I), ENGL 325 (Shakespeare II), ENGL 326 (17th-Century Literature), ENGL 327 (18th-Century Literature), ENGL 328 (18th-Century Studies), and ENGL 329 (English Literature 1780-1837).

Because of the flexibility of departmental requirements and the variety of career paths to which the major may lead, all students should confer frequently and closely with advisors. No courses outside the department are required for the major, but the department recommends courses in comparative literature, history, philosophy, history and criticism of the fine arts, theater, and literature in other languages. Students planning to go to graduate school are reminded of the importance of foreign language study.

Completion of the University composition requirement (ENGL 150 or SAGES First Seminar) is a prerequisite for most English courses at the 200 level and above.

Departmental Honors
To qualify for honors, English majors follow a track consisting of at least 36 hours above the 100 level, including the general requirements for the major (see above); ENGL 387 (Critical Theory), or approved substitute; at least 18 hours of approved electives in literary and cultural studies; and one of the following language courses: FRCH 202, GREK 202, GRMN 202, JAPN 202, LATN 202, SPAN 202, or equivalent in a language for which 300-level literature courses are available. The award of honors requires a minimum GPA of 3.5 in courses taken for the Honors Program.

Teacher Licensure in Integrated Language Arts
A special program is available that leads to the B.A. and candidacy for licensure by the State of Ohio to teach Integrated Language Arts in grades 7-12 (Adolescents to Young Adults). The teaching credential is valid in Ohio, and it is honored in many other states. The program consists of a more prescriptive form of the normal English major and a series of education courses that includes student teaching in a local school. (See the program description for Teacher Licensure elsewhere in this bulletin.) Because of the student teaching and because some of the education courses must be taken at John Carroll University, early and careful planning is vital. Consult Judith Oster, the English advisor, for details about this program.

The subject area requirements for teacher licensure (42 credit hours) are as follows: ENGL 150, 200, 202, 204, 256, 300, 380, 390, 393; ENGL 255 or 257K; ENGL 259; ENGL 301, 307, 379, or COSI 313; two of ENGL 257B, 270, 362H, 365E, 365Q, 366G; ENGL 368A, 368B, or 368C. Recommended Electives: ENGL 203, 214, 303, 304, 310, 317, 392, 480.

Integrated Graduate Studies
The Department of English participates in the Integrated Graduate Studies program, which makes it possible to complete both a B.A. and an M.A. in English in about five years of full-time study. The department particularly recommends the program to qualified stu-
GRADUATE PROGRAMS
The Department of English offers programs in American and English literature and language leading to the Master of Arts and Doctor of Philosophy degrees. At either the M.A. or Ph.D. level, students may elect a concentration in Writing History and Theory. The department also collaborates with the Department of Modern Languages and Literatures in offering a Master of Arts in comparative literature.

COURSES DESCRIPTIONS

ENGL 148. Introduction to Composition (3) Practice and training in various modes and genres of writing. Undergraduate CIM students placed into ENGL 148 must complete the course with a grade of C or higher in order to enroll in ENGL 150.

ENGL 150. Expository Writing (3) Substantial training and practice in academic writing.

ENGL 180. Writing Tutorial (1-2) Substantial scheduled tutorial work in writing.

ENGL 181. Reading Tutorial (1) Scheduled tutorial in reading for those who need work beyond ENGL 148 or who come to the Writing Center seeking substantial help. May be repeated in special instances, but only one semester hour will count toward the degree.

ENGL 183. Academic Writing Studio (1) A course exploring basic issues and techniques of academic writing. Students who take it as early in the sequence as possible will be required to make up deficiencies without graduate credit. The department requires all candidates for admission to submit their scores on aptitude sections of the Graduate Record Examination. Candidates are also required to submit a writing sample, consisting of at least 15 pages of academic writing. Students whose native language is not English are normally admitted only as provisional students. After 12 semester hours of satisfactory work, they are granted regular status.

New and continuing graduate students may apply for graduate student assistantships, teaching is viewed as part of the education of every graduate student. The department provides opportunities for graduate assistants to gain teaching experience in a variety of English courses. Other teaching opportunities exist elsewhere in the university and in Greater Cleveland.

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ENGL 200. Literature in English (3) This course introduces students to the reading of literature in the English language. Through close attention to the practice of reading, students are invited to consider some of the characteristic forms and functions imaginative literature has taken, together with some of the changes that have taken place in what and how readers read. Recommended preparation: Concurrent enrollment in ENGL 150 or USFS 100.

ENGL 202. Expository Writing (3) A course exploring basic issues and techniques of academic writing. Students who take it as early in the sequence as possible will be required to make up deficiencies without graduate credit. The department requires all candidates for admission to submit their scores on aptitude sections of the Graduate Record Examination. Candidates are also required to submit a writing sample, consisting of at least 15 pages of academic writing. Students whose native language is not English are normally admitted only as provisional students. After 12 semester hours of satisfactory work, they are granted regular status.

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ENGL 204. Introduction to Journalism (3) A course exploring basic issues and techniques of writing narrative prose and verse through exercises, analysis, and experiment. For students who wish to try their abilities across a spectrum of genres. Recommended preparation: ENGL 150 or USFS 100.

ENGL 213. Introduction to Fiction Writing (3) A beginning workshop in fiction writing, introducing such concepts as voice, point of view, plot, characterization, dialogue, description, and the like. May include discussion of literary examples,
both classic and contemporary, along with student work. Recommended preparation: ENGL 150 or USFS 100.

ENGL 214. Introduction to Poetry Writing (3)
A beginning workshop, focusing on such elements of poetry as verse-form, syntax, figures, sound, tone. May include discussion of literary examples as well as student work. Recommended preparation: ENGL 150 or USFS 100.

ENGL 217B. Writing for the Health Professions (3)
This course offers practice and training in the professional and technical writing skills common to health professions (e.g., medicine, nursing, dentistry). Attention will be paid to the writing processes of drafting, revising, and editing. Typical assignments include letters, resumes, personal science, professional communication genres (e.g., e-mail, reports, patient charts, and histories), and scholarly genres (e.g., abstracts, articles, and reviews). Recommended preparation: FSCC 100 or equivalent.

ENGL 255. Major British Writers (3)
Introduction to literary studies and survey of selected English authors from the Medieval period to the present. Recommended preparation: Concurrent enrollment in ENGL 150 or USFS 100.

ENGL 256. Major American Writers (3)
Introduction to literary studies and survey of literature of the United States from colonial times to the present. Recommended preparation: Concurrent enrollment in ENGL 150 or USFS 100.

ENGL 257A. The Novel (3)
Introductory readings in the novel. May be organized chronologically or thematically. Some attention to the novel as a historically situated genre.

ENGL 257B. Poetry (3)
Introductory readings in poetry. May be organized chronologically or thematically. Attention to the formal qualities of poetry in relation to meaning, expressivity, etc.

ENGL 270. Introduction to Gender Studies (3)
This course introduces women and men students to the methods and concepts of gender studies, women’s studies, and feminist theory. An interdisciplinary course, it covers approaches used in literary criticism, history, philosophy, political science, sociology, anthropology, psychology, film studies, cultural studies, art history, and religion. It is the required introductory course for students taking the women’s studies major. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 270, HSTY 270, PHIL 270, RLGN 270, and WGST 201.
Global & Cultural Diversity

ENGL 285. Special Topics Seminar (1)
One-credit seminars on special topics in literature or language; see departmental listings for topics each term. Maximum of 3 credits. Recommended preparation: ENGL 150 or USFS 100.

ENGL 290. Masterpieces of Continental Fiction (3)
Major works of fiction from the 19th century and earlier. Offered as ENGL 290 and WLIT 290.

ENGL 291. Masterpieces of Modern Fiction (3)
Major works of fiction of the 20th century. Offered as ENGL 291 and WLIT 291.

ENGL 300. English Literature to 1800 (3)
A survey of major British authors from Chaucer to Milton and Dryden. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 301. Linguistic Analysis (3)
Analysis of modern English from various theoretical perspectives: structural, generative, discourse analytical, sociolinguistic, psycholinguistic, and cognitive linguistic. Some attention to the major dialects of American English. Offered as ENGL 301 and ENGL 401. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 302. English Literature from 1800 to the 20th Century (3)
A survey of major British authors from Wordsworth to the present. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 303. Intermediate Writing Workshop: Fiction (3)
Continues developing the concepts and practice of the introductory courses, with reading, writing, and discussion of fiction in various forms, including the short story, the novella; and the novel. Maximum 6 credits. Prereq: ENGL 203 or ENGL 213.

ENGL 304. Intermediate Writing Workshop: Poetry (3)
Continues developing the concepts and practice of the introductory courses, with emphasis on the reading and revision as well as consideration of poetic genres through examples from established poets. Maximum 6 credits. Prereq: ENGL 203 or ENGL 214.

ENGL 305. Playwriting (3)
Theory and practice of dramatic writing, in the context of examples, classic and contemporary. Recommended preparation: ENGL 203 or ENGL 213 or ENGL 214 or ENGL 303 or ENGL 304. Offered as ENGL 305 and THTR 312.

ENGL 306. Intermediate Writing Workshop: Creative Non-Fiction (3)
A writing workshop that focuses on non-fiction (journals, memoirs, etc.) Students will study and write narrative journalism, the memoir, and the personal essay. Prereq: ENGL 203 or ENGL 213 or ENGL 214.

ENGL 307. Intermediate Writing Workshop: Journalism (3)
Continues developing the concepts and practices of the introductory course, with emphasis on feature writing for magazines, story structure, and reportorial techniques. Prereq: ENGL 204 and either ENGL 150 or 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, or FSCS.

ENGL 308. American Literature (3)
A survey of major American authors from the puritans to the present. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 309. Topics in Journalism (3)
Study and practice of specialized forms of journalism. Maximum of six credits. Recommended preparation: ENGL 150 or USFS 100.

ENGL 310. History of the English Language (3)
An introductory course covering the major periods of English language development: Old, Middle, and Modern. Students will examine both the linguistic forms and the cultures in which the forms were used. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 310 and ENGL 410.

ENGL 312. Chaucer (3)
An introduction to the work of Geoffrey Chaucer, with emphasis on “The Canterbury Tales.” Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 314. Advanced Playwriting (3)
Theory and practice of dramatic writing with special focus on the craft of writing a full-length play. Offered as ENGL 314 and THTR 314. Prereq: ENGL 305 or THTR 312.

ENGL 316. Screenwriting (3)
A critical exploration of the craft of writing for film, in which reading and practicum assignments will culminate in the student submitting an original full-length screenplay. Offered as ENGL 316 and THTR 316.

ENGL 317. Business and Technical Writing (3)
Professional communication in theory and practice, including audience analysis, logic and strategy applied to the writing of technical reports, proposals, manuals, progress and feasibility studies, memoranda, and letters. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 320. Renaissance Literature (3)
Aspects of English Renaissance literature and its contexts from 1500-ca. 1620. Genres studied might include poetry, drama, prose fiction, expository and polemic writing, or some works from Continental Europe. Writers such as Skelton, More, Erasmus, Wyatt, Sidney, Spenser, Marlowe, Lanier, Wroth, Shakespeare, Donne. Maximum 6 credits. Offered as ENGL 320 and ENGL 420. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 323. Milton (3) Poetry and selected prose, including the careful study of "Paradise Lost." Offered as ENGL 323 and ENGL 423. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 324. Shakespeare: Histories and Tragedies (3) Close reading of a selection of Shakespeare's tragedies and history plays (e.g., "Richard the Third," "Julius Caesar," "Hamlet," "King Lear"). Topics of discussion may include Renaissance drama as a social institution, the nature of tragedy, national history, gender roles, sexual politics, the state and its opponents, theatrical conventions. Assessment may include opportunities for performance. Offered as ENGL 324, ENGL 424, and THTR 334. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 325. Shakespeare: Comedies and Romances (3) Close reading of selected plays of Shakespeare in the genres of comedy and romance (e.g., "The Merchant of Venice," "Twelfth Night," "Measure for Measure," "The Tempest"). Topics of discussion may include issues of sexual desire, gender roles, marriage, the family, genre conventions. Assessment may include opportunities for performance. Offered as ENGL 325, ENGL 425, and THTR 335. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 327. Eighteenth-Century Literature (3) Survey of a variety of writings from or relevant to the eighteenth century. Writers discussed may include Dryden, Behn, Defoe, Pope, Swift, Gay, Fielding, Richardson, Burney, Wollstonecraft and others working in drama, lyric and epic poetry, biography and autobiography, political and philosophical writings and prose fiction. Thematic approaches may include: satire, journalism and literature, the rise of the novel. Maximum 6 credits. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 328. Studies in the Eighteenth Century (3) This course examines selected topics in the English literary culture of the eighteenth century, a culture which extended to the Americas and to other English colonies. Literary writings will be examined in relation to other aspects of the culture, which may include visual arts, marital institutions, the printing industry, property law, medicine, and other topics. Maximum 6 credits. Offered as ENGL 328 and ENGL 428. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 329. English Literature, 1780-1837 (3) Aspects of English literature and its contexts in the early 19th century. Genres might include poetry, prose fiction, political and philosophical writing, literary theory of the period. Writers such as the Wordsworth, Coleridge, Blake, Austen, Byron, the Shelleys. Maximum 6 credits. Offered as ENGL 329 and ENGL 429. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 330. Victorian Literature (3) Aspects of English literature and its contexts during the reign of Queen Victoria. Genres studied might include poetry, prose fiction, political and philosophical writing. Writers such as the Brontes, Gaskell, Dickens, Eliot, Hardy, Tennyson, the Brownings, Arnold, Carlyle, Ruskin, Goss, Swinburne, and Hopkins. Maximum 6 credits. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 331. Studies in the Nineteenth-Century (3) Individual topics in English literary culture of the 19th century. Topics might be thematic or formal, such as literature and science, medicine, labor, sexuality, or Empire; literature and other arts; Gothic fiction, decadence. Maximum 6 credits. Offered as ENGL 331 and ENGL 431. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 332. Twentieth-Century British Literature (3) Aspects of British literature (broadly interpreted) and its contexts during the 20th century. Genres studied might include poetry, fiction, and drama. Such writers as Joyce, Woolf, Conrad, Ford, Lawrence, Mann, Shaw, Beckett, Stoppard, Yeats, Edward or Dylan Thomas, Stevie Smith, Bowen, Spark. Maximum 6 credits. Offered as ENGL 332 and ENGL 432. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 333. Studies in the Twentieth Century (3) Individual topics in twentieth-century literary culture. Particular issues and topics may cross national boundaries and genre lines as well as explore political, psychological, and social themes, such as movements, comparative studies across the arts, literature and war, literature and occultism. Maximum 6 credits. Offered as ENGL 333 and ENGL 433. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 334. Shakespeare: Histories and Tragedies (3) Offered as ENGL 324, ENGL 424, and THTR 334. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGLISH 335. Major Writers (3) Close and detailed study of the work of one or two writers: development, social and aesthetic contexts, reception, interpretation, significance. Maximum 6 credits. Offered as ENGL 353 and ENGL 453. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 336. American Literature Before 1865 (3) Aspects of American literature and its contexts from the colonial period through the end of the Civil War. Writers such as Bradstreet, Taylor, Franklin, Poe, Stowe, Alcott, Melville, Hawthorne, Emerson, Douglass. Maximum 6 credits. Offered as ENGL 356 and ENGL 456. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 337. American Literature 1865-1914 (3) Aspects of American literature and its contexts from the Civil War to the First World War. Writers such as Whitman and Dickinson, Twain, Howells, James, Chopin, Wharton. Maximum 6 credits. Offered as ENGL 357 and ENGL 457. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 338. American Literature 1914-1960 (3) Aspects of American literature and its contexts from the First World War to the Cold War. Genres studied might include fiction, poetry, drama, polemics. Writers such as T.S. Eliot, Pound, Stevens, Moore, W.C. Williams, Dos Passos, West, Fitzgerald, Hemingway, Cather, Faulkner, Barnes, Miller, T. Williams, O’Neill. Maximum 6 credits. Offered as ENGL 358 and ENGL 458. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 339. Studies in Contemporary American Literature (3) Individual topics in literary culture since the 1960s. Topics may include the Beats, literature of the Vietnam war, post-modern fiction, contemporary poetry, the documentary novel. Maximum 6 credits. Offered as ENGL 359 and ENGL 459. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 340. Studies in American Literature (3) Individual topics in American literary culture such as regionalism, realism, impressionism, literature and popular culture, transcendentalism, the lyric, proletarian literature, the legacy of the Civil War. Maximum 6 credits. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 341. Modern American Literature (3) Offered as ENGL 341 and ENGL 441. Prereq: 100 level first year seminar in USFS, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.
ENGL 363H. African-American Literature (3)
A historical approach to African-American literature. Such writers as Wheatley, Equiano, Douglass, Jacobs, DuBois, Hurston, Hughes, Wright, Baldwin, Ellison, Morrison. Topics covered may include slave narratives, African-American autobiography, the Harlem Renaissance, the Black Aesthetic, literature or protest and assimilation. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 363H, ETHS 363H, WLIT 363H, ENGL 463H, and WLIT 463H. Global & Cultural Diversity

ENGL 365E. The Immigrant Experience (3)
Study of fictional and/or autobiographical narrative by authors whose families have experienced immigration to the U.S. Among the ethnic groups represented are Asian-American, Jewish-American, Hispanic-American. May include several ethnic groups or focus on a single one. Attention is paid to historical and social aspects of immigration and ethnicity. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 365E, WLIT 365E, ENGL 465E, and WLIT 465E. Global & Cultural Diversity

ENGL 365N. Topics in African-American Literature (3)
Selected topics and writers from nineteenth and twentieth-century African-American literature. May focus on a genre, a single author or a group of authors, a theme or themes. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 365N, ETHS 365N, WLIT 365N, ENGL 465N, and WLIT 465N. Global & Cultural Diversity

ENGL 365Q. Post-Colonial Literature (3)
Readings in national and regional literatures from former European colonies such as Australia and African countries. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 365Q, ETHS 365Q, WLIT 365Q, ENGL 465Q, and WLIT 465Q. Global & Cultural Diversity

ENGL 366G. Minority Literatures (3)
A course dealing with literature produced by ethnic and racial minority groups within the U.S. Individual offerings may include works from several groups studied comparatively, or focus on a single group, such as Native Americans, Chicano/Chicana, Asian-Americans, Caribbean-Americans. African-American works may also be included. May cover the entire history of the U.S. or shorter periods. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 366G, WLIT 466G, ENGL 466G, and WLIT 466G. Global & Cultural Diversity

ENGL 367. Introduction to Film (3)
An introduction to the aesthetics of film form. We will analyze the elements that make up a film, screening films that facilitate our discussion of how these elements interact with one another to constitute whole formal systems that generate meanings and other effects. We will bring various theoretical and historical considerations to bear as we explore and appreciate the art of cinema. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 367 and ENGL 467.

ENGL 368A. Film History, Theory, and Criticism (3)
This course is an introduction to the three major approaches to cinema that together constitute the field of film studies. The course will be broken into three units: film theory; film criticism; and film history. Screening one film per week, we will consider each film in light of the particular unit’s and week’s focus. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 368A, WLIT 368A, ENGL 468A, and WLIT 468A.

ENGL 368B. History of Film (3)
Analysis of selected topics in film history, such as film before 1940, American cinema 1940 to the present. European or Asian cinema since 1940. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 368B and ENGL 468B.

ENGL 368C. Topics in Film (3)
Individual topics in film, such as a particular national cinema, images of women in film, film comedy, New Wave film, literature and film. Maximum 12 credits. Offered as ENGL 368C, WLIT 368C, ENGL 468C, and WLIT 468C.

ENGL 371. Topics in Women’s Studies (3)
Individual topics and issues in women’s studies relating to writing by and about women, such as feminist theory and criticism; the politics of gender and sexuality; women in popular culture; women in the writing business. Maximum 6 credits. Offered as ENGL 371 and ENGL 471. Prereq: 100 level first year seminar in USFS, FSNA, FSNO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 372. Studies in the Novel (3)
Selected topics in the history and formal development of the novel, such as detective novels; science fiction; epistolary novels; the rise of the novel; the stream of consciousness novel; the Bildungsroman in English. Maximum 6 credits. Offered as ENGL 372 and ENGL 472. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSNO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 373. Studies in Poetry (3)
Selected topics and issues in the study of poetry, such as reading poetry, the elegy, pastoral poetry, love poetry, the long poem, form and meter in poetry. Maximum 6 credits. Offered as ENGL 373 and ENGL 473.

ENGL 374. Internship in Journalism (3–6)
Students work as interns at area newspapers, magazines, trade publications, radio or television and meet as a class to share their experiences as interns and to focus on editorial issues—reporting, writing, fact-checking, editing—that are a part of any journalistic enterprise. Students are responsible for pre-arranging their internship prior to the semester they intend to take the class but can expect guidance from the instructor in this regard. Recommended preparation: ENGL 204 or permission of the department.

ENGL 375. Internship in Technical Communication (3–6)
Students create technical and professional documents in a selected corporate or organizational setting, do assigned reading, and meet as a class to participate in seminar discussions and review of work. Students must pre-arrange internship assignment with instructor prior to semester. Recommended preparation: ENGL 317 or ENGL 398N and permission of department.

ENGL 376. Studies in Genre (3)
Topics in literary genres, such as comedy, biography and autobiography, satire, allegory, the short story, the apologue, narrative poetry. May cross over the prose/poetry boundary. Maximum 6 credits. Offered as ENGL 376 and ENGL 476. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSNO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 379. Topics in Language Studies (3)
Aspects of contemporary language studies. Topics such as history of rhetoric, Saussurean linguistics, generative grammar, psycholinguistics, sociolinguistics, cognitive and construction grammars, metaphor, language acquisition, stylistics. Maximum 9 credits. Offered as ENGL 379 and ENGL 479. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSNO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 380. Departmental Seminar (3)
The English departmental seminar, recommended for the junior year. A topical course, emphasizing disciplinary forms of writing. The class will incorporate an advising function, so that students are prepared for choosing a project for their Capstone Seminar. Prereq or Coreq: ENGL 300. SAGES Dept Seminar

ENGL 385. Special Topics in Literature (3)
Close study of a theme or aspect of literature not covered by traditional generic or period rubrics, such as “spatial imagination,” “semiotics of fashion in literature,” “epistolary.” Maximum 9 credits. Offered as ENGL 385 and ENGL 485. Prereq: 100 level first year seminar in USFS, FSCC,
ENGL 386. Studies in Literature and Culture (3)
Boundary-crossing study of the relations between literary and other aspects of a particular culture or society, including theoretical and critical issues raised by such study. For example, literature and medicine, gay and lesbian literature, Asian/ Western literary relations, emotion in literature, philosophy and literature, literature and music. Maximum 9 credits. Offered as ENGL 366 and ENGL 466. Prereq: 100 level first year seminar in USFS, FSCE, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 387. Literary and Critical Theory (3)
A survey of major schools and texts of literary and critical theory. May be historically or thematically organized. Maximum 6 credits. Offered as ENGL 387, WLLT 387, ENGL 487, and WLLT 487. Prereq: 100 level first year seminar in USFS, FSCE, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 390. Independent Study and Creative Projects (1-6)
Up to six semester hours of independent study may be taken in a single semester. Must have prior approval of faculty member directing the project. Projects may be critical or creative in nature.

ENGL 392. Classroom Teaching (3)
For undergraduate students who assist in the teaching of ENGL 150, 180, or 181. Interested students should check with the director of composition (for ENGL 150, 180, or 181) before the beginning of the semester in which they wish to participate. May be repeated only once; not more than three semester hours in ENGL 392 may be counted toward the major. Prereq: ENGL 382. Offered as ENGL 382, USFS 100.

ENGL 395. Capstone Seminar (3)
Capstone course, to be taken in the senior year. Open to non-English majors. Required for the English Honors Track. Features individual projects in a workshop environment; students have the option of a research-based or a creative writing project. Prereq: ENGL 300 and ENGL 380. SAGES Senior Cap

ENGL 398. Professional Communication for Engineers (2)
A writing course for Engineering students only, covering academic and professional genres of written and oral communication. Taken in conjunction with Engineering 398, English 398 constitutes an approved SAGES Departmental Seminar. Prereq: ENGL 150 or 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, or FSCS. Coreq: ENGR 398. SAGES Dept Seminar

ENGL 398N. Professional Communication for Engineers (3)
Principles and practices of effective communication in the workplace, with an emphasis on computer-mediated communication. Topics include analyzing audience needs in context, visual communication, computer-mediated documents, ethics, and team writing. Typical assignments include e-mail, memos, letters, reports, documentation, and oral presentations. Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, FSTS, FSCS or ENGL 150.

ENGL 399. Senior Thesis (3)
Elective research or creative project. Should be used for Honors Projects option. By department approval only. Maximum 6 credits.

ENGL 400. Rhetoric and Teaching of Writing (3)
Classical and modern theories of rhetoric; their application in the classroom. Required of graduate assistants and tutors who have had no prior experience in the teaching of composition. Prereq: Graduate standing.

ENGL 401. Linguistic Analysis (3)
Analysis of modern English from various theoretical perspectives: structural, generative, discourse analytical, sociolinguistic, psycholinguistic, and cognitive linguistic. Some attention to the major dialects of American English. Offered as ENGL 301 and ENGL 401.

ENGL 406. Advanced Creative Writing (3)
Workshop for serious undergraduate and graduate writers. Offered alternate years; alternates between poetry and fiction. Admission requires review of writing sample by faculty. Maximum 6 credits.

ENGL 410. History of the English Language (3)
An introductory course covering the major periods of English language development: Old, Middle, and Modern. Students will examine both the linguistic forms and the cultures in which the forms were used. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 310 and ENGL 410.

ENGL 420. Renaissance Literature (3)
Aspects of English Renaissance literature and its contexts from 1500-ca. 1620. Genres studied might include poetry, drama, prose fiction, expository and polemic writing, or some works from Continental Europe. Writers such as Skelton, More, Erasmus, Wyatt, Sidney, Spenser, Marlowe, Lanier, Wroth, Shakespeare, Donne. Maximum 6 credits. Offered as ENGL 320 and ENGL 420.

ENGL 423. Milton (3)
Poetry and selected prose, including the careful study of “Paradise Lost.” Offered as ENGL 323 and ENGL 423.

ENGL 424. Shakespeare: Histories and Tragedies (3)
Close reading of a selection of Shakespeare’s tragedies and history plays (e.g., “Richard the Third,” “Julius Caesar,” “Hamlet,” “King Lear”). Topics of discussion may include Renaissance drama as a social institution, the nature of tragedy, national history, gender roles, sexual politics, the state and its opponents, theatrical conventions. Assessment may include opportunities for performance. Offered as ENGL 324, ENGL 424, and THTR 334.

ENGL 425. Shakespeare: Comedies and Romances (3)
Close reading of selected plays of Shakespeare in the genres of comedy and romance (e.g., “The Merchant of Venice,” “Twelfth Night,” “Measure for Measure,” “The Tempest”). Topics of discussion may include issues of sexual desire, gender roles, marriage, the family, genre conventions. Assessment may include opportunities for performance. Offered as ENGL 325, ENGL 425, and THTR 335.

ENGL 428. Studies in the Eighteenth Century (3)
This course examines selected topics in the English literary culture of the eighteenth century, a culture which extended to the Americas and to other English colonies. Literary writings will be examined in relation to other aspects of the century culture, which may include visual arts, marital institutions, the printing industry, property law, medicine, and other topics. Maximum 6 credits. Offered as ENGL 328 and ENGL 428.

ENGL 429. English Literature, 1780-1837 (3)
Aspects of English literature and its contexts in the early 19th century. Genres might include poetry, prose fiction, political and philosophical writing, literary theory of the period. Writers such as the Wordsworth, Coleridge, Blake, Austen, Byron, the Shelleys. Maximum 6 credits. Offered as ENGL 329 and ENGL 429.

ENGL 431. Studies in the Nineteenth-Century (3)
Individual topics in English literary culture of the 19th century. Topics might be thematic or formal, such as literature and science, medicine, labor, sexuality, or Empire; literature and other arts; Gothic fiction, decadence. Maximum 6 credits. Offered as ENGL 331 and ENGL 431.

ENGL 432. Twentieth-Century British Literature (3)
Aspects of British literature (broadly interpreted) and its contexts during the 20th century. Genres studied might include poetry, fiction, and drama. Such writers as Joyce, Woolf, Conrad, Ford, Lawrence, Mansfield, Shaw, Beckett, Stoppard, Yeats, Edward or Dylan Thomas, Stevie Smith, Bowen, Spark. Maximum 6 credits. Offered as ENGL 332 and ENGL 432.
ENGL 433. Studies in the Twentieth Century (3)
Individual topics in twentieth-century literary culture. Particular issues and topics may cross national boundaries and genre lines as well as explore political, psychological, and social themes, such as movements, comparative studies across the arts, literature and war, literature and occultism. Maximum 6 credits. Offered as ENGL 333 and ENGL 433.

ENGL 453. Major Writers (3)
Close and detailed study of the work of one or two writers: development, social and aesthetic contexts, reception, interpretation, significance. Maximum 6 credits. Offered as ENGL 353 and ENGL 453.

ENGL 456. American Literature Before 1865 (3)
Aspects of American literature and its contexts from the colonial period through the end of the Civil War. Writers such as Bradstreet, Taylor, Franklin, Poe, Stowe, Alcott, Melville, Hawthorne, Emerson, Douglass. Maximum 6 credits. Offered as ENGL 356 and ENGL 456.

ENGL 457. American Literature 1865–1914 (3)
Aspects of American literature and its contexts from the Civil War to the First World War. Writers such as Whitman and Dickinson, Twain, Howells, James, Chopin, Wharton. Maximum 6 credits. Offered as ENGL 357 and ENGL 457.

ENGL 458. American Literature 1914–1960 (3)
Aspects of American literature and its contexts from the First World War to the Cold War. Genres studies might include fiction, poetry, drama, polemics. Writers such as T.S. Eliot, Pound, Stevens, Moore, W.C. Williams, Dos Passos, West, Fitzgerald, Hemingway, Cather, Faulkner, Barnes, Miller, T. Williams, O’Neill. Maximum 6 credits. Offered as ENGL 358 and ENGL 458.

ENGL 459. Studies in Contemporary American Literature (3)
Individual topics in literary culture since the 1960s. Topics may include the Beats, literature of the Vietnam war, post-modern fiction, contemporary poetry, the documentary novel. Maximum 6 credits. Offered as ENGL 359 and ENGL 459.

ENGL 463H. African-American Literature (3)
A historical approach to African-American literature. Such writers as Wheatley, Equiano, Douglass, Jacobs, DuBois, Hurston, Hughes, Wright, Baldwin, Ellison, Morrison. Topics covered may include slave narratives, African-American autobiography, the Harlem Renaissance, the Black Aesthetic, literature or protest and to assimilation. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100.

ENGL 465E. The Immigrant Experience (3)
Study of fictional and/or autobiographical narrative by authors whose families have experienced immigration to the U.S. Among the ethnic groups represented are Asian-American, Jewish-American, Hispanic-American. May include several ethnic groups or focus on a single one. Attention is paid to historical and social aspects of immigration and ethnicity. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 365E, WLIT 365E, ENGL 465E, and WLIT 465E.

ENGL 465N, Topics in African–American Literature (3)
Selected topics and writers from nineteenth and twentieth-century African-American literature. May focus on a genre, a single author or a group of authors, a theme or themes. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 365N, WLIT 365N, ENGL 465N, and WLIT 465N.

ENGL 465Q, Post-Colonial Literature (3)
Readings in national and regional literatures from former European colonies such as Australia and African countries. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 365Q, WLIT 365Q, WLIT 365Q, ENGL 465Q, and WLIT 465Q.

ENGL 466G. Minority Literatures (3)
A course dealing with literature produced by ethnic and racial minority groups within the U.S. Individual offerings may include works from several groups studied comparatively, or focus on a single group, such as Native Americans, Chicanos/Chicanas, Asian-Americans, Caribbean-Americans. African-American works may also be included. May cover the entire history of the U.S. or shorter periods. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 366G, WLIT 466G, ENGL 466G, and WLIT 466G.

ENGL 467. Introduction to Film (3)
An introduction to the aesthetics of film form. We will analyze the elements that make up a film, screening films that facilitate our discussion of how these elements interact with one another to constitute whole formal systems that generate meanings and other effects. We will bring various theoretical and historical considerations to bear as we explore and appreciate the art of cinema. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 367 and ENGL 467.

ENGL 468A. Film History, Theory, and Criticism (3)
This course is an introduction to the three major approaches to cinema that together constitute the field of film studies. The course will be broken into three units: film theory; film criticism; and film history. Screening one film per week, we will consider each film in light of the particular unit’s and week’s focus. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 368A, WLIT 368A, ENGL 468A, and WLIT 468A.

ENGL 468B. History of Film (3)
Analysis of selected topics in film history, such as film before 1940, American cinema 1940 to the present, European or Asian cinema since 1940. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 368B and ENGL 468B.

ENGL 468C. Topics in Film (3)
Individual topics in film, such as a particular national cinema, images of women in film, film comedy, New Wave film, literature and film. Maximum 12 credits. Offered as ENGL 368C, WLIT 368C, ENGL 468C, and WLIT 468C.

ENGL 471. Topics in Women’s Studies (3)
Individual topics and issues in women’s studies relating to writing by and about women, such as feminist theory and criticism; the politics of gender and sexuality; women in popular culture; women in the writing business. Maximum 6 credits. Offered as ENGL 371 and ENGL 471.

ENGL 472. Studies in the Novel (3)
Selected topics in the history and formal development of the novel, such as detective novels; science fiction; episiotary novels; the rise of the novel; the stream of consciousness novel; the Bildungsroman in English. Maximum 6 credits. Offered as ENGL 372 and ENGL 472.

ENGL 473. Studies in Poetry (3)
Selected topics and issues in the study of poetry, such as reading poetry, the elegy, pastoral poetry, love poetry, the long poem, form and meter in poetry. Maximum 6 credits. Offered as ENGL 373 and ENGL 473.

ENGL 476. Studies in Genre (3)
Topics in literary genres, such as comedy, biography and autobiography, satire, allegory, the short story, the apologue, narrative poetry. May cross over the prose/poetry boundary. Maximum 6 credits. Offered as ENGL 376 and ENGL 476.

ENGL 479. Topics in Language Studies (3)
Aspects of contemporary language studies. Topics such as history of rhetoric, Saussurean linguistics, generative grammar, psycholinguistics, sociolinguistics, cognitive and construction grammars, metaphor, language acquisition, stylistics. Maximum 9 credits. Offered as ENGL 379 and ENGL 479.

ENGL 480. ESL Composition Theory (3)
Study of theories related to teaching ESL composition, including second language acquisition;
specialized grammar related to common ESL problems; cultural and affective issues; different Englishes; composition theory and research as it relates to ESL.

ENGL 485. Special Topics in Literature (3)
Close study of a theme or aspect of literature not covered by traditional generic or period rubrics, such as “spatial imagination,” “semiotics of fashion in literature,” “epistolariology.” Maximum 9 credits. Offered as ENGL 385 and ENGL 485.

ENGL 486. Studies in Literature and Culture (3)
Boundary-crossing study of the relations between literary and other aspects of a particular culture or society, including theoretical and critical issues raised by such study. For example, literature and medicine, gay and lesbian literature, Asian/Western literary relations, emotion in literature, philosophy and literature, literature and music. Maximum 9 credits. Offered as ENGL 386 and ENGL 486.

ENGL 487. Literary and Critical Theory (3)
A survey of major schools and texts of literary and critical theory. May be historically or thematically organized. Maximum 6 credits. Offered as ENGL 387, WLIT 387, ENGL 487, and WLIT 487.

ENGL 501. Theories of Rhetoric (3)

ENGL 502. Critical Theory (3)
Theories and methods of contemporary literary study. Required of all graduate degree-seeking students.

ENGL 506. Professional Writing: Theory and Practice (3)
Prepares graduate students to teach disciplinary forms of writing, including technical and professional writing, in academic and non-academic settings. Prereq: ENGL 400.

ENGL 508. Seminar: English Literature 1550–1660 (3)

ENGL 510. Research Methods (3)
This course focuses on methods and resources for research in English, including substantial treatments of narrative, poetic, and close-reading skills. It introduces graduate students to questions of textuality, genre, medium, authorship, reception, historiography, and bibliography. It features an introduction to libraries, special collections, InterLibrary Loan, and print and computer databases (including internet resources and the Oxford English Dictionary). The Research Methods course invites students to develop professional attitudes toward the study of English language and literature and offers a common base and vocabulary to students whose professional interests will inevitably diverge in the course of their study.

ENGL 517. Seminar: American Literature (3)
ENGL 518. Seminar: English Literature 1660–1800 (3)
ENGL 519. Seminar: English Literature 1800–1900 (3)
ENGL 520. Seminar: 20th Century Literature (3)
ENGL 521. Seminar: The Novel (3)
ENGL 522. Seminar: Topics in Poetry (3)
ENGL 524. Seminar: Criticism and Other Special Topics (3)
ENGL 525. Intellectual Property and the Construction of Authorship (3)
“Authorship” and “invention” are among the West’s most powerful ideas—the categories by which creative production has been defined and valued for the last two centuries. We will investigate the emergence and consolidation of these ideas in the context of some of the institutions, technologies, and practices that have fostered and been fostered by them, such as printing and publishing, copyright and patent law, education curricula and disciplinary pedagogies. Then we will turn our attention to the varieties of authorship and invention in operation today—from the solitary ethos characteristic of the arts and humanities to the collaborative, even corporate, forms in ascendance in science and industry. How are ideas of authorship and invention employed in the various discursive spheres to assign credit and responsibility? May tensions be found with creative practice? What are the stakes? Who wins, who loses? And what will be the consequences of digitization and globalization? Our study will culminate in attendance at an interdisciplinary conference on “Con/texts of Invention” which will take place at Case Western Reserve on April 21-23. The goal of our study will be to identify worthy research topics within students’ own areas of interest. Prereq: ENGL 525 and HSTY 525.

ENGL 519. Seminar: English Literature 1800–1900 (3)

ENGL 518. Seminar: English Literature 1660–1800 (3)

ENGL 517. Seminar: American Literature (3)

ENGL 519. Seminar: English Literature 1800–1900 (3)

ENGL 520. Seminar: 20th Century Literature (3)

ENGL 521. Seminar: The Novel (3)

ENGL 522. Seminar: Topics in Poetry (3)

ENGL 524. Seminar: Criticism and Other Special Topics (3)

ENGL 525. Intellectual Property and the Construction of Authorship (3)

PROGRAM ADVISORY COMMITTEE
Peter L. McCall, J.D., Ph.D.
Professor of Geological Sciences; Director, Environmental Studies Program
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Professor of Physics
Peter Shulman, Ph.D.
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Sara Waller, Ph.D.
Assistant Professor of Philosophy
Joseph White, Ph.D.
Luxembourg Family Professor of Public Policy, Department of Political Science

UNDERGRADUATE PROGRAMS

ENGL 701. Dissertation Ph.D. (1-18)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

ENVIRONMENTAL STUDIES PROGRAM
211 A. W. Smith Building
www.case.edu/artsci/estd
Phone: 216-368-3676; Fax: 216-368-3691
Peter L. McCall, Director
E-mail: peter.mccall@case.edu

Environmental Studies is a multidisciplinary program that introduces students to the societal determinants and implications of environmental problems. The program emphasizes the moral, cultural, and political dimensions of environmental problems and solutions that arise from scientific understanding of the environment, bringing to bear the issues and methods of the humanities and social sciences as well as those of the sciences and the professions. The program is designed to serve the needs of students seeking a liberal education or a broad intellectual base for more technical training in environmental sciences. Students can pursue a major or a minor in environmental studies.

ENGL 651. Thesiss M.A. (1-18)
Prereq: Dissertation research consent or advanced to M.A. candidacy milestone.
Major
The Environmental Studies program offers a major (30 credit hours) leading to the Bachelor of Arts degree. However, it may be elected only as a second major. The double major is required so that the multidisciplinary perspective offered by the program will be complemented by a concentrated disciplinary major. To declare the major, students should have declared a first major and have sophomore or junior standing. Up to six credits in required and elective courses taken by students for their first major may be applied to their environmental studies major. None of the required courses may be taken pass/no pass.

The required courses are:
- ESTD 101. Introduction to Environmental Thinking
- ESTD 398. Environmental Seminar

In addition, one course from each of the following disciplinary groups is required:

HUMANITIES
- PHIL 414. Animal Cognition and Consciousness
- HSTY 378. History of the American Environment
- HSTY 327. Comparative Environmental History

SOCIAL POLICY
- ECON 368. Environmental Economics
- GEOL 303/POSC 303. Environmental Law

SCIENCE AND ENGINEERING
- EECs 342. Introduction to Global Issues
- BIOL 351. Principles of Ecology
- GEOL 202. Global Environmental Problems

If a required course is not offered, substitution of a course to fulfill the distribution requirement is possible only with permission of the program director.

At least 15 credit hours must be taken from a list of approved electives. This list will change from time to time as departmental offerings change; please consult the program director for updated information. An approved Washington Study internship or summer field course may be used to satisfy part or all of the elective requirement. All programs of study must be approved by the director.

Minor
The minor in environmental studies (15 credit hours) consists of:
- ESTD 101
- one course each from two of the three disciplinary groups above
- two of the approved electives, which may include courses from the third disciplinary group

COURSE DESCRIPTIONS

ESTD 101. Introduction to Environmental Thinking (3)
Critical comparison of scientific, historical, religious, and literary conceptions of nature. Theories of environmental ethics, legal, and economic conceptions of environmental goods. Current controversies concerning human population growth, energy use, the consumer society, and attitudes towards animals.

ESTD 398. Seminar in Environmental Studies (3)
Small group discussion and student presentations concerning the cultural determinants of environmental attitudes. Each student presents two seminars on current environmental issues, one local and one global. Recommended preparation: ESTD 101.

ETHNIC STUDIES PROGRAM
204 Guilford House
www.case.edu/arts/ethnic
Phone: 216-368-4885; Fax: 216-368-2216
Gilbert Doho, Director
E-mail: gilbert.doho@case.edu

The goal of the Ethnic Studies program is to expand and enhance the university’s course offerings on ethnicity and race in the United States. The program’s objectives are: (1) to examine relationships among racial/ethnic groups, the processes of racial/ethnic formation, and their interactions with class, gender, and sexuality at the personal and collective levels; (2) to foster the development of research skills in a broad range of disciplines in the humanities; (3) to contribute to an interdisciplinary knowledge of the challenges and contributions of ethnic minorities in the United States; (4) to impart to students a deep knowledge of the cultures of Africa and Latin America; (5) to help students develop competencies for working with people of different racial/ethnic backgrounds and to foster an understanding of racial/ethnic diversity; (6) to support students and faculty in the transmission of knowledge, in the discovery and development of new ideas, and in research and writing in the field of ethnic studies; (7) to inculcate in students an understanding of the complexity and challenges of multiethnic societies, and to prepare them for careers in education, business, law, government service, social work, social welfare, health care, teaching, public policy, law enforcement, urban and community development, and the arts.

Ethnic Studies is an interdisciplinary program. The program aims to develop fundamental skills in critical and global thinking and in comparative analysis, as well as an understanding of the interactions of race, class, gender, and sexuality in the experiences of a range of social groups. It is designed to bring together a community of students, faculty, and staff devoted to the transmission of knowledge and the discovery of new ideas in the field of ethnic studies. Ethnic Studies also offers diverse perspectives that challenge monolithic thinking about the formation of identities and societies.

The program’s core courses focus on the exploration and comparison of the cultures, history, politics, and economics of Africa, Latin America, and their diasporas. Program offerings explore ethnicity and cross-cultural exchange globally and in postcolonial frames. Ethnic Studies supports research pertinent to the field and encourages cultural and academic exchange among scholars and students.

The program is part of the university’s mission to enhance the recruitment, retention, and excellence of a diverse faculty and student body. Our long-term goals are to extend program offerings to encompass other ethnic minority groups and to develop a center that will foster an appreciation of ethnic diversity and difference in the learning and research communities of Case Western Reserve University.

PROGRAM ADVISORY COMMITTEE
Gilbert Doho, Ph.D.
Associate Professor of Modern Languages and Literatures; Director, Ethnic Studies Program

Alice Bach, Ph.D.
Archbishop Paul J. Hallinan Professor of Catholic Studies, Department of Religious Studies

Joy Bostic, Ph.D.
Assistant Professor of Religious Studies

M. Gabriela Copertari, Ph.D.
Assistant Professor of Modern Languages and Literatures

Atwood D. Gaines, Ph.D., M.P.H.
Professor of Anthropology

Kurt Koenigsberger, Ph.D.

CASE WESTERN RESERVE UNIVERSITY
UNDERGRADUATE PROGRAMS

Minor
The ethnic studies minor is open to all undergraduate students. It requires a minimum of 15 credit hours. Students are required to take 6 credits from among ethnic studies core courses and 9 credits in their chosen areas of concentration. Community projects are strongly recommended, and students are encouraged to carry out field research in their areas of concentration.

I. Core Courses (6 credits)
The core courses are designed to introduce students to the interdisciplinary field of ethnic studies. Courses may be individually or team taught and will sometimes be conducted in seminar format. Students are encouraged to use the tools and perspectives of several disciplines (history, literature, art history, anthropology, film, sociology, and political science, for example) to address the experiences of African-Americans and Latino/a Americans. Courses center on the examination of social, cultural, political, and economic structures that shape the life of these ethnic minorities in the United States. They examine how race, class, and gender have impacted their identities as well as their economic, social, political, and cultural productions. Assignments and courses make maximum use of the archives and collections of University Circle institutions.

- ETHS 251 Introduction to the Study of Race and Ethnicity (3)
- ETHS 252 Introduction to African-American Studies (3)
- ETHS 252B Introduction to Latino/a Studies (3)
- ETHS 253A Introduction to Modern African History (3) (Cross-listed with HSTY 135)
- ETHS 253B Introduction to Latin American History (3)

II. Areas of Concentration (9 credits)

African Studies Concentration

- ANTH 322 Living Africa (3)
- ARTH 290 Introduction to the Art of Sub-Saharan Africa (3)
- ETHS 235 Theater and Identities (3)
- ETHS 251A Oral Performances and Ethnic Identities (3)
- ETHS 252 African Feminisms (3)
- ETHS 259 Religions and Cultures in Africa and African Diasporas (3)
- FRCH/ETHS 338 The Cameroon Experience
- HSTY258 History of Southern Africa (3)
- HSTY 268 Colonialism in African (3)
- FRCH/WLIT 295 The Francophone World (3)
- FRCH/WLIT 308 The Paris Experience (3)
- ETHS 394 The Poetics of War in Africa (3)
- POSC 366 Government and Politics of Africa (3)
- COSI 260 Multicultural Aspects of Human Communication (3)
- COSI 328 Media Effects and Literacy (3)
- ECON 375 Economics of Developing Countries (3)

African-American Studies Concentration

- ETHS 222 African-American Religions
- HSTY 261 African-American History 1865-1945 (3)
- ENGL 365N Topics in African-American Literature (3)
- ENGL 368H African-American Literature (3)
- HSTY 260 Slavery and Emancipation (3)
- HSTY 262 African-American History since 1945 (3)
- HSTY 318 History of Black Women in U.S. (3)
- COSI 260 Multicultural Aspects of Human Communication (3)
- COSI 328 Media Effects and Literacy (3)
- ECON 375 Economics of Developing Countries (3)

Latin America and Caribbean Studies Concentration

- ETHS 336 Struggle for Justice in Latin America (3)
- ETHS 287 Drugs, Wars, and Coffee: A History of Modern Colombia (3)
- ETHS 390 The Poetics of Gender in Latin America (3)
- SPAN/WLIT 205 The Hispanophone World (3)
- SPAN 385 Hispanic Literature in English (3)
- SPAN 336 Chicano/a Literature (3)
- SPAN 370 Latin American Cinema (3)
- ECON 375 Economics of Developing Countries (3)
- SPAN 303 Latin American Cultural Conflicts (3)
- SPAN 322 Latin American Short Story (3)
- SPAN 326 The Fantastic in Latin American Prose (3)
- SPAN 339 Latin American Poetic Revolt (3)
- SPAN 342 Latin American Feminist Voices (3)
- SPAN 343 The New Drama in Latin America (3)
- POSC 364 Dictatorship and Democracy in 20th-Century Latin America (3)
- COSI 260 Multicultural Aspects of Human Communication (3)
- COSI 328 Media Effects and Literacy (3)
- ECON 375 Economics of Developing Countries (3)

Global Ethnic Studies Concentration

- ANTH 314 Cultures of the United States (3)
- ANTH 388 Globalization, Development, and Underdevelopment (3)
- WGST/ETHS 301 Women, Creativity, and the Arts
- FRCH/ETHS/WLIT/WGST 335 Women in Developing Countries (3)
- ANTH 345 Ethnicity, Gender, and Mental Health (3)
- ANTH 357 Native American Cultures (3)
- ANTH 530 Race, Class and Gender in Place (3)
- COSI 260 Multicultural Aspects of Human Communication (3)
- COSI 328 Media Effects and Literacy (3)
- ETHS 259 Religion and Cultures in Africa and African Diasporas (3)
- ECON 375 Economics of Developing Countries (3)
ETHS 214. Comparative Slavery (3)
People around the world have been enslaving one another since the beginning of time. From the seventeenth to the nineteenth centuries, millions of African chattel labored on southern plantations, supporting the “peculiar institution” whose terrible legacy remains with us today. For hundreds of years before European slave traders began ferrying human cargo across the Atlantic, however, coercive bondage was a well-entrenched feature of Mediterranean civilizations, justified by religious and secular law alike. This course will explore diverse types of unfree labor, from slavery in ancient Greece and Rome, serfdom in medieval Europe, captivity in North Africa and indentured servitude in colonial America. Did earlier systems of domination around the Mediterranean prepare the way for the establishment of Atlantic slavery? How did ideologies about religious difference, ethnicity, and race help justify this ultimate form of human degradation?
Offered as ETHS 214, HSTY 214

ETHS 218. Jews in Early Modern Europe (3)
This course surveys the history of Jews in Europe and the wider world from the Spanish expulsion through the French Revolution. Tracking peregrinations out of the Iberian Peninsula to the British Isles, France, Holland, Italy, Germany, Poland-Lithuania, the Ottoman Empire and the American colonies, it examines the diverse ways Jews organized their communities, interacted with their non-Jewish neighbors and negotiated their social, economic and legal status within different states and empires. What role did Jews play and what symbolic place did they occupy during a period of European expansion, technological innovation, artistic experimentation, and religious and political turmoil? What internal and external dynamics affected Jewish experiences in the sixteenth, seventeenth and eighteenth centuries? Through a selection of inquisitorial transcripts, government records, memoirs and historical literature, we will explore topics such as persecution, conversion, messianic, toleration, emancipation and assimilation.
Offered as HSTY 218 and JDST 218, ETHS 218.

ETHS 220. The Early Modern Mediterranean (3)
For centuries before Columbus crossed the Atlantic Ocean, travelers and traders, pirates and pilgrims, mercenaries and missionaries explored the coasts of the Mediterranean Sea—and engaged in commerce, as well as religious, economic and military competition. If religion and ethnicity divided Muslims, Christians and Jews from Algiers to Athens, did shared geography, foodstuffs, and cultural values bind them together? This course examines the unity and diversity of this maritime region by considering the peoples, beliefs, commodities and diseases that circulated through it during the sixteenth, seventeenth, and eighteenth centuries. Does the early modern Mediterranean showcase a clash of civilizations or provide an enduring model for coexistence? Topics include merchant culture, diplomacy, honor and shame, slavery and colonization.
Offered as ETHS 220, HSTY 220.

ETHS 222. African-American Religions (3)
This course is an exploration of the rich diversity of African American religions from the colonial period to the present. Attention will be given to key figures, institutional expressions, and significant movements in African American religious history. Major themes include African traditions in American religions, slavery and religion, sacred music, social protest, Black Nationalism in religion, Islam, African American women and religion, and black and womanist theologies. Course requirements will include field trips to local religious sites.
Offered as ETHS 222 and RLGN 222.

ETHS 234. France and Islam (3)
This seminar examines French encounters with the Muslim world from the Middle Ages to the present. Over the last millennium, France has viewed Saracens, Moriscos, Turks, Berbers, and Arabs with admiration and fear, disdain and incomprehension. Between the eleventh and thirteenth centuries, French soldiers battled in the Holy Land; for several hundred years after that, France and the Ottoman Empire exchanged diplomats, traders and slaves. The colonial occupation of Algeria that began in 1830 ended violently in 1962. By then, the empire that struck back had also come home through large waves of immigration. Today, the social and economic status, religious affiliation, political significance and cultural impact of French citizens of North African descent are the subject of burning national debate. Taking a long view on Franco-Muslim relations, the course will explore such topics as the Crusades, Mediterranean piracy and captivity, Napoleon’s Egyptian campaign, the Algerian War of Independence, the “veil affair,” riots in the suburbs of Paris and World Cup soccer.
Offered as ETHS 234, HSTY 234. SAGES Dept Seminar

ETHS 235. Theater and Identity (3)
This course aims at surveying identities in dramatic and performance texts in the modern era. It will help students develop skills to study plays and related theatrical forms, to analyze images for their social and political meanings, to investigate issues of identity, to appreciate the complexities of identity and images of self and other as related in theater, media and the larger political and social contexts. African and African-American identities, Latina/o-American and Latin American identities, Native-American identities, Asian-American and Asian identities, Gender identities will be examined.

ETHS 251. Perspectives in Ethnicity, Race, Religion and Gender (3)
This course is designed to introduce students to the study of ethnicity. Basic concepts such as race, gender, class, and identity construction will be examined. Students are encouraged to use the tools and perspectives of several disciplines to address the experiences of ethnic groups in the United States.
Offered as ETHS 251 and RLGN 251. Global & Cultural Diversity

ETHS 251A. Oral Performances and Ethnic Identities (3)
This course is an in-depth study of performances that have helped to shape and anchor the identities of different non-Western ethnic groups. The course will explore the multi-generic composition of the oral epic, which combines forms as diverse as narrative, song, praise poetry, theater, music and historical oratory. ETHS 251A will provide a comprehensive overview of oral performances while focusing on a particular area or areas of Africa, Asia, the United States, or Latin America. In the African continent, for example, the focus will be on the Madinka Sundjata corpus, dealing with the empire of Mali; the life of Shaka, the Zulu in South Africa; while in the United States, the narrative life of Frederick Douglas, blues and negro-spiritual will be considered at the sites of ethnic discourse. Using a comparative approach, the course will examine aesthetic issues of oral performance, the written word, interactions between music and voice, and interaction between poetic and prose narrative forms. The performance texts will be augmented by field recordings and in-class demonstrations by griots and other storytellers from Africa and the United States.

ETHS 252A. Introduction to African-American Studies (3)
This course is designed to introduce students to the study of Black History, cultures, economics, and politics. Students will learn about the development of the field by exploring theoretical questions, methodological approaches, and major themes that have shaped the study of black people, primarily in the U.S. context. This is a seminar-style, discussion-based course that emphasizes critical analysis and expository writing.
Offered as ETHS 252A and HSTY 252A. Global & Cultural Diversity

ETHS 252B. Introduction to Latina/o Studies (3)
Interdisciplinary introduction to the basis for a
Latin/o ethnicity through an exploration of commonalities and differences in the peoples of Latin American and Caribbean origin within the continental United States. Topics include methodological and theoretical formulations central to the field (e.g., racial, gender, and sexual formations, modes and relations of production and class, nation and transnational), history and contemporary issues of identity, family, community, immigration, and the potential for a pan-ethnic identity. Discussions will focus on major demographic, social, economic and political trends: historical roots of Latinas/os in the U.S.; the evolution of Latin/o ethnicity and identity; immigration and the formation of Latin/o communities; schooling and language usage; tendencies and determinants of socioeconomic and labor force status; discrimination, segregation and bias in contemporary America; racial and gender relations; and political behavior among Latinas/os.

Global & Cultural Diversity

ETHS 253A. Introduction to Modern African History (3)
A general introduction to major themes in modern African history, with an emphasis on the nineteenth and twentieth centuries. Topics include oral tradition and narrative, economic structure and dynamics, religious movements, colonialism, nationalism, and the dilemmas of independent African states.
Offered as ETHS 253A and HSTY 135.
Global & Cultural Diversity

ETHS 253B. Introduction to Latin American History (3)
This course provides an introduction to the historical and cultural development of Latin America, in an attempt to identify the forces, both internal and external, which shape the social, economic and political realities in present day Latin America. Beginning with its pre-Columbian civilizations, the course moves through the conquest and colonial period of the Americas, the wars of independence and the emergence of nation-states in the nineteenth century, and the issues confronting the region throughout the turbulent twentieth century, such as migration and urbanization, popular protest and revolution, environmental degradation, great power intervention, the drug trade and corruption, and the integration of the region into the global economy.
Offered as ETHS 253B and HSTY 136.
Global & Cultural Diversity

ETHS 258. History of Southern Africa (3)
A survey of southern Africa from about 1600. Topics include the social structure of pre-colonial African societies, the beginnings of European settlement, the rise of Shaka, the discovery of minerals and the development of industry, Zimbabwe's guerrilla war and independence, and the rise and apparent demise of apartheid.
Offered as ETHS 258 and HSTY 258.
Global & Cultural Diversity

ETHS 259. Tricksters, Conjurers, and Gods: Religion in West Africa and Diaspora (3)
This course will present a portrait of West African religious history framed in the religious themes common to the rest of the world. We will focus upon the traditional religions that provided the philosophical, religious, and the ethical basis of the African cultures. Focusing primarily on traditional West African religions and their related myths, rituals, divinities, and religious art, the course will consider African indigenous religions as well as those beliefs, traditions, and ritualism that have become part of the religious life in the diaspora in the Americas.
Offered as ETHS 259 and RLGN 259.
Global & Cultural Diversity

ETHS 260. U.S. Slavery and Emancipation (3)
Begins with the African encounter with Europeans during the emergence of the modern slave trade. Students are introduced to the documents and secondary literature on the creation and maintenance of slavery, first in colonial America, and then in the United States. The course concludes with the destruction of slavery.
Offered as ETHS 260 and HSTY 260.
Global & Cultural Diversity

ETHS 261. African-American History 1865-1945 (3)
Explores the formation of a modern African-American culture between emancipation and the end of World War II. Emergence of a northern-based leadership, the challenge of segregation, emergence of bourgeois culture, the fashioning of racial consciousness and black nationalism, the shift from a primarily southern and rural population to one increasingly northern and urban, the creation and contours of a modern African-American culture, the construction of racial/gender and racial/class consciousness.
Offered as ETHS 261 and HSTY 261.
Global & Cultural Diversity

ETHS 262. African-American History Since 1945 (3)
Completes the three-term sequence of the African-American history survey (although the first two courses are not prerequisites for this course). Explores some of the key events and developments shaping African-American social, political, and cultural history since 1945.
Offered as HSTY 262 and ETHS 262.
Global & Cultural Diversity

ETHS 265. Colonialism in Africa (3)
Examines the immense social and cultural changes which took place in Africa as a result of colonial occupations, in the period roughly from 1880 to 1965. It is organized around three major rubrics which were central to the colonial experience: the spread of Christianity, economic forces which led to new forms of labor, and the growth of nationalist resistance.
Offered as ETHS 268 and HSTY 268.
Global & Cultural Diversity

ETHS 287. State, War, Drugs, and Coffee in Colombia: History of Modern Colombia (3)
This course will analyze the major forces that have shaped Colombian history from the 19th century to the present. Colombia is one of the largest and most fascinating countries in Latin America. It has been intricately linked to the U.S. market as a major coffee producer and, more recently, as a major supplier of illicit drugs. Colombia has always been one of the wealthier Latin American countries, and it has a high degree of electoral democracy. Paradoxically, however, Colombia has also experienced rather high levels of regionalism and political violence. This course seeks to explore the history of these paradoxes. It will situate Colombia’s contemporary conflicts within a larger historical perspective.
Offered as ETHS 287 and HSTY 287.
Global & Cultural Diversity

ETHS 295. The Francophone World (3)
The course offers an introduction to the Francophone World from a historical, cultural, and literary perspective. The Francophone World includes countries and regions around the globe with a substantial French-speaking population (and where French is sometimes, but not always, an official language): North America (Louisiana, Quebec, and Acadia); North Africa (Tunisia, Morocco, Algeria, and Egypt); the Middle-East (Lebanon, Syria); the Caribbean (Martinique, Guadeloupe, Haiti); South-East Asia (Vietnam); and Europe (France, Belgium, Switzerland, and Luxembourg).
FRCH 295 provides a comprehensive overview of the Francophone World, while focusing on a particular area or areas in any given semester. In this particular semester we will focus on the Caribbean, the Maghreb, and select countries of Sub-Saharan Africa (Senegal, Cameroon). Our inquiry will include the study of their colonization histories, of the Independences period (broadly speaking, the 1960s), and of the post colonial era through film, literature, and readings of significant political/theoretical texts.
Offered as ETHS 295, FRCH 295, and WLIT 295.
Global & Cultural Diversity

ETHS 301. Women, Creativity and the Arts (3)
WGST301/ETHS301 is one of two core courses for the program in Women's and Gender Studies and an elective course for the ETHS minor. All WGST majors are to take one course concentrating on the subject of women and the arts specifically. This course also fulfills the cultural diversity requirement. In this course, students will focus on two areas of study: a) women and creativity and b) women and activism through the arts. A history of women in the arts will be covered, but the general focus of the course is on women in the arts since the 1960s in particular, and on artwork that reflects or provokes social change. “Arts” are defined in the broadest of sense. That is, students will study women's production in painting, photography, graphic design, sculpture, dance, film, music, and theater. A variety of learning techniques will
be applied: Students will look at feminist theories on art, be introduced to the notion of cyberfeminism, study actual artwork and its reproductions, understand the role of art in feminist activism and how women "create" differently from men, and work closely with several feminist artists/activists through various programs on campus and the community in order to facilitate the planning and carrying out of artistic production. Subsequently, students will interact with children in Cleveland schools in conjunction with these artists giving master classes, and be exposed to art exhibits abroad through videoconferencing with the Algerian Cultural Center in Paris and locally through University Circle Institutions. Offered as WGST 301 and ETHS 301.

ETHS 314. Cultures of the United States (3)
This course considers the rich ethnic diversity of the U.S. from the perspective of social/cultural anthropology. Conquest, immigration, problems of conflicts and accommodation, and the character of the diverse regional and ethnic cultures are considered as are forms of racism, discrimination, and their consequences. Groups of interest include various Latina/o and Native peoples, African-American groups, and specific ethnic groups of Pacific, Mediterranean, European, Asian, and Caribbean origin.
Offered as ANTH 314, ETHS 314, and ANTH 414.

Global & Cultural Diversity

ETHS 316. African Political Thought (3)
Introduction to select themes in the work of contemporary African philosophers, with special emphasis on political thought. In this course, students will learn something about factors affecting the creation and flow of knowledge and ideas about Africa and discuss the relative importance of the "nation-state" as an idea in Europe, pre-colonial Africa, and postcolonial Africa.
Offered as PHIL 316/416 and ETHS 316/416.

Global & Cultural Diversity

ETHS 318. History of Black Women in the U.S. (3)
Chronologically arranged around specific issues in black women's history organizations, participation in community and political movements, labor experiences, and expressive culture. The course will use a variety of materials, including autobiography, literature, music, and film.
Offered as ETHS 318, HSTY 318, and WGST 318.

ETHS 335. Women in Developing Countries (3)
This course will feature case studies, theory, and literature of current issues concerning women in developing countries primarily of the French-speaking world. Discussion and research topics include matriarchal traditions and FGM in Africa, the Tunisian feminist movement, women, Islam, and tradition in the Middle East, women-centered power structures in India (Kerala, Pondicherry), and poverty and women in Vietnam, Laos, and Cambodia. Guest speakers and special projects are important elements of the course. Seminar-style format, taught in English, with significant disciplinary writing in English for WGST, ETHS, and some WLIT students, and writing in French for FRCH and WLIT students. Writing assignments include two shorter essays and a substantial research paper.
Offered as ETHS 335, FRCH 335, WLIT 335, WGST 335, FRCH 435 and WLIT 435. SAGES Dept Seminar
Global & Cultural Diversity

ETHS 336. The Struggle for Justice in Latin America (3)
This course looks at how indigenous peoples, women, workers, workers, peasants, and Afro-Latin Americans struggled for justice in Latin America. It will study how notions of justice have changed from colonial times to the present. It will also examine how different sectors of Latin American society understood the meaning of justice and how that understanding evolved through time. This class seeks to familiarize students with the history of the idea of justice in Latin America. At the end of this course students will understand the complex intellectual and political differences behind Latin America's apparent chaotic and tumultuous political history. Second, it seeks to develop students' critical thinking by examining how an abstract term, such as justice, changes across time and space.
Offered as ETHS 336 and HSTY 336.
Global & Cultural Diversity

ETHS 338. The Cameroon Experience (3)
Three-week immersion learning experience living and studying in Cameroon. The focus of the course is the culture, literature, and language of Anglophone Cameroon, with some emphasis on Anglophone Cameroon. Students spend a minimum of fifteen hours per week visiting cultural sites and attending arranged courses at the University of Buea. Students will prepare a research paper. Course work is in French. To do course work in English, students should enroll in WLIT 338 or ETHS 338.
Offered as ETHS 338, FRCH 338, WLIT 338, ETHS 438, FRCH 438, and WLIT 438.
Global & Cultural Diversity

ETHS 352. African Feminisms (3)
This course traces the history of African feminism from its origins within traditions through to a more contemporary theoretical analysis of gender, marriage, and motherhood seen from a Afrocentric perspective. Approaches studied are those that pertain to anthropology, history, literature, sociology, and culture. African feminist theory of scholars such as Filomina Steady, Cheikh Anta Diop, Buchi Emecheta, Ifi Amadiume, Oyono Amate, and Calixthe Beyala will be studied and there will be some comparative analysis of Western theories to show how African feminisms are clearly distinct. Theories of these scholars will be presented, and in the process, students will look at cases of women in Cameroon, Nigeria, Ghana, Kenya, and Senegal. It is commonly believed that African women are defined for a long time according to constructs of Western anthropology. This course will thus look at social institutions such as woman-to-woman marriage, matriarchy, and various women's rituals in order to identify African constructs of gender, family, kinship, marriage, and motherhood.
Offered as ETHS 352 and WGST 352.

The major focus of this seminar will range from the ongoing questions of peace and justice in Israel and occupied Palestine to the land and border questions; Green line, crossing points, the wall; to interpretations from biblical to contemporary texts, reflecting a multiplicity of agendas. Our primary focus will be the analysis of recent research and scholarship on issues of mass violence, contested space and land, gender, race and ethnicity, religious sectarianism, colonialism/imperialism. Through our readings we will identify the bias and concerns of various interpretive communities involved in the ongoing struggles in this very small area. With two peoples claiming the same land for different reasons, can this conflict ever be resolved? Recommended preparation: One course about the Middle East.
Offered as ETHS 359 and RLGN 320.

ETHS 362. Politics of Central Asia (3)
Once an unfamiliar region to many people of the world, Central Asia took center stage in the fall of 2001 as a result of the U.S. campaign against terrorism. This course will introduce students to the politics of Central Asia, focusing on the region today composed of Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzistan, and Kazakhstan. We will review the nationalism, foreign relations, religion, ethnicity, and economics of the region.
Offered as ETHS 362, POSC 362, and POSC 462.

Global & Cultural Diversity

ETHS 363H. African-American Literature (3)
A historical approach to African-American literature. Such writers as Wheatley, Equiano, Douglass, Jacobs, DuBois, Hurston, Hughes, Wright, Baldwin, Ellison, Morrison. Topics covered may include slave narratives, African-American autobiography, the Harlem Renaissance, the Black Aesthetic, literature or protest and to assimilation. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100.
Offered as ENGL 363H, ETHS 363H, WLIT 363H, ENGL 463H, and WLIT 463H.

Global & Cultural Diversity

ETHS 364. Dictatorship and Democracy in Modern Latin America (3)
Examination of political leadership in 20th-century Latin America, exploring the nature, causes, and consequences of dictatorship and democracy in the region, moving from the collapse of oligarchic rule and the emergence of populism in the 1930s and...
1940s, to the end of democracy and establishment of military regimes in the 1960s and 1970s, and ultimately to the contemporary processes of democratization and economic liberalization.

Offered as ETHS 364, POSC 364, and POSC 464.

Global & Cultural Diversity

ETHS 365N. Topics in African-American Literature (3)
Selected topics and writers from nineteenth and twentieth-century African-American literature. May focus on a genre, a single author or a group of authors, a theme or themes. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100.

Offered as ENGL 365N, ETHS 365N, WLIT 365N, ENGL 465N, and WLIT 465N.

Global & Cultural Diversity

ETHS 365Q, Post-Colonial Literature (3)
Readings in national and regional literatures from former European colonies such as Australia and African countries. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100.

Offered as ENGL 365Q, ETHS 365Q, WLIT 365Q, ENGL 465Q, and WLIT 465Q.

Global & Cultural Diversity

ETHS 366. Government and Politics of Africa (3)
Comparative analysis of the political forces and organizations currently functioning in Africa, as well as a survey of the formal government institutions. Special emphasis on single-party rule, military rule, and the political ramifications of African socialism, tribalism and the problems of national integration.

Offered as ETHS 366, POSC 366, and POSC 466.

Global & Cultural Diversity

ETHS 369. Current Controversies in Latin American Politics and Society (3)
In addition to questions about race, religion, abortion, the drug industry, immigration, democracy, private property, and free trade, the course will tackle Latin America’s apparent shift to the political and ideological left, Chavez’s “Imperialism,” and Cuba’s humanitarian aid.

Offered as ETHS 369, POSC 369 and POSC 469.

Global & Cultural Diversity

ETHS 370K. Nationalism, Ethnicity, and Religion in World Politics (3)
Examination of the post-Cold War surge in conflicts among nationalism, ethnic groups, and religions with particular attention to the former Yugoslavia, Ireland, India, Africa, and the Middle East.

Offered as ETHS 370K, POSC 370K, and POSC 470K.

Global & Cultural Diversity

ETHS 374. Politics of Development in the

Global South (3)
Exploration of the post-World War II emergence of the Global South nations of Africa, Asia, the Middle East, Latin America, and Eastern Europe arena.

Offered as ETHS 374, POSC 374, and POSC 474.

Global & Cultural Diversity

ETHS 385. Hispanic Literature in Translation (3)
Critical analysis and appreciation of representative literary masterpieces from Spain and Latin America, and by Hispanics living in the U.S. Texts cover a variety of genres and a range of literary periods, from works by Cervantes to those of Gabriel Garcia Marquez. The course will examine the relationship between literature and other forms of artistic production, as well as the development of the Hispanic literary text within the context of historical events and cultural production of the period. Counts toward Spanish major only as related course. No knowledge of Spanish required.

Offered as ETHS 385, ETHS 485, SPAN 385, SPAN 485, WLIT 385, and WLIT 485.

Global & Cultural Diversity

ETHS 394. The Subaltern and The Poetics of War in Africa (3)
This course is a seminar on major war writers and filmmakers in Africa such as Chinua Achebe, Ngugi wa Thiong’o, Emmanuel Dongola, Iweala Uzodinma, Ismael Beah, Semenebe Ousmane, Ingrid Sinclair etc. Students will be asked to use postcolonial theory to critically read and view films and texts on war in Africa. They will engage in discussion with guest scholars in the field of African studies. In addition to a final research paper, students are also required to write short papers on selected books and films read and/or viewed during the semester.

ETHS 399. Independent Study (0-3)
This course focuses on topics in ethnicity. In consultation with the program director and instructors, students pick topics in their concentrations and make a list of books and films for personal and intensive reading. Some of these projects might be Arts and Identity in post-independent Africa [African Concentration], films, literatures and human rights in Latin America [Latin America and Caribbean Concentration], civil rights through music and songs [African-American Concentration] etc. Travel may be a component of this course depending on the nature of the students’ interests. Weekly reports are required for the instructors to measure the students progress.

ETHS 416. African Political Thought (3)
Introduction to select themes in the work of contemporary African philosophers, with special emphasis on political thought. In this course, students will learn something about factors affecting the creation and flow of knowledge and ideas about Africa and discuss the relative importance of the “nation-state” as an idea in Europe, pre-colonial Africa, and postcolonial Africa.

Offered as PHIL 316/416 and ETHS 316/416.

ETHS 438. The Cameroon Experience (3)
Three-week immersion learning experience living and studying in Cameroon. The focus of the course is the culture, literature, and language of Francophone Cameroon, with some emphasis on Anglophone Cameroon. Students spend a minimum of fifteen hours per week visiting cultural sites and attending arranged courses at the University of Buea. Students will prepare a research paper. Course work is in French. To do course work in English, students should enroll in WLIT 338 or ETHS 338.

Offered as ETHS 338, FRCH 338, WLIT 338, ETHS 438, FRCH 438, and WLIT 438.

ETHS 485. Hispanic Literature in Translation (3)
Critical analysis and appreciation of representative literary masterpieces from Spain and Latin America, and by Hispanics living in the U.S. Texts cover a variety of genres and a range of literary periods, from works by Cervantes to those of Gabriel Garcia Marquez. The course will examine the relationship between literature and other forms of artistic production, as well as the development of the Hispanic literary text within the context of historical events and cultural production of the period. Counts toward Spanish major only as related course. No knowledge of Spanish required.

Offered as ETHS 385, ETHS 485, SPAN 385, SPAN 485, WLIT 385, and WLIT 485.

EVALUATION BIOLOGY
PROGRAM

238 Mather Memorial
www.case.edu/artsci/evolutionarybiology
Phone: 216-368-2264; Fax: 216-368-5334
Cynthia Beall, Chair
E-mail: cynthia.beall@case.edu

The program in Evolutionary Biology is designed to provide students with knowledge of macro- and micro-evolutionary processes underlying the evolution and diversification of life on Earth and an understanding of the meta-scientific issues involved in this unique field of study.

The program includes grounding in the history and philosophy of evolutionary thought and alternative conceptualizations of the mechanisms, patterns, and processes of evolution. It emphasizes evolutionary theory, foundations of ecology and genetics, focused study of particular organisms or groups of organisms, and the dynamics of evolutionary principles in scientific inquiry.

PROGRAM STEERING COMMITTEE

Cynthia Beall, Ph.D.
Professor of Anthropology; Director, Evolutionary Biology Program

Mark D. Adams, Ph.D.

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Associate Professor of Genetics, School of Medicine
Radhika Atit, Ph.D.
Warren E. Rupp Distinguished Assistant Professor, Department of Biology
Darin Croft, Ph.D.
Assistant Professor of Anatomy, School of Medicine
Yohannes Haile-Selassie, Ph.D.
Curator and Head of Physical Anthropology, Cleveland Museum of Natural History
Joseph Koonce, Ph.D.
Professor of Biology
Bruce Latimer, Ph.D.
Associate Professor of Anatomy, School of Medicine
Peter McCall, J.D., Ph.D.
Professor of Geological Sciences
Scott Simpson, Ph.D.
Professor of Anatomy, School of Medicine
Mark Willis, Ph.D.
Associate Professor of Biology
Peter A. Zimmerman, Ph.D.
Associate Professor, Center for Global Health and Diseases, School of Medicine

UNDERGRADUATE PROGRAMS

Major
Evolutionary biology is a second major, to be pursued in conjunction with a conventional disciplinary major. Up to 12 credits in required and elective courses taken by students for their first major may be applied to their evolutionary biology major.

The 30-credit interdisciplinary major in evolutionary biology consists of:
1. Three foundation courses
2. One senior seminar
3. One course in ecology
4. One course in the philosophy/history of science
5. Four approved electives

The approved electives may include additional courses from the list of philosophy/history of science courses (see below). In consultation with a major advisor, students will tailor intensive study to suit particular interests within the major. Courses will be selected from the following list.

FOUNDATION COURSES

- BIOL 251 or 214 Intro to Organismal and Population Systems / Genes and Evolution
- GEOL 210 Historical Geology and Paleontology
- PHIL 225 Evolution

SENIOR SEMINAR

- PHIL 394 Seminar in Evolutionary Biology

PHILOSOPHY/HISTORY OF SCIENCE OPTIONS

- HSTY 201 Science in Western Thought I
- HSTY 202 Science in Western Thought II
- HSTY 394 History of Biology
- HSTY 402 Survey of the History of Science II
- PHIL 203 Natural Philosophy I
- PHIL 204 Natural Philosophy II
- PHIL 303 Topics in Philosophy of Science
- PHIL 309 Philosophical Issues in Genetics

ECOLOGY OPTIONS

- BIOL 216 Organisms and Ecosystems
- BIOL 336 Aquatic Biology
- BIOL 337 Marine Ecology
- BIOL 370 Ecology

APPROVED ELECTIVE COURSES

- ANAT 375 Human Evolution: The Fossil Evidence
- ANAT 377 Human Musculoskeletal Anatomy
- ANAT 383 Evolutionary Anatomy
- ANTH 103 Introduction to Human Evolution
- ANTH 105 Worldwide Variation in Human Biology
- ANTH 295 Comparative Primate Behavior
- ANTH 302 Darwinian Medicine
- ANTH/GEOL/PHIL 367/368 Capstone In Evolutionary Biology
- ANTH/PHIL 368/BIOL 369

Minor
The 15-credit interdisciplinary minor consists of three foundation courses and two approved electives. In consultation with a minor advisor, students will tailor intensive study to suit their particular interests.

FRENCH AND FRANCOPHONE STUDIES PROGRAM

203 Clark Hall
www.case.edu/artsci/fr_studies
Phone: 216-368-2633
Laura E. Hengehold, Director
E-mail: laura.hengehold@case.edu

Designed to develop cross-cultural awareness and to foster international understanding, the French and Francophone Studies (FFS) program adds an exciting dimension to the traditional liberal arts curriculum. The French
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should also discuss their choice of a minor or a second major with their advisor.

FFS majors should demonstrate French language ability by completing French 201-202 or the equivalent. They will also take at least one 300-level FRCH course (see Foundations in Culture courses below).

The major in French and Francophone Studies requires a minimum of 33 credit hours in the following areas:

1. Foundations in Language (8 hours)

For students entering at the 200-level of French language, completion of French 201 and 202. Students entering at the 300-level of language study complete 21 credits in III below.

2. Foundations in Culture (9 hours)

These courses introduce students to French and Francophone cultures. FRCH/ WLIT 295 (The Francophone World) is required. Beyond this, students select two courses from FRCH 316, 318, 319, and HSTY 310.

3. Electives: Related Courses in French and Other Disciplines (15-21 hours)

Students select from courses that focus on French and Francophone cultures in FRCH and other disciplines (art history, political science, history, etc.). These are chosen from the approved list (see below) and in conjunction with a program advisor. No more than 9 of these credits may be chosen from FRCH courses.

ANTHROPOLOGY
• ANTH 322 Living Africa
• ANTH 337 Comparative Medical Systems
• ANTH 356 Mediterranean Culture and Society
• ANTH 399 Independent Study (French content)

ART HISTORY
• ARTH 240 Introduction to Medieval Art
• ARTH 260 Art in the Age of Grandeur
• ARTH 280 Modern Art and Modern Science
• ARTH 284 History of Photography
• ARTH 290 Introduction to the Art of Sub-Saharan Africa
• ARTH 340 Issues in Non-Western Art
• ARTH 367 17th- and 18th-Century French Art
• ARTH 374 Impressionism to Symbolism

ECONOMICS
• ECON 372 International Finance
• ECON 373 International Trade
• ECON 375 Economics of Developing Countries

ENGLISH
• ENGL 290 Masterpieces of Continental Fiction (also WLIT 290)
• ENGL 301 Linguistic Analysis (French content)
• ENGL 368C Topics in Film (also WLIT 368C) (French content)
• ENGL 379 Topics in Language Studies (when taught as Semiotics)
• ENGL 387 Literary and Critical Theory (also WLIT 387)

HISTORY
• HSTY 151 Technology in European Civilization
• HSTY 201/202 Science in Western Thought
• HSTY 212 Modern European History
• HSTY 215 Europe in the Twentieth Century
• HSTY 220 The Early Modern Mediterranean
• HSTY 234 France and Islam
• HSTY 250 Issues and Methods in History (French content)
• HSTY 268 Colonialism in Africa
• HSTY 309 Reformation Europe, 1500-1650 (also RLGN 374)
• HSTY 310 The French Revolutionary Era
• HSTY 313 Women in Modern European History
• HSTY 314 Imposters in Early Modern Europe
• HSTY 315 Heresy and Dissidence in the Middle Ages (also RLGN 315)
• HSTY 332 European Diplomacy in the Age of Nationalism, 1789-1945
• HSTY 348 Modern Social Thought (also POSC 348)
• HSTY 397 Undergraduate Tutorial (French content)

INTERNATIONAL STUDIES
• INTL 396 International Independent
Study (French content)

MUSIC
- MUHI 301 History of Western Music I
- MUHI 302 History of Western Music II
- MUHI 303 History of Western Music III

PHILOSOPHY
- PHIL 302 Modern Philosophy
- PHIL 315 Selected Topics in Philosophy (French content)
- PHIL 325 Philosophy of Feminism (French content)
- PHIL 399 Directed Study (French content)

POLITICAL SCIENCE
- POSC 326 Comparative Constitutions
- POSC 348 Modern Social Thought (also HSTY 348)
- POSC 351 Modern Political Thought (French content)
- POSC 366 Government and Politics of Africa
- POSC 367 Western European Political Systems
- POSC 370A Political Economy
- POSC 373 Politics of the European Union
- POSC 374 Politics of Development in the Global South
- POSC 395 Special Projects (French content)

RELIGIOUS STUDIES
- RLGN 315 Heresy and Dissidence in the Middle Ages (also HSTY 315)
- RLGN 341 Religion and Postmodernism
- RLGN 374 Reformation Europe, 1500-1650 (also HSTY 309)
- RLGN 392 Independent Study (French content)

THEATER
- THTR 229 Theater History II (also WLIT 229)
- THTR 329 Dramatic Literature (French content)
- THTR 399 Independent Study (French content)

WORLD LITERATURE
- WLIT 211 World Literature I
- WLIT 212 World Literature II
- WLIT 229 Theater History II (also THTR 229)
- WLIT 290 Masterpieces of Continental Fiction (also ENGL 290)
- WLIT 300 The City In Literature (French content)
- WLIT 368C Topics in Film (also ENGL 368C) (French content)
- WLIT 390 Topics in World Literature (French content)
- WLIT 399 Independent Study (French content)

Courses offered in a given semester with a French and Francophone Studies component are posted in Guilford House at registration time and on the FFS Web site.

Minor
The minor requires 15-17 credits. Students entering at the 200 level of language competence take 201, 202, and three more courses in FRCH and from the approved list. At least 6 credits should be taken in disciplines other than FRCH. Students entering at the 300 level of language competence take five courses at the 200 and 300 levels in FRCH and from the approved list. At least 3 credits should be in courses from FRCH taught in the French language, and at least 6 credits should be taken in disciplines other than FRCH.

Teacher Licensure Option
Students participating in the teacher licensure program complete a 45- to 47-hour major in French, including course work in French language, culture, and literature, and a 35-hour sequence in professional education. Course work in French begins in the freshman year with a language course appropriate to the student’s proficiency level and continues until the student has completed a range of upper-level courses and has met the goals of the program. Students are strongly urged to complete some of their course work in a French-speaking country and are assisted in identifying opportunities for study abroad. Interested students should contact Professor Marie Lathers. The professional education component (see program description for Teacher Licensure elsewhere in this bulletin) begins with a sequence taken on campus, followed by 20 semester hours, including student teaching, at John Carroll University.

SUBJECT AREA REQUIREMENTS:

*Required only for students who begin their French major at the intermediate level
**Students at the intermediate (200) level select five courses (15 credit hours); students entering the program at the advanced (300) level select seven courses (21 credit hours).

Study Abroad
Study abroad in France, Belgium, Switzerland, French Canada, the Francophone Caribbean, or a Francophone African or Middle Eastern country is strongly encouraged but not required for FFS majors. The Department of Modern Languages and Literatures offers a summer study abroad program in Paris (FRCH/WLIT 308) in even-numbered years. A summer study abroad program in Cameroon (FRCH/WLIT/ETHS 338) is offered in odd-numbered years. FRCH 208 is a spring break service-learning excursion to Montreal.

DEPARTMENT OF GEOLOGICAL SCIENCES

112 A.W. Smith Building
http://geology.case.edu
Phone: 216-368-3690; Fax: 216-368-3691
Gerald Matisoff, Chair
E-mail: gerald.matisoff@case.edu

The geological sciences encompass a wide range of inquiries into the physical, chemical, and biological processes that shape the earth and the planets. Application of these inquiries to understanding a planet’s evolution through time is a unique attribute of geological investigations. Knowledge of the past and present reveals the constraints of our environment and serves as a guide for the future.

In recent years, significant advances have been made in the understanding of plate tectonics, properties of the earth’s interior, the nature of surface and near-surface processes, the history of the earth’s climate, the ecology of living and ancient organisms, and the comparative geology of other planets. Geologic knowledge is fundamental to resource conservation, land use planning, environmental geochemistry, hydrology, engineering construction works, and other environmental concerns.

Department faculty focus their research in four areas: surficial processes, planetary materials, geochemistry, and sedimentary basin analysis. The department offers degree programs leading to the B.A. and B.S. in Geological Sciences, B.A. in Environmental Geology, B.A. in Environmental Studies, Master of Science (M.S.), and Doctor of Philosophy...
The Environmental Studies program is described elsewhere in this bulletin.

DEPARTMENT FACULTY

Gerald Matisoff, Ph.D.
(Johns Hopkins University)
Professor and Chair
Sedimentary and environmental geochemistry

Ralph P. Harvey, Ph.D.
(University of Pittsburgh)
Associate Professor
Planetary geology

Steven A. Hauck, II, Ph.D.
(Washington University)
Assistant Professor
Geodynamics

Peter L. McCall, Ph.D., J.D.
(Yale University)
Professor; Director, Environmental Studies Program
Benthic ecology; paleoecology

Beverly Z. Saylor, Ph.D.
(Massachusetts Institute of Technology)
Associate Professor
Sedimentary geology

James A. Van Orman, Ph.D.
(Massachusetts Institute of Technology)
Associate Professor
Geochemistry

Peter J. Whiting, Ph.D.
(University of California, Berkeley)
Associate Professor and Associate Dean
Geomorphology; surface water hydrology; environmental geology

Adjunct Faculty

Philip O. Banks, Ph.D.
(California Institute of Technology)
Adjunct Associate Professor
Geology; geochronology

Enriqueta Barrera, Ph.D.
(Case Western Reserve University)
Adjunct Associate Professor
Geochemistry; paleoeclimatology

Andrew Dombard, Ph.D.
(Washington University-St. Louis)
Adjunct Associate Professor; University Illinois-Chicago
Planetary geophysics

Joseph T. Hannibal, Ph.D.
(Kent State University)
Adjunct Associate Professor; Cleveland Museum of Natural History
Invertebrate paleontology

Michael Ketterer, Ph.D.
(University of Colorado)
Adjunct Professor; Northern Arizona University
Analytical chemistry

David Saja, Ph.D.
(University of Pennsylvania)
Adjunct Assistant Professor; Cleveland Museum of Natural History
Minerology

Richard C. Schmidt, Ph.D.
(McGill University, Canada)
Adjunct Professor
Economic geology

Emeritus Faculty

Samuel M. Savin, Ph.D.
(California Institute of Technology)
Jesse Earl Hyde Professor Emeritus and Dean Emeritus of the College of Arts and Sciences
Isotope geochemistry

UNDERGRADUATE PROGRAMS

Majors

Students in geological sciences obtain a solid background in basic science and mathematics as well as intensive training in the major. In addition, because of the wide variety of ways in which geologic knowledge can be applied, all students are encouraged to take electives in subjects appropriate to their personal objectives, which may be as diverse as the engineering applications of geology or the socioeconomic and legal systems bearing on environmental issues. The undergraduate programs stress practical experience and fieldwork as well as classroom study. The environmental geology major combines courses in geological sciences with courses in basic and applied sciences to provide students with an understanding of environmental problems, with employable skills, and with a background for graduate study or professional school.

All students participate in a three-semester Senior Project sequence in which they propose a research project, conduct the research, write a thesis, and present it to the department.

GEOLOGICAL SCIENCES MAJOR

The minimum requirements include 8 hours each of chemistry, physics, and calculus, plus any one of GEOL 101, 110, and 115, plus GEOL 119, 210, 301, 315, 317, 341, 344, 360, 390, 391, and 392. GEOL 360 provides comprehensive field training in the summer between the junior and senior years (this course necessitates transfer credit, which must be approved by the department).

ENVIRONMENTAL GEOLOGY MAJOR

The minimum requirements include 8 hours each of chemistry and calculus, plus BIOL 114, ESTD 101, PHYS 115, and STAT 201, plus GEOL 110, 119, 210, 303, 305, 317, 321, 390, 391, and 392.

In the above majors, the student and his or her advisor will design the remainder of the curriculum based on individual interests, in accordance with departmental and college requirements. An integrated undergraduate-graduate program leading to a master’s degree in five years is available. Special programs, such as interdisciplinary majors, also may be arranged.

Minor

Students may complete a minor in geological sciences by taking up to three of GEOL 101, 110, 115, and 117, plus GEOL 119 and sufficient upper-level GEOL courses to total 15 hours.

GRADUATE PROGRAMS

Graduate programs leading to the Master of Science and Doctor of Philosophy degrees are offered. Both programs are flexible so as to meet the needs of the individual student. General areas of study include aquatic systems, aquatic and groundwater chemistry, environmental geochemistry, benthic ecology, biostatigraphy and paleontology, environmental and urban geology, geomorphology, limnology, paleoclimatology, petrology, sedimentary geochemistry, sedimentation and stratigraphy, stable isotope studies, meteoritics, planetary materials, geodynamics of planetary interiors, and planetary geology. More specific information is available from the departmental office, the departmental Web page, and the Office of Admission of the School of Graduate Studies.

FACILITIES

The department’s research facilities include thin sectioning and mineral separation facilities; laboratories for chemical analysis of water, including an ion chromatograph, colorimetric spectrometer, atomic absorption spectrophotometer, electrochemistry equipment, and an environmental glove box; alpha and gamma spectroscopic facilities for analysis of environmental nuclides; equipment for studying...
animal-sediment relations, including a scanning gamma spectrometer; scanning electron microscope; electron microprobe; chemical reactors and a diamond anvil press for high-temperature and high-pressure geochemical experiments; and high-speed computing equipment.

Also housed in the department are laboratories for paleontological and micropaleontological investigations and for work in ecology and sedimentology. A well-field owned by the university is available for groundwater sampling and analysis.

The department also contains a wide range of other equipment, such as reflected and transmitted light microscopes, fluid inclusion microscope, cathodoluminescence microscope, submicroon and clay-silt-sand particle size analyzers, high magnetic field mineral separator, X-ray diffractometer, and field equipment for groundwater and geophysical work, including resistivity meter, seismic refraction instrument, ground conductivity meter, magnetometer, and gravimeter and field equipment for soil and sediment sampling.

**COURSE DESCRIPTIONS**

**GEOL 101. The Earth and Planets (3)**
An examination of the geological processes that have shaped the planets and moons of the inner solar system, focusing on those with relevance to our own planet Earth. Following an introduction to the fundamentals of planetary geology, lectures and exercises will explore how the inner planets (the asteroids, Mercury, Venus, Earth, the Moon, and Mars) exhibit the effects of planetary differentiation, impact cratering, volcanic activity, tectonics, climate, and interactions with life.

**GEOL 110. Physical Geology (3)**
Introduction to geologic processes and materials that shape the world we live in. Hydrologic cycle and evolution of landscapes, Earthquakes, volcanoes, plate tectonics, and geologic resources. Students desiring laboratory experience should enroll in GEOL 119 concurrently.

**GEOL 115. Introduction to Oceanography (3)**
The sciences of oceanography. Physical, chemical, and geologic features and processes of the oceans. Differences and similarities between the oceans and large lakes including the Great Lakes. Required: Sunday field trip.

**GEOL 117. Weather and Climate (3)**
Introduction to the study of weather and climate. Covers the basics of meteorology, climate zones, the hydrologic cycle, and weather prediction. Lectures address timely topics including greenhouse warming, past global climates, and recent advances in meteorology.

**GEOL 119. Geology Laboratory (1)**
Principles and techniques common to the geological sciences including rock and mineral identification, map interpretation, land form analysis, application of geological information to engineering works, and more. One three-hour laboratory or field trip weekly. Recommended preparation: GEOL 110.

**GEOL 202. Global Environmental Problems (3)**
Science, policy and ethics of environmental problems that affect the entire planet. Examination of problems of current interest, such as population growth, climate change, ozone depletion, and fisheries, from a variety of viewpoints. Construction of simple computer models of a global process using Stella II. No previous computer experience or knowledge of numerical methods is required.

**GEOL 210. Historical Geology/Paleontology (3)**
History of life as recorded in sedimentary rocks. Case histories of important basins of deposition; the interrelationships of paleogeography, plate tectonics, and evolution. Two lectures and one laboratory weekly.

**GEOL 220. Environmental Geology (3)**

**GEOL 225. Evolution (3)**
Multidisciplinary study of the course and processes of organic evolution provides a broad understanding of the evolution of structural and functional diversity, the relationships among organisms and their environments, and the phylogenetic relationships among major groups of organisms. Topics include the genetic basis of micro- and macroevolutionary change, the concept of adaptation, natural selection, population dynamics, theories of species formation, principles of phylogenetic inference, biogeography, evolutionary rates, evolutionary convergence, homology, Darwinian medicine, and conceptual and philosophical issues in evolutionary theory.

**GEOL 301. Stratigraphy and Sedimentation (3)**
Formation, distribution, and composition of sediments and sedimentary rocks. Modern depositional environments and their ancient analogues; principles of stratigraphic and biostratigraphic correlation. Two lectures and one laboratory per week.

**GEOL 303. Environmental Law (3)**
Problems in the environmental geosciences and the legal response. Types of pollution regulation, regulation of petroleum and coal exploration and development, water rights, wildlife and public lands management, common law remedies, and the role of scientific experts. Topics of current social interest.

**GEOL 305. Geomorphology and Remote Sensing (3)**
Recognition and interpretation of land forms and their significance in revealing present and past geologic processes. Introduction to acquisition and analysis of data through aerial photography and satellite imagery. Two lectures and one laboratory weekly. Recommended preparation: GEOL 110 and GEOL 119.

**GEOL 307. Evolutionary Biology and Paleobiology of Invertebrates**
Important events in the evolution of invertebrate life; structure, function, and phylogeny of major invertebrate groups.

**GEOL 315. Structural Geology and Geodynamics (3)**
Theoretical analysis of deformation in earth materials, with illustrations of deformational styles in various tectonic settings and the dynamics of the Earth's interior. Recommended preparation: GEOL 110.

**GEOL 317. Introduction to Field Methods (3)**
Practice in field procedures, recognition and testing of hypotheses in the field, field mapping and analysis of sedimentary, igneous, and metamorphic rocks in deformed and tectonically active settings. Weekly meeting plus spring break field trip. Students required to pay partial cost of meals, lodging, and travel. Prereq: GEOL 119.

**GEOL 318. Topics in Field Methods (3)**
Field analysis of geological and environmental problems. Topics and locations will vary. Requires preparatory meetings and week-long field trip, usually during spring break. Students required to pay partial cost of meals, lodging, and travel. Recommended preparation: GEOL 119 or permission of instructor.

**GEOL 321. Hydrogeology**
Basic and applied concepts pertaining to the occurrence and movement of groundwater. Definitions, basic equations, applications to a variety of geologic settings, wells. Requires one Saturday field trip to make field measurements, collect and analyze data, and prepare a report. Offered as GEOL 321 and GEOL 421.

**GEOL 330. Geophysical Field Methods and Laboratory (4)**
Use of seismic refraction and reflection, gravity, electrical, magnetic, and electromagnetic meth-
ods to infer the earth’s structure and composition. Application of inverse theory to estimate model parameters. Requires students to make field measurements, analyze data, and prepare a report. Includes several required Saturday field trips.
Offered as GEOL 330, GEOL 430.

GEOL 336. Aquatic Chemistry (4)
Chemical equilibria occurring in natural waters. Quantitative methods of describing acid-base, metal ion/ligand, precipitation/dissolution, and oxidation/reduction reactions. Geochemical cycling of trace metals and nutrients.
Offered as GEOL 336 and GEOL 436.

GEOL 341. Mineralogy (4)
Crystallography, hand specimen mineralogy and petrology, principles of crystal structure and crystal chemistry, elementary thermodynamics and phase diagrams, and an introduction to the petrographic microscope. Three lectures and one three-hour laboratory weekly. Recommended preparation: GEOL 119.

GEOL 344. Igneous and Metamorphic Petrology (4)
Composition, classification, and genesis of igneous and metamorphic rocks, emphasizing physical and chemical principles governing their origin. Laboratory study of rocks in thin section. Two lectures and two three-hour laboratories weekly. Prerequisite: GEOL 341.

GEOL 345. Planetary Materials (1–3)
An introduction to the materials that make up the solid matter of the solar system. Student presentations will review our current understanding of accessible primitive materials such as meteorites, cosmic dust, lunar and ancient terrestrial rocks, and their relationship to modern natural materials and solar system processes.
Offered as GEOL 345 and GEOL 445.

GEOL 349. Geological Problems (1–3)
Special work arranged according to the qualifications of the student.

GEOL 350. Geochemistry (3)
Introduction to geochemistry. Properties of the elements, elemental and isotopic fractionation, element transport, geochemical systems, geochronology, mineral reactions, the solid Earth, Earth in the solar system. A quantitative approach to modeling geochemical processes will be emphasized throughout.
Offered as GEOL 350 and GEOL 450.

GEOL 360. Summer Field Camp (6)
Six-week course in geologic field methods and mapping. Not offered at Case Western Reserve University; must be taken at another college or university. Credits will be transferred.

GEOL 367. Topics in Evolutionary Biology (3)
The focus for this course on a special topic of interest in evolutionary biology will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution. ANAT/ANTH/GEOL/PHIL 467/Biol 468 will require a longer, more sophisticated term paper, and additional class presentation.
Offered as ANTH 367, BIOL 368, GEOL 367, PHIL 367, ANAT 467, ANTH 467, BIOL 468, GEOL 467, and PHIL 467.

GEOL 390. Introduction to Geological Research (3)
Examination of factors in the selection, design, and conduct of research projects and in the analysis and interpretation of research results. Consideration of ethical issues in scientific research. Practice in proposal writing and oral presentation. Consultations with department faculty in preparation for individual Senior Project proposals. Research initiation.
SAGES Dept Seminar

GEOL 391. Senior Project (2)
Research project required of all department majors, based on formal project proposals presented to department faculty. Proposals may be submitted prior to the semester in which GEOL 391 is taken. Emphasis is on independence, initiative, and follow-through in planning and conducting the project. Grading deferred until completion of GEOL 392 (required). This course is the first of a 2-semester Senior Capstone (GEOL 391, 392) sequence. Recommended preparation: GEOL 390. SAGES Senior Cap

GEOL 392. Professional Presentation (2)
Preparation and presentation of final written and oral reports on individual Senior Projects. Class meetings focus on group discussion of problem areas in analysis and interpretation of project results, and in styles of writing poster and oral presentations as demonstrated by practice examples. This course is the second in a two-course (GEOL 391, 392) Senior Capstone sequence. Recommended preparation: GEOL 391. SAGES Senior Cap

GEOL 394. Seminar in Evolutionary Biology (3)
This seminar investigates 20th-century evolutionary theory, especially the Modern Evolutionary synthesis and subsequent expansions of and challenges to that synthesis. The course encompasses the multidisciplinary nature of the science of evolution, demonstrating how disciplinary background influences practitioners’ conceptualizations of pattern and process. This course emphasizes practical writing and research skills, including formulation of testable theses, grant proposal techniques, and the implementation of original research using the facilities on campus and at the Cleveland Museum of Natural History.
Offered as ANTH 394, BIOL 394, GEOL 394, HSTY 394, PHIL 394, ANTH 494, BIOL 494, GEOL 494, HSTY 494, and PHIL 494.

GEOL 396. Undergraduate Research in Evolutionary Biology (3)
Students propose and conduct guided research on an aspect of evolutionary biology. The research will be sponsored and supervised by a member of the CASE faculty or other qualified professional. A written report must be submitted to the Evolutionary Biology Steering Committee before credit is granted.
Offered as ANTH 396, BIOL 396, GEOL 396, and PHIL 396.

GEOL 405. Geomorphology and Remote Sensing (3)
Recognition and interpretation of land forms and their significance in revealing present and past geologic processes. Introduction to acquisition and analysis of data through aerial photography and satellite imagery. Two lectures and one laboratory weekly. Recommended preparation: GEOL 110 and GEOL 119.
Offered as GEOL 305 and GEOL 405.

GEOL 415. Structural Geology and Geodynamics (3)
Theoretical analysis of deformation in earth materials with illustrations of deformational styles in various tectonic settings and the dynamics of the Earth’s interior. Recommended preparation: GEOL 110.
Offered as GEOL 315 and GEOL 415.

GEOL 421. Hydrogeology (3)
Basic and applied concepts pertaining to the occurrence and movement of groundwater. Definitions, basic equations, applications to a variety of geologic settings, wells. Requires one Saturday field trip to make field measurements, collect and analyze data, and prepare a report.
Offered as GEOL 321 and GEOL 421.

GEOL 425. Geotectonics (3)
Interpretation of the major crustal features of the earth in terms of plate tectonics and associated phenomena.

GEOL 430. Geophysical Field Methods and Laboratory (4)
Use of seismic refraction and reflection, gravity, electrical, magnetic, and electromagnetic methods to infer the earth’s structure and composition. Application of inverse theory to estimate model parameters. Requires students to make field measurements, analyze data, and prepare a report. Includes several required Saturday field trips.
Offered as GEOL 330, GEOL 430.

GEOL 436. Aquatic Chemistry (4)
Chemical equilibria occurring in natural waters. Quantitative methods of describing acid-base, metal ion/ligand, precipitation/dissolution, and oxidation/reduction reactions. Geochemical cycling of trace metals and nutrients.
Offered as GEOL 336 and GEOL 436.

GEOL 437. Chemistry of Natural Waters (3)
Advanced topics in aquatic chemistry. Thermodynamics models for ion/ligand speciation in natural waters; origin and composition of seawater, chemical and mineralogical sequence during evaporation, chemical weathering, groundwater and river water chemistry, chemical cycling and a global mass balances; perturbations on natural systems by man. Predictive capabilities of box models.

GEOL 444. Flow and Sediment Transport (3)
This course focuses on open channel flow and sediment transport mechanics. A mathematical framework for the description of free surface flow and various modes of particle transport is built. This framework is used in discussions of geomorphic and sedimentologic processes and features. Specific topics covered include dimensional analysis, forces on settling particles, fluid flow, initiation of particle movement, bedload and suspended load transport and their calculation, and channel form.

GEOL 445. Planetary Materials (1–3)
An introduction to the materials that make up the solid matter of the solar system. Student presentations will review our current understanding of accessible primitive materials such as meteorites, cosmic dust, lunar and ancient terrestrial rocks, and their relationship to modern natural materials and solar system processes. Offered as GEOL 345 and GEOL 445.

GEOL 450. Geochemistry (3)
Introduction to geochemistry. Properties of the elements, elemental and isotopic fractionation, element transport, geochemical systems, geochronology, mineral reactions, the solid Earth, Earth in the solar system. A quantitative approach to modeling geochemical processes will be emphasized throughout.
Offered as GEOL 350 and GEOL 450.

GEOL 455. Isotope Geochemistry (3)
Principles and applications of naturally occurring variations of isotopic abundances in geologic, hydrologic, and biologic systems. Includes consideration of radioactive and radiogenic isotopes and their use in geochronology and as tracers; consideration of isotopic fractionations (especially of light stable isotopes), their thermodynamic and kinetic causes, and their use in understanding mechanisms and conditions of geologic processes and as tracers.

GEOL 467. Topics in Evolutionary Biology (3)
The focus for this course on a special topic of interest in evolutionary biology will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution, ANAT/ANTH/GEOL/PHIL 467/BIOL 468 will require a longer, more sophisticated term paper, and additional class presentation.
Offered as ANTH 367, BIOL 368, GEOL 367, PHIL 367, ANAT 467, ANTH 467, BIOL 468, GEOL 467, and PHIL 467.

GEOL 494. Seminar in Evolutionary Biology (3)
This seminar investigates 20th-century evolutionary theory, especially the Modern Evolutionary synthesis and subsequent expansions of and challenges to that synthesis. The course encompasses the multidisciplinary nature of the science of evolution, demonstrating how disciplinary background influences practitioners' conceptualizations of pattern and process. This course emphasizes practical writing and research skills, including formulation of testable theses, grant proposal techniques, and the implementation of original research using the facilities on campus and at the Cleveland Museum of Natural History.
Offered as ANTH 394, BIOL 394, GEOL 394, HSTY 394, PHIL 394, ANTH 494, BIOL 494, GEOL 494, HSTY 494, and PHIL 494.

GEOL 503. Seminar: Geomorphology/Glacial Geology (1)

GEOL 504. Seminar: Geochemistry (1)

GEOL 506. Seminar in Geophysics (1–3)
Selected topics in geophysics: advanced research issues, classical papers, current state of the field, advanced techniques. Course content will vary depending on interests of students and faculty.

GEOL 509. Seminar: Graduate Research (1)

GEOL 511. Special Readings in Geology (1–6)
Detailed study of a selected topic in geology under the guidance of a faculty member.

GEOL 512. Special Readings in Geology (1–6)
Detailed study of a selected topic in geology under the guidance of a faculty member.

GEOL 536. Seminar in Great Lakes Issues (1–3)
Selected topics related to Great Lakes basin studies: research problems, scientific processes, classic research papers, current events, policy issues, and legislative initiatives. Course content will vary depending on interests of students and faculty.
Offered as BIOL 536 and GEOL 536.

GEOL 601. Special Problems and Research (1–18)
(Credit as arranged.)

GEOL 651. Thesis M.S. (1–18)
(Credit as arranged.)

GEOL 701. Dissertation Ph.D. (1–18)
(Credit as arranged.)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.
Jerry Piven, Ph.D.
Lecturer in Philosophy

David Rothenberg, Ph.D.
Assistant Professor of Music

Susanne Vees-Gulani, Ph.D.
Assistant Professor of Modern Languages and Literatures; Associate Director, Max Kade Center for German Studies

UNDERGRADUATE PROGRAMS

Major
The major in German Studies, which includes a German language requirement, concentrates on the study of the German cultural tradition in history, philosophy, the fine arts, music, film studies, politics, and culture. The major is particularly suited to students wishing to combine interests in German language and culture with a major in another discipline.

The major requires 30 hours, to be distributed as follows:

1. Required courses (6 hours):
   German 303 and German 396 (Senior Capstone) or equivalent

2. Electives (24 hours):
   Eight additional 300-level courses from the approved list of German Studies courses, no more than three of which may be in any one department.

The list of approved courses includes offerings from several departments and programs, including Art History and Art, Economics, English, History, Modern Languages and Literatures, Music, Philosophy, Political Science, Religious Studies, Theater, and World Literature. For the latest information about approved courses, please consult the program director.

Possible concentrations for the German Studies major include history and philosophy; German literature and theater history; political science and history; art history; music history; and religious studies. Within the program requirements, students are free to shape the major as they wish, based on their own intellectual interests.

Minor
The course requirements for the minor (15 hours) are as follows:

1. At least German 303 or 311 (3 hours)

2. Four additional 300-level courses from the approved list of German Studies courses, chosen from any two departments, or a thematic course of study approved in advance by the program director (12 hours)

GERONTOLOGICAL STUDIES PROGRAM

226 Mather Memorial
www.case.edu/artsci/soci/gerontological.html
Phone: 216-368-2703; Fax: 216-368-2676
Dale Dannefer and Gary T. Deimling, Directors
E-mail: dale.dannefer@case.edu; gary.deimling@case.edu

The Gerontological Studies program is a multidisciplinary program designed to integrate research and theory from multiple disciplines about aging, old age, and the life course. Prompted in part by broad social and technological changes that include the “graying” of the world’s population, humanists, scientists, social scientists, and professionals have become interested in understanding the position of the aged in society, the aging process in various contexts, and the meaning of aging to individuals. The program draws on the most recent thinking and research in a variety of disciplines to provide students with a background that will be helpful after graduation, both in work and in graduate or professional school.

In keeping with the interdisciplinary nature of the program, the core courses are drawn from five departments: Anthropology, Communication Sciences, History, Psychology, and Sociology. Students may choose from a variety of courses according to their own interests. Most of the electives are not specifically gerontology courses but cover topics that contribute to the understanding of aging and the aged. The perspectives gained in the core courses will provide the student with the background needed to relate the material in the more general courses to gerontological issues. The program is firmly grounded in the liberal arts and thus provides the student with the challenge to think and communicate effectively and to integrate diverse information, theories, and practice.

Gerontological Studies is an appropriate major or minor for students with a wide variety of career goals. The aging of the population has made available entry-level positions for persons with baccalaureate degrees in organizations that provide services to and formulate policy for the elderly. Many graduate programs now include an emphasis on aging for which a degree in Gerontological Studies would serve as a useful background. Students planning to pursue professional degrees will find that an increasing number of their clients or patients will be older adults and that problems with which they must deal will be related to the aged. The perspective provided by participating in the Gerontological Studies program provides students with excellent background in working with older populations. This background is particularly important for students who plan to pursue careers in human services, business, law, medicine, academics, or the sciences.

Faculty members associated with the program are engaged in a variety of funded research projects. These include studies of Alzheimer’s disease; cancer survivorship; patterns of care for the urban elderly in China; visual perception changes that accompany aging; the impact of high levels of physical activity on the biological aging process; grandparent-grandchild relationships; and stress, coping, and adaptation among urban community and institutionalized elderly.

PROGRAM ADVISORY COMMITTEE

Dale Dannefer, Ph.D.
Selah Chamberlain Professor and Chair, Department of Sociology, Co-Director, Gerontological Studies Program

Gary T. Deimling, Ph.D.
Professor of Sociology, Co-Director, Gerontological Studies Program

Charlotte Ikels, Ph.D.
Professor of Anthropology

T. J. McCallum, Ph.D.
Associate Professor of Psychology

UNDERGRADUATE PROGRAMS

Major
The Gerontological Studies program offers a major that leads to the Bachelor of Arts degree. However, it may be selected only as a second major, the first major being in a traditional academic department. The major consists of a minimum of 30 credits; 15 are in required courses and 15 are in approved elective courses. The required courses are:

- ANTH 304 Anthropology of Aging (3)
- COSI 345 Communication and Aging (3)
• PSCL 369 Adult Development and Aging
• SOCI 369 Aging in American Society (3)
• SOCI 496 Public Policy and Aging (3)

At least 15 credit hours must be earned in the approved electives listed below. This list changes from time to time as departmental offerings change. Check with a program director for current information.

• ANTH 215 Health, Culture, and Disease: An Introduction to Medical Anthropology (3)
• ANTH 301/401 Biological Aging in Humans (3)
• ANTH 318 Death and Dying (3)
• SOCI 269 Young and Old Face the Twenty-first Century (3)
• SOCI 311 Health, Illness, and Social Behavior (3)
• SOCI 313 Sociology of Stress and Coping (3)
• SOCI 319 Sociology of Institutional Care (3)
• SOCI 370 Family Structure and Process (3)
• GERO 397 Special Studies in Gerontology (1–3)
• GERO 398 Seminar in Gerontological Studies (3)
• GERO 399 Independent Studies in Gerontology (1–3)

Minor
The minor consists of 15 credits, including at least two of the core gerontology courses (ANTH 304, COSI 345, PSCL 369, SOCI 369, and SOCI 396), and any three of the approved electives or remaining core courses.

GRADUATE CERTIFICATE PROGRAM IN GERONTOLOGY
University Center on Aging and Health
1420 Frances Payne Bolton School of Nursing
http://fpb.case.edu/Centers/UCAH/program.shtml
Phone: 368-2692; Fax: 216-368-6389
May L. Wykle, Director
E-mail: may.wykle@case.edu

The University Center on Aging and Health is dedicated to the premise that aging is a developmental process spanning the entire life cycle, and brings together social and behavioral sciences, health sciences, and the humanities to encourage teaching and research activities in every unit of the University. The Center sponsors a certificate program in gerontology for graduate and professional students and for those who already hold graduate degrees.

A student interested in a graduate certificate in gerontology must be enrolled in a master’s or doctoral program, or be a special non-degree student with at least a master’s degree (or equivalent). To receive a certificate in gerontology, a student must submit a formal application, be approved by the University Center on Aging and Health, and take 12 credit hours of course work.

The student must complete the following courses:

1. Two three-credit courses in gerontology within the student’s discipline, one of which can be an independent study.
2. One three-credit course in gerontology or independent study outside the student’s discipline.
3. A three-credit seminar in gerontology offered by the center.

Any departures from the requirements must be approved by the center director. For further information, contact the University Center on Aging and Health at the address given above.

COURSE DESCRIPTIONS

GERO 397. Special Studies in Gerontology (1–3)
Independent study. Limited to junior and senior majors and minors.

GERO 496. Public Policy and Aging (3)
(See EPBI 408.) Cross-listed as EPBI 408.

GERO 498. Seminar in Gerontological Studies (3)
Major themes in gerontology. Seminar members choose a problem area, explore the relevant literature from a multi-disciplinary perspective, and develop a research project using knowledge gained through community observation and library exploration.

GERO 601. Independent Study (1–3)
For students enrolled in the graduate certificate program in gerontology.

HISTORY AND PHILOSOPHY OF SCIENCE PROGRAM
204 Mather House
www.case.edu/artsci/hpst
Phone: 216-368-2614
Alan Rocke, Director
E-mail: alan.rocke@case.edu

The Department of Philosophy and the Department of History together offer an undergraduate major in the history and philosophy of science. The purpose of the major is to develop a humanistic understanding of the nature and development of science through the combined use of philosophical and historical methods. The major provides a foundation for graduate study in a range of academic disciplines and for careers in such areas as business, medicine, law, public policy, and science journalism. It also may be profitably combined with a program in one of the sciences. Within the major, a student may seek an emphasis on the philosophy of science, the history of the physical sciences, or the history of the biological and medically related sciences.

PROGRAM ADVISORY COMMITTEE
Alan J. Rocke, Ph.D.
Henry Eldridge Bourne Professor of History; Director, History and Philosophy of Science Program

James M. Edmonson, Ph.D.
Adjunct Associate Professor of History; Director, Dittrick Medical History Center

Miriam R. Levin, Ph.D.
Professor of History

Colin McLarty, Ph.D.
Truman P. Haidt Professor of Intellectual Philosophy; Associate Professor of Philosophy

Jonathan Sadowsky, Ph.D.
Theodore J. Castele Professor; Associate Professor of History

UNDERGRADUATE PROGRAMS

Major
The history and philosophy of science major requires 30 credit hours from courses in philosophy and in history of science and technology. Required are PHIL 101, 204, and 302; HSTY 151 and 202; HSTY/PHIL 203; HSTY/PHIL 390; and three electives approved by the major advisor. Students who major in the history and philosophy of science are not permitted to take a second major in philosophy or to minor in philosophy.

Minor
The minor in history and philosophy of science consists of HSTY 202, PHIL/HSTY 203, and PHIL 204, plus two electives approved by the minor advisor.
The Department of History offers comprehensive undergraduate and graduate programs, with particular emphases on American history; the history of science, technology, environment, and medicine; and social history and policy. Historical studies are sometimes categorized among humanistic studies and sometimes among the social sciences. Allied with both traditions, historians seek an understanding of the past by analyzing societies and how they change over time.

The Department of History offers instruction within the customary frameworks that have formed the basis of historical studies, and it also has developed special emphases in social, cultural, political, and economic perspectives that allow instruction and research on such topics as the African-American experience, the environment, business and economy, technology and science, medicine, women’s history and gender studies, legal history, and comparative social history. Courses in history, or a formal major or minor in history, traditionally have been attractive to students as preparation for a wide variety of career and professional interests, including teaching, law, government, and journalism, and such public history activities as archival administration, historical museum administration, restoration and preservation of historic sites, and writing.

DEPARTMENT FACULTY
Jonathan Sadowsky, Ph.D.  
(Johns Hopkins University)  
Theodore J. Castele Professor; Associate Professor and Chair; Adjunct Associate Professor of Global Health and Diseases, School of Medicine  
Medical history; African history; comparative history
Molly W. Berger, Ph.D.  
(Case Western Reserve University)  
Instructor; Associate Dean, College of Arts and Sciences  
History of technology; U.S. cultural history; nineteenth and twentieth centuries
John Broich, Ph.D.  
(Stanford University)  
Assistant Professor  
British history; British Empire; environmental history; history of public health
Daniel Cohen, Ph.D.  
(Brandeis University)  
Associate Professor  
Colonial America; U.S. cultural history
David C. Himmack, Ph.D.  
(Columbia University)  
Hiram C. Hayden Professor of History  
American social and urban history; economic history
Marina Lasso, Ph.D.  
(University of Florida)  
Assistant Professor  
Latin American and Caribbean history; race and nationalism
Kenneth F. Ledford, Ph.D., J.D.  
(Johns Hopkins University, University of North Carolina)  
Associate Professor  
Modern German history; Modern European history; European legal history; history of the professions
Miriam R. Levin, Ph.D.  
(University of Massachusetts)  
Professor  
Industrial culture; European technology; French cultural history
Alan Rocke, Ph.D.  
(University of Wisconsin, Madison)  
Henry Elridge Bourne Professor of History; Director, History and Philosophy of Science Program  
History of science; science, technology, and society
Renée M. Sentilles, Ph.D.  
(College of William and Mary)  
Associate Professor; Director, American Studies Program  
American women’s history; U.S. cultural history; American studies
Peter Shulman, Ph.D.  
(Massachusetts Institute of Technology)  
Assistant Professor  
History of technology and science; environmental history; United States foreign relations
Theodore L. Steinberg, Ph.D.  
(Brandeis University)  
Adeline Barry Davie Distinguished Professor of History; Professor of Law  
U.S. environmental and legal history
Gillian L. Weiss, Ph.D.  
(Stanford University)  
Assistant Professor  
Early modern France; comparative slavery; the Mediterranean
Rhonda Y. Williams, Ph.D.  
(University of Pennsylvania)  
Associate Professor  
African American history; U.S. social history

Secondary Faculty
Rachel Sternberg  
(Bryn Mawr College)  
Associate Professor of Classics  
Greek language and literature; Greek social history; history of emotion; reception of the classical tradition in the age of Jefferson
Peter J. Whitehouse, M.D., Ph.D.  
(Johns Hopkins University)  
Professor of Neurology  
Geriatric neurology; behavioral neurology; dementia; history of neurology

Adjunct Faculty
James M. Edmonson, Ph.D.  
(University of Delaware)  
Adjunct Associate Professor; Director, Dittrick Medical History Center  
Medical history
John Grabowski, Ph.D.  
(Case Western Reserve University)  
Krieger-Mueller Associate Professor in Applied History  
U.S. history; immigration and ethnicity; local history
Gladys Haddad, Ph.D.  
(Case Western Reserve University)  
Adjunct Professor  
American studies; women’s education
John Vacha, M.A.  
(Case Western Reserve University)  
Adjunct Assistant Professor  
Theater history

UNDERGRADUATE PROGRAMS

Major
The history major may be elected in one of two formats: (1) the regular major, and (2) the teacher licensure major.

1) The regular major requires a minimum of 30 hours in history courses, including HSTY 112, HSTY 113, HSTY 250 (Issues and Methods in History), and HSTY 398 (Senior Research Seminar), as well as six additional courses in history, four of which must be agreed upon in consultation with the departmental advisor to form a coherent field of historical inquiry. The
focus might be geographical (for example, European history), chronological (for example, 20th-century history), topical (for example, women’s history), or some combination of these. The remaining two courses are open electives, and with permission, a course outside of History, in a related discipline, may be accepted towards the hours for the major.

2) The teacher licensure major requires 30 hours of history, including the same four courses required for the regular major and a minimum of six semester hours in each of three focus areas: United States history, World/European studies, and Asian, African, and Latin American studies. Candidates for teacher licensure (Integrated Social Studies, Adolescents and Young Adults) must also take courses in economics, political science, and sociology (9 hours), and 35 hours in education courses offered through Case Western Reserve and John Carroll University (see Teacher Licensure description elsewhere in this bulletin), culminating in student teaching. Students interested in pursuing this option should confer with the department’s undergraduate advisor.

Subject area requirements (39 hours):
HSTY 112, 113, 250, 398; two of HSTY 152, 206, 253, 255, 256, 257, 260, 262, 266, 325, 353, 354, 355, 356, 358, 378; two of HSTY 151, 200, 211, 212, 221, 222, 223, 254, 308, 309, 310, 334, 335, 342; two of HSTY 131, 135, 258, 268, 280, 281, 282, 285, 382, 383; one of ECON 102 or 103 or POSC 260; one of SOCI 112A, 112B, 113A, 113B, 302, 310. (With advisor approval, economics requirement may be met with HSTY 255, sociology requirement may be met with HSTY 262 or HSTY 325, and political science requirement may be met with HSTY 256.)

Integrated Graduate Studies

The Department of History participates in the Integrated Graduate Studies program. Interested students should note the general requirements and procedures of the Graduate School, but must also consult the departmental advisor about the specific requirements, guidelines, and opportunities for IGS in history.

Minor

A minor in history is available to all undergraduate students. It consists of 15 hours in history, including HSTY 112-113 (history core courses) and three additional courses, chosen in consultation with the departmental advisor; the courses must form a coherent field of historical inquiry.

Advanced Placement Credit

Students with Advanced Placement (AP) scores of 4 or better will receive three semester hours of college credit, applicable to the total number of credits required for graduation as well as to any major, minor, or sequence in history. AP credit may not be applied to the HSTY 112 and 113 core courses. Credit by way of AP examination in U.S. history is given for HSTY 256 (American Political History) and in European history for HSTY 212 (Modern European History).

GRADUATE PROGRAMS

The Department of History offers both the M.A. and the Ph.D. in history, but it emphasizes its two focused Ph.D. programs, in Social History and Policy and in the History of Science, Technology, Environment and Medicine. In practice, these two programs are closely related. The department also joins with the Law School to offer an M.A./J.D. dual-degree program. Informally, students can combine graduate study in history with the certificate or degree programs of the Mandel Center for Nonprofit Organizations. All applicants for graduate degrees in history must submit transcripts from all previous undergraduate, graduate, and professional study, scores on the GRE or a comparable standardized test, and three letters of recommendation. The department recommends, but does not require, an undergraduate major in history.

Master of Arts

The M.A. in history requires 27 hours of course work, including 6 hours of carefully supervised work on a master’s thesis (a work of original research based on primary sources). For the joint J.D./M.A. program, students must be admitted to both the History graduate program and the law school. They can earn the degree in either three and one-half years or three years and two summers of study, completing a total of 106 hours (including double credits of up to nine hours).

Doctor of Philosophy

Students are admitted into the History Department’s graduate programs with or without a master’s or professional degree. Students who do not have a master’s degree in history may be required to complete that degree in the department before moving on to the Ph.D.; those who have earned graduate or professional degrees closely related to their Ph.D. programs may petition for direct admission to the Ph.D. program. Students who first complete their M.A. in history at Case Western Reserve must complete an additional 24 hours of course work, pass the qualifying exams required by their program of study, and prepare a Ph.D. dissertation while enrolling in at least 18 hours of supervised dissertation-writing work. Students who have completed their master’s-level work before coming to Case Western Reserve must complete at least 24 hours of course work before taking their qualifying exams. All Ph.D. students are required to take HSTY 470 (Historiography, Method, and Theory), HSTY 477 (Seminar in Comparative History), and HSTY 479 (Historical Research and Writing).

Program in Social History and Policy

The Social History and Policy program is designed to prepare students for careers either as analysts and administrators of social policy, or as teachers and researchers in colleges and universities. The program defines social policy broadly to include not only welfare, family and juvenile matters, aging, health care, and medicine, but also education, urban history, environmental history, cultural policies regarding museums, libraries and similar agencies, and labor. The program recognizes that social policies are made and put into practice by private, nonprofit organizations and through legal institutions as well as through federal, state, and local legislatures and executives.

Applicants for the Social History and Policy program must submit GRE scores and three letters of recommendation. The program does not require an M.A. in history, and has admitted several students with J.D., M.S.W., library science, or other degrees, but it often requires students with limited backgrounds in U.S. history to take extra course work. More tightly structured than the traditional Ph.D., the Social History and Policy program requires 18 hours of course work (and possibly additional hours to prepare for examinations); qualifying examinations in U.S. history and in the history of social policy; a cognate field; and a dissertation. The program also includes an option for the student to complete a policy-related internship; recent internships have been conducted with the Cleveland Federation for Community Planning, the Interchurch Council of Greater Cleveland, the Bureau of Jewish Education, the Sisters of Charity of St.
Augustine, and the Hathaway Brown School.

Program in the History of Science, Technology, Environment and Medicine

The History of Science, Technology, Environment and Medicine program was established in 1961 as the first in the nation to emphasize the history of technology as well as the history of science. The program's areas of particular strength include the social and cultural history of technology, both American and European, technology and science policy, the history of the physical sciences since the Renaissance, gender issues in technology and science, the history of medicine, and the history of the environment. The course of study for the Ph.D. includes the M.A. requirements, written and oral qualifying examinations, and a dissertation. While most graduates of the program teach in universities, others work in museums or archives, or deal with science policy questions.

The Department of History also offers a traditional Ph.D. program in U.S. history. For this program, which does not admit students every year, an M.A. in history is strongly recommended. This program requires 24 hours of course work beyond the M.A. as well as comprehensive oral examinations in the general field (U.S. history from the colonial period to the present), in a major field (a period or subfield of U.S. history), and in two cognate fields, at least one of which is a field other than U.S. history.

FACILITIES

Case Western Reserve University, the other institutions in the University Circle neighborhood, and the Cleveland area in general offer excellent facilities for historical research. These facilities are especially strong in the fields of social history and policy and in the history of medicine, health care, nonprofit organizations, technology, and science. The university library's extensive collections in these fields are significantly augmented by the holdings of the nationally ranked Allen Memorial Library in the history of medicine and health care, and of the equally distinguished Western Reserve Historical Society in regional economic, social, nonprofit, ethnic, African-American, and Jewish history. Both the Allen Memorial Library and the Western Reserve Historical Society library are adjacent to the campus. The Cleveland Public Library, just five miles from campus in downtown Cleveland, is the third largest public library in the U.S.; it maintains excellent research collections in Ohio, U.S., and British history, technology, and business. The University has also pioneered in the development of electronic connections to other libraries and to research resources in general; Ohio's many colleges and universities have one of the nation's leading interlibrary loan programs.

COURSE DESCRIPTIONS

HSTY 106. Introduction to Early American History (3)

History of colonial British North America and the early United States through 1860. Focuses on contrasting social systems in different colonies and regions; causes and consequences of the American Revolution; political, religious, and economic transformations between 1790 and 1860. Students will examine various scholarly approaches and methods, but will particularly explore the lives and values of early Americans through personal writings such as diaries and autobiographies.

HSTY 110. Roman Civilization (3)

The enduring significance of the Romans studied through their history, literature, art, and philosophy. Lectures and discussion. Offered as CLSC 112 and HSTY 110.

HSTY 111. Greek Civilization (3)

This course constitutes the first half of a year-long sequence on classical civilization. It examines the enduring significance of the Greeks studied through their history, literature, art, and philosophy. Lectures and discussion. (For the second course in the sequence, see CLSC 112.) Offered as CLSC 111 and HSTY 111.

HSTY 112. Introduction to American History (3)

History of the United States from the first settlements to the present. Emphasis on themes such as political and social revolution, slavery and race relations, industrialism, and national cultures.

HSTY 113. Introduction to Modern World History (3)

The history of the nineteenth and twentieth centuries in global context. Emphasis on the forces that have created or shaped the modern world: industrialization and technological change; political ideas and movements such as nationalism; European imperialism and decolonization; and the interplay of cultural values.

Global & Cultural Diversity

HSTY 117. Introduction to American Studies (3)

This course is designed to introduce students to the interdisciplinary field of American Studies while also empowering them to use the tools and perspectives of several disciplines, such as history, literature, art history, and anthropology. This course aims to introduce students to the various disciplines that constitute American Studies while paying special attention to the ways in which these disciplines can work together to illuminate the study of American cultures, past and present. Students will combine different methodologies in the process of completing assignments designed to make use of a variety of University Circle institutions. For the purposes of this course, biography is treated as a constructed genre that comes in a variety of forms, including autobiography, biographical novels, oral histories, and film. The class will discuss how certain biographies have created archetypal American identities, and how gender/race/class/historical context, etc. have affected the writing and reading of biography and restructured notions of identity. Offered as AMST 117 and HSTY 117.

HSTY 133. Introduction to Chinese History and Civilization (3)

This course explains the continuities and discontinuities in the history of China by stressing the development and distinctive adaptations of cultural, religious, and political patterns from the origins of the Chinese civilization to the present. By focusing on major cultural, socio-economic, and political issues such as Confucianism, Buddhism, trade relations, imperialism, and intellectual discourse in the overall Asian context (with particular reference to Korea and Japan), we discuss the historical development of China and its situation on entering the 21st century. Taking into account the key historical events in the last century, we examine the emergence of China as a modern nation-state and the fundamental transformation of Chinese society in the post-war period. Offered as ASIA 133 and HSTY 133.

Global & Cultural Diversity

HSTY 134. Introduction to Japanese History and Civilization (3)

This course provides an introduction to various aspects of Japanese civilization, from its origins to the present. By focusing on major cultural, socio-economic, and political issues such as the adaptation and transformation of Confucianism, Buddhism, Shintoism, social structures, material culture, foreign relations, militarism, nationalism, and intellectual discourse in the overall Asian context (with particular reference to Korea and China), we discuss the historical development of Japan and the country’s position on entering the 21st century. We examine the emergence of Japan as a modern nation-state and the fundamental transformation of its society in the post-war period. Offered as ASIA 134 and HSTY 134.

Global & Cultural Diversity

HSTY 135. Introduction to Modern African History (3)

A general introduction to major themes in modern African history, with an emphasis on the nineteenth and twentieth centuries. Topics include oral tradition and narrative, economic structure and dynamics, religious movements, colonialism,

HSTY 136. Introduction to Latin American History (3)
This course provides an introduction to the historical and cultural development of Latin America, in an attempt to identify the forces, both internal and external, which shape the social, economic and political realities in present day Latin America. Beginning with its pre-Columbian civilizations, the course moves through the conquest and colonial period of the Americas, the wars of independence and the emergence of nation-states in the nineteenth century, and the issues confronting the region throughout the turbulent twentieth century, such as migration and urbanization, popular protest and revolution, environmental degradation, great power intervention, the drug trade and corruption, and the integration of the region into the global economy. Offered as ETHS 253B and HSTY 136. Global & Cultural Diversity

HSTY 151. Technology in European Civilization (3)
The history of technology in ancient Mediterranean, medieval, and modern European society until the First World War. The course introduces students to the relationship between technology and its social, political, and cultural settings, and to the values invested in technology at significant historical moments. There will be visits to local industrial sites, architectural and engineering monuments, and the Cleveland Museum of Art. Offered as ETHS 253B and HSTY 136.

HSTY 152. Technology in America (3)
Origins and significance of technological developments in American history, from the first settlements to the present. Emphasis on the social, cultural, political, and economic significance of technology in American history. Offered as ETHS 253B and HSTY 136.

HSTY 163. Modern Britain and Its Empire (3)
This lecture and discussion course covers the history of Britain at the height of its political and industrial power and the history of the expanding and contracting British Empire. Britain was a nation of great technological, economic, and military power, but it also experienced extraordinary stresses. Industrialization meant material prosperity for some, but hardship and dehumanization for others. Many questioned how overwhelming poverty and ignorance could be allowed to stand beside such vast affluence. And subjects of the British in India, Ireland, and elsewhere struggled for independence from an empire that claimed to bring freedom, reason, and equality. The British learned to their cost, too, that decolonization often meant being caught in the crossfire of ethnic rivals. This course will explore the many paradoxes of the history of the British at their most dominant.

HSTY 200. The Ancient World (3)
Ancient Western history from the origins of civilization in Mesopotamia to the dissolution of the Roman Empire in the West. Offered as CLSC 201 and HSTY 200.

HSTY 201. Science in Western Thought I (3)
The development of Western thinking about the natural world and our relation to it, as part of culture, from pre-classical civilizations to the age of Newton.

HSTY 202. Science in Western Thought II (3)
The development of Western thinking about the natural world and our relation to it, as part of culture, from Newton to the modern age. HSTY 201 is not a prerequisite.

HSTY 203. Natural Philosophy I (3)
Historical and philosophical interpretation of some epochal events in development of science. Copernican revolution, Newtonian mechanics, Einstein’s relativity physics, quantum mechanics, and evolutionary theory; patterns of scientific growth; structure of scientific “revolutions;” science and “pseudo-science.” First half of a year-long sequence. Offered as HSTY 203 and PHIL 203.

HSTY 204. Introduction to the Nonprofit Sector (3)
The United States has by far the largest and most important “nonprofit sector” in the world, a sector consisting of voluntary non-governmental organizations that provide health care, education and social services as well as arts, religious, and advocacy activities. Using mostly primary sources, this course considers the significance of the nonprofit sector in the U.S., its advantages and disadvantages, its uses for different groups of Americans, and current trends. Students have the option of writing either a standard term paper, or a study of strategic challenges facing a contemporary nonprofit organization. Offered as HSTY 204 and PHIL 204.

SAGES Dept Seminar

HSTY 207. Natural Philosophy II (3)
Conceptual, methodological, and epistemological issues about science: concept formation, explanation, prediction, confirmation, theory construction and status of unobservables; metaphysical presuppositions and implications of science; semantics of scientific language; illustrations from special sciences. Second half of a year-long sequence. Offered as HSTY 207 and PHIL 204.

HSTY 208. Social History of Crime (3)
This course explores the relationship between law and history in American society. It uses social history methodology to suggest new ways of understanding how the law works as a system of power to advance certain interests at the expense of less powerful groups. Emphasis is on issues of pressing concern to America’s poor and working class, including the death penalty, abortion, rape, the war on drugs, and the prison industry.

HSTY 210. Byzantine World 300-1453 (3)
Development of the Byzantine empire from the emperor Constantine’s conversion to Christianity and founding of the eastern capital at Constantinople to the fall of Constantinople to Turkish forces in 1453. Offered as CLSC 210 and HSTY 210.

HSTY 211. The Medieval World, 300-1500 (3)
Medieval history and civilization from the fall of the Roman Empire to the age of the Renaissance. Interactions between medieval Europe and other Mediterranean and Eurasian cultures.

HSTY 212. Modern European History (3)
The history of Europe from the late eighteenth century to the present. Themes include political upheavals and movements, as well as industrial, social, intellectual, and cultural changes. This course provides a solid foundation for those wishing to take more specialized courses in European history.

HSTY 213. Earthquake, Flood, and Fire: Natural Disaster in History (3)
The wind blows, mobile homes take flight, and people die. Natural disasters are that simple. Or are they? This course employs a historical approach to penetrate the mythology of natural disaster, focusing on the human dimension behind these so-called natural acts. By peeling back the layers of obfuscation, deposited there by successive generations of city boosters and technocrats, we learn that there is nothing simple or natural behind hurricane, tornado, flood, and earthquake calamities.

HSTY 214. Comparative Slavery (3)
People around the world have been enslaving one another since the beginning of time. From the seventeenth to the nineteenth centuries, millions of African chattel labored on southern plantations, supporting the “peculiar institution” whose terrible legacy remains with us today. For hundreds of years before European slave traders began ferrying human cargo across the Atlantic, however, coercive bondage was a well-entrenched feature of Mediterranean civilizations, justified by religious and secular law alike. This course will explore diverse types of unfree labor, from slavery in ancient Greece and Rome, serfdom in medieval Europe, captivity in North Africa and indentured servitude in colonial America. Did earlier systems of domination around the Mediterranean prepare the way for the establishment of Atlantic slavery? How did ideologies about religious difference, ethnicity, and race help justify this ultimate form of human degradation? Offered as: EHTS 214, HSTY 214

HSTY 215. Europe in the 20th Century (3)
The twentieth century has seen stupendous transformations in the internal structures of European politics, economics, society, and culture and in
Europe’s place in the world. This course traces Europe’s transition from a continent of sovereign nation-states or empires ruled by monarchs with starkly hierarchical social structures, through wars, revolution, dictatorships, destruction, division, and destitution, to a conflicted present. The contradictory combination of peace, freedom, and pluralism combined with cultural critique of the very consumer society that has reduced conflict challenges students’ linear notions of historical development.

HSTY 216. Vikings and Medieval Scandinavia (3)
A survey of the history of the Vikings and medieval Scandinavia, covering approximately the eighteenth to the fifteenth centuries AD. Topics explored include: causes of the “outbreak” and cessation of Viking expeditions, the role of the Vikings as raiders and/or traders in Western Europe, the role of the Vikings in the emerging states of Russia, Iceland and medieval Scandinavian law, the historicity of the saga literature, and Viking descendents—Normans and “Rus.”

HSTY 217. History of Corporate America (3)
This course will explore the origins and evolution of big business’s role in American society. It is not a course about the history of corporations but rather a course that examines how corporate entities have affected fundamental aspects of political, social, and economic life. It will deal with the period from the late nineteenth century to the present and cover such topics as diverse as labor struggles, capitalism, and slavery and colonization.

HSTY 218. Jews in Early Modern Europe (3)
This course surveys the history of Jews in Europe and the wider world from the Spanish expulsion through the French Revolution. Tracking peregrinations out of the Iberian Peninsula to the British Isles, France, Holland, Italy, Germany, Poland-Lithuania, the Ottoman Empire and the American colonies, it examines the diverse ways Jews organized their communities, interacted with their non-Jewish neighbors and negotiated their social, economic and legal status within different states and empires. What role did Jews play and what symbolic place did they occupy during a period of European expansion, technological innovation, artistic experimentation, and religious and political turmoil? What internal and external dynamics affected Jewish experiences in the sixteenth, seventeenth and eighteenth centuries? Through a selection of inquisitorial transcripts, government records, memoirs and historical literature, we will explore topics such as persecution, conversion, messianism, toleration, emancipation and assimilation.

HSTY 220. The Early Modern Mediterranean (3)
For centuries before Columbus crossed the Atlantic Ocean, travelers and traders, pirates and pilgrims, mercenaries and missionaries explored the contours of the Mediterranean Sea—and engaged in commerce, as well as religious, economic and military competition. If religion and ethnicity divided Muslims, Christians and Jews from Algiers to Athens, did shared geography, foodstuffs, and cultural values bind them together? This course examines the unity and diversity of this maritime region by considering the peoples, beliefs, commodities and diseases that circulated through it during the sixteenth, seventeenth, and eighteenth centuries. Does the early modern Mediterranean showcase a clash of civilizations or provide an enduring model for coexistence? Topics include merchant culture, diplomacy, honor and shame, slavery and colonization.

HSTY 221. Medieval and Tudor/Stuart England (3)
English history from Anglo-Saxon times through the Tudor and Stuart age; kings and kingship, the growth of Parliament, the common law, international politics, and England’s relations with Celtic Britain.

HSTY 222. Early Modern Europe (3)
Europe has not always existed. To find out who created it and when, this course will ask two fundamental questions: First, how did the geographic, linguistic, religious and ethnic characteristics of European identity develop over the course of the sixteenth, seventeenth and eighteenth centuries? Second, how did Europeans in this period influence other parts of the world? Through close readings of memoirs, treaties and chronicles, and discussions of secondary literature, we will explore the political, social, and religious history of Europe from roughly 1500 to 1800. Topics include: exploration and conquest; Protestant and Catholic reformations; witchcraft and popular culture; science and medicine; Enlightenment and Revolution.

HSTY 223. Evolution (3)
Multidisciplinary study of the course and processes of organic evolution provides a broad understanding of the evolution of structural and functional diversity, the relationships among organisms and their environments, and the phylogenetic relationships among major groups of organisms. Topics include the genetic basis of micro- and macro-evolutionary change, the concept of adaptation, natural selection, population dynamics, theories of species formation, principles of phylogenetic inference, biogeography, evolutionary rates, evolutionary convergence, homology, Darwinian medicine, and conceptual and philosophical issues in evolutionary theory.

HSTY 224. Jews in the Modern World (3)
Investigation of the impact of modernity on the Jewish community. In particular, the course will examine the influence of the Emancipation and Enlightenment on the social situation of the Jews in Europe and America and the corresponding changes in Judaic religion, philosophy, social structure, and culture. Attention will be paid to the creation of a modern Jewish identity in the secular culture of the post-Medieval world.

HSTY 225. People and the Land in Pre-Modern Europe (3)
This course explores the relationship between the peoples of Europe and their environments as Europe changed from a backwater of the Roman Empire into the seat of a number of globe-spanning empires. It examines how Europeans changed the land over time in order to derive a subsistence, produce surplus, and, later, to fuel the growth and power of early modern state. The course will delve into the ways that Europeans thought about nature and with admiration and fear, disdain and incomprehension. Between the eleventh and thirteenth centuries, French soldiers battled in the Holy Land; for several hundred years after that, France and the Ottoman Empire exchanged diplomats, traders and slaves. The colonial occupation of Algeria that began in 1830 ended violently in 1962. By then, the empire that struck back had also come home through large waves of immigration. Today, the social and economic status, religious affiliation, political significance and cultural impact of French citizens of North African descent are the subject of burning national debate. Taking a long view on Franco-Muslim relations, the course will explore such topics as the Crusades, Mediterranean piracy and captivity, Napoleon’s Egyptian campaign, the Algerian War of Independence, the “veil affair,” riots in the suburbs of Paris and World Cup soccer.
themes that have shaped the study of black people, questions, methodological approaches, and major politics. Students will learn about the study of Black History, cultures, econom-

HSTY 252A. Introduction to African-American Studies (3)
This course is designed to introduce students to the study of Black History, cultures, econom-
ics, and politics. Students will learn about the development of the field by exploring theoretical questions, methodological approaches, and major themes that have shaped the study of black people, primarily in the U.S. context. This is a seminar-

HSTY 252. History and American Culture (3)
American technology is a cultural phenomenon, a part of, rather than separate from, more general concerns. Examines technology through historical writings, literature, images, and both material and popular culture.

HSTY 254. The Holocaust (3)
History of racism in European society from 18th to 20th century; investigation, from perspectives of history, psychology, literature, philosophy, and religion, of how bureaucracy could exterminate six million Jews; responses of individuals, groups, institutions, and nations to deliberate extermination of nearly a whole people. Offered as HSTY 254 and RLGN 254.

HSTY 255. Economic History of the United States (3)
The growth of the American economy from the colonial period to the present. Competing explana-
tions of economic growth; significant attention to the political and legal environment in which the U.S. economy developed; “lessons” of past experi-
ence for contemporary policy; some attention to inequality and the changing distribution of wealth and income. Offered as ECON 255 and HSTY 255.

HSTY 256. American Political History (3)
From the origins of American politics in the colonial period to the present. The Revolution and Constitutional debate; presidential politics and leadership; voters and voting patterns; Congress and the courts. Emphasis both on the ideas that animated American politics and on the relation of politics to society.

HSTY 257. Immigrants in America (3)
Immigration to America has constantly reshaped the way the nation views itself. This course exam-

HSTY 258. History of Southern Africa (3)
A survey of southern Africa from about 1600. Topics include the social structure of pre-colonial African societies, the beginnings of European settle-

HSTY 259. U.S. Slavery and Emancipation (3)
Beginning with the African encounter with Europeans during the emergence of the modern slave trade. Students are introduced to the documents and secondary literature on the creation and maintenance of slavery, first in colonial America, and then in the United States. The course concludes with the destruction of slavery. Offered as ETHS 259 and HSTY 260.

HSTY 260. U.S. Slavery and Emancipation (3)
Explores the fashioning of a modern African-American culture between emancipation and the end of World War II. Emergence of a northern-based leadership, the challenge of segregation, emergence of bourgeois culture, the fashioning of racial consciousness and black nationalism, the shift from a primarily southern and rural popula-
tion to one increasingly northern and urban, the creation and contours of a modern African-American culture, the construction of racial/gender and racial/class consciousness. Offered as ETHS 260.

HSTY 261. African-American History 1865-1945 (3)
Examines the immense social and cultural changes which took place in Africa as a result of colonial occupations, in the period roughly from 1880 to 1965. It is organized around three major rubrics which were central to the colonial experience: the spread of Christianity, economic forces which led to new forms of labor, and the growth of nationalist resistance. Offered as ETHS 261.

HSTY 262. African-American History Since 1945 (3)
Completes the three-term sequence of the African-American history survey (although the first two courses are not prerequisites for this course). Explores some of the key events and developments shaping African-American social, political, and cultural history since 1945. Offered as HSTY 262 and ETHS 262.

HSTY 263. History of the Professions (3)
Professions are one of the central occupational structures of modern society. This course teaches about the historical context of the professions that many students will seek to join. It covers the three classic “learned” professions of clergy, law, and medicine, and newer ones such as accountancy, engineering, management, and nursing. It is compar-

HSTY 264. The Engineer in America (3)
History, culture, politics, ethical considerations, and gender issues of the engineering profession in the United States.

HSTY 265. History of the Professions (3)
This course introduces women and men students to the methods and concepts of gender studies, women’s studies, and feminist theory. An interdisci-

HSTY 266. Colonialism in Africa (3)
Examines the immense social and cultural changes which took place in Africa as a result of colonial occupations, in the period roughly from 1880 to 1965. It is organized around three major rubrics which were central to the colonial experience: the spread of Christianity, economic forces which led to new forms of labor, and the growth of nationalist resistance. Offered as ETHS 268.

HSTY 267. Global & Cultural Diversity

HSTY 268. Global & Cultural Diversity

HSTY 269. Global & Cultural Diversity

HSTY 270. Introduction to Gender Studies (3)
This course reviews the history of sports in America from the colonial period to the present. It gives particular attention to the evolution of sports as a major business and to the roles of gender, ethnicity, and race in the history of America sport, as well as to the emergence of sports as a major defining characteristic of America life and society.

HSTY 271. Contemporary China (3)
Beginning with the Opium Wars, we review the historical development of intellectual discourse, public reaction, and political protest in late Im-
perial and Republican China from the early 19th century to the communist revolution in 1949. In contrast to the conventional description of China from a Western point of view, this course tries to explain the emergence of modern China in the
context of its intellectual, political, and socio-economic transformation as experienced by Chinese in the 19th and 20th century. By discussing the influence of the West, domestic rebellions, and political radicalism, we examine how the Chinese state and society interacted in search for modernization and reforms, how these reforms were continued during the Republican period, and to what extent historical patterns can be identified in China's present-day development.

Global & Cultural Diversity

HSTY 284. Daily Life in Imperial China (3)
This course is an interdisciplinary study of Chinese society using methodological approaches from the fields of social, cultural, economic, and art history. In order to explore the fabric of society in Imperial China (from the beginning to the early 20th century) in a creative, interactive way— including folk customs, life at the court, in city and countryside, religious activities, gender roles, material culture, consumption, entertainment, and social hierarchies—we use the excellent Chinese collection in the Cleveland Museum of Art and various visual aids such as slides and CD-ROMs in the classroom.

Offered as ASIA 284 and HSTY 284.
Global & Cultural Diversity

HSTY 285. Modern Japan (3)
This course introduces students to the many changes that characterize the social, political, economic, and intellectual history of modern Japan from the mid-19th century to the present. We discuss to what extent the Meiji state was built upon Japan's "traditional" heritage, how modernization and Western influence were implemented in and perceived by society, and which factors led the government to adopt extreme imperialist and militarist policies in the early 20th century. Looking at the emergence of a new Japan after World War II, we focus on employment structures, mass culture, urbanization, gender roles, and social patterns in order to understand the transformation of modern Japanese society.

Global & Cultural Diversity

HSTY 287. State, War, Drugs, and Coffee in Colombia: History of Modern Colombia (3)
This course will analyze the major forces that have shaped Colombian history from the 19th century to the present. Colombia is one of the largest and most fascinating countries in Latin America. It has been intricately linked to the U.S. market as a major coffee producer and, more recently, as a major supplier of illicit drugs. Colombia has always been one of the wealthier Latin American countries, and it has a high degree of electoral democracy. Paradoxically, however, Colombia has also experienced rather high levels of regionalism and political violence. This course seeks to explore the history of these paradoxes. It will situate Colombia's contemporary conflicts within a larger historical perspective.

Offered as ETHS 287 and HSTY 287.
Global & Cultural Diversity

HSTY 298. Departmental Seminar (3)
The Department of History Departmental Seminar. A topical course, emphasizing disciplinary forms of writing, it is recommended for students before the end of their junior years. The class will advance the goals of SAGES within the disciplinary context of history by focusing on close readings of texts, analytical writing, and intensive seminar-style classroom discussions.

SAGES Dept Seminar

HSTY 299. Topics in History (3)
Subject matter will vary with instructor but will focus on some particular topic or historical approach. Course description available from departmental office.

HSTY 302. Ancient Greece: Archaic, Classical, and Hellenistic Periods (3)
The rise of Hellenic thought and institutions from the eighth to the third centuries B.C., the rise of the polis, the evolution of democracy at Athens, the crises of the Persian and Peloponnesian Wars, fifth century historiography, the growth of individualism, and the revival of monarchy in the Hellenistic period.

Offered as CLSC 302 and HSTY 302.

HSTY 303. History of the Early Church: First Through Fourth Centuries (3)
Explores the development of the diverse traditions of Christianity in the Roman Empire from the first through the fourth centuries C.E. A variety of New Testament and extra-Biblical sources are examined in translation. Emphasis is placed on the place of Christianity in the larger Roman society, and the variety of early Christian ideals of salvation, the church, and Church leadership.

Offered as HSTY 303 and RLGN 373.

HSTY 304. Ancient Rome: Republic and Empire (3)
Growth and development of the Roman state from the unification of Italy in the early third century B.C. to the establishment of the oriental despotism under Diocletian and Constantine. The growth of empire in the Punic Wars, the uncertain steps toward an eastern hegemony, the crisis in the Republic from the Gracchi to Caesar, the new regime of Augustus, the transformation of the leadership class in the early Empire, and the increasing dominance of the military over the civil structure.

Offered as CLSC 304 and HSTY 304.

HSTY 306. History Museums: Theory and Reality (3)
This course is an intensive summer internship (10 hours per week) at the Western Reserve Historical Society, complemented by extensive readings in museum/archival theory and public historical perception. It is designed both to introduce students to museum/archival work and to compare theoretical concepts with actual museum situations. Interns will be assigned a specific project within one of the Society's curatorial or administrative divisions, but will have the opportunity to work on ancillary tasks throughout the History's headquarters in University Circle.

Off ered as HSTY 306 and HSTY 406.

HSTY 307. Development of Chemistry and Chemical Engineering (3)
The development of chemical ideas; theories of matter, composition, structure, and reaction; the application of chemistry and chemical theory from antiquity to the 20th century; all considered in social context.

HSTY 308. Italian Renaissance 1350-1600 (3)
Political and cultural history of Renaissance Italy, Florence, Venice, Rome, and the development of Humanism. Extensive reading of major writers such as Machiavelli.

HSTY 309. Reformation Europe, 1500-1650 (3)
Origins and development of Protestantism, the Catholic Counter-Reformation, and the interaction between secular power and religious identity in Christian Europe.

Offered as HSTY 309 and RLGN 374.

HSTY 310. The French Revolutionary Era (3)
Causes, progress, and results of the internal transformation of France from 1789 to 1815; impact of revolutionary ideas on other European and non-European societies.

HSTY 311. Seminar: Modern American Historiography (3)
This seminar examines the approaches that professional historians of the United States have taken to the writing of American history in the past fifty years, with emphasis on changes in historical concerns, master debates among historians, and contemporary interests. Topics covered include national politics and government, economic development, social history, the history of ethnicity, race, and gender, and foreign policy and international relations. Each student will read widely and will prepare a series of reports on selected books and authors.

Offered as HSTY 311 and HSTY 411.

HSTY 312. European Legal History (3)
Examines the development of the legal systems of Central and Western Europe since the reception of Roman law. Focus will fall upon the alliance of Roman law and the absolutist state, the rise of bureaucratic absolutism, codification and the rise of liberal constitutional and legal thought, the Central European Rechtsstaat tradition, the historical school and legal positivism, the differing trajectories of development of bars in private practice, and the shape of modern European civil law systems, all in their social contexts.

HSTY 314. Impostors in Early Modern Europe (3)
Religious persecution during the early modern period (16th-18th centuries) compelled Jews to attend Mass, Muslims to baptize their children and
Protestants of count Hail Marys on a rosary. Eu-
ropean exploration of Asia, Africa and the Ameri-
cas inspired an Englishman to pass himself off as
Tawianese and an African to present himself as
a European. The choice between marriage and a
convent led one woman to cut off her hair, sew her
skirt into britches and make herself into a conquis-
tador in Peru. In pursuit of social mobility, court-
iers remade themselves to suit the conventions of
the court. Posing, passing and pretending, these
early modern Europeans crossed lines of religion,
gender, race and class. Today we might call some
of these figures impostors but praise others as self-
made men and women. What was the difference
between lying and self-fashioning in early modern
Europe? What forces and phenomena compelled
people to remake themselves? Was the early mod-
ern period the age of dissimulation? This course ex-
plores these questions by reading memoirs, hand-
books, inquisitorial documents and plays from the
period of light of contemporary theoretical litera-
ture.

HSTY 315. Heresy and Dissidence in the
Middle Ages (3)
Survey of heretical individuals and groups in
Western Europe from 500 - 1500 A.D., focusing
on popular rather than academic heresies. The de-
velopment of intolerance in medieval society and the
problems of doing history from hostile sources
will also be explored.
Offered as HSTY 315 and RLGN 315.

HSTY 318. History of Black Women in the
U.S. (3)
Chronologically arranged around specific issues in
black women’s history organizations, participation in
community and political movements, labor ex-
périences, and expressive culture. The course will
use a variety of materials, including autobiography,
literature, music, and film.
Offered as ETHS 318, HSTY 318, and WGST
318.

HSTY 319. The Crusades (3)
This course is a survey of the history of the idea of
“crusade,” the expeditions of Western Europeans
to the East known as crusades, the Muslim and
Eastern Christian cultures against which these
movements were directed, as well as the culture of
the Latin East and other consequences of these
crusades.
Offered as HSTY 319 and RLGN 319.

HSTY 322. Feminist Theory, Women’s His-
 tory, Gender History (3)
A reading seminar designed to expose students to
current theory and methods in feminist history, as
well as feminist scholarship more generally. It
includes a variety of topics representative of inter-
est and concerns shared by feminist historians,
as well as a range of methodological approaches
and theoretical debates. The course aims to im-
port a sense of the ways in which feminist theory
has been applied to and has transformed historical
scholarship.
Offered as HSTY 322, WGST 322, HSTY 422,
and WGST 422.

HSTY 325. U.S. Politics, Culture, and Soci-
ety: 1787-1865 (3)
Explores politics, culture, and society in the Unit-
ed States between the War for Independence and
the Civil War. Topics include the transformation
of political ideology, the political process, capital-
 ist development in cities, factories, and the coun-
tryside, and changing dynamics of class, race, and
 gender in both the North and South.

HSTY 327. Comparative Environmental
History (3)
Environmental history is the study of how humans
have influenced the environments around them
and how the environment itself has influenced the
course of human societies. This course provides
students with the skill to identify and analyze
these interactions. It introduces course partici-
pants to the main themes of environmental his-
tory literature and the driving questions guiding
environmental history research by examining case
studies drawn around the globe, including Pre-
Columbian America, Medieval Japan, Colonial
Africa, and Modern Germany. This course will
help course participants recognize the important
patterns and developments that have led to present
day human-environmental relationships.
Offered as HSTY 327 and HSTY 427.

HSTY 329. Museums and Globalization (3)
Museums are everywhere contested spaces today.
Historically designed as agents of public education
and community formation, now they are centers of
public controversy on a global scale. From Paris to
Nairobi museums figure in conflicts over urban re-
development, national identity, cultural diversity,
and global tourism. Questions we will consider in
this course: what are the fundamental features of
museums as institutions; how have they been
structured; what ties have linked them to wider
national and international communities, politi-
cal, economic and social concerns; how have they
used resources such as research, collecting, build-
ings, display technologies, and geographic location
to carry out these functions; how do museums in
Asia, Africa the Middle East and Latin America
figure in the current international contention over
the issue of heritage: This is an innovative course
offered jointly by JHU and CWRU using web-
based technologies that allow students to collab-
orate on projects and access museums across the
globe through internet resources with “visitors”
from other countries participating on-line and
students buildings web links for their presenta-
tions and written projects. This is an innovative
course using web-based technologies that allow
discussions between students and “visitors” from
other countries, as well as student collaboration
on projects and access to museums across the globe
through internet resources. Offered as HSTY 329
and HSTY 429.

HSTY 332. European Diplomacy in the Age
of Nationalism: 1789-1945 (3)
Preseets a broad interpretation of the development
of the international system in Europe between the
French Revolution of 1789 and the end of the Eu-
ropean era in 1945. It explains why and how the
closed European state system at the beginning of
the nineteenth century evolved into an interna-
tional transcontinental system by the early twenty-
ith century. Approved SAGES Departmental
Seminar.
SAGES Dept Seminar

HSTY 334. History of 19th Century Ger-
many (3)
Examines the political, social, economic, and cul-
tural history of Germany from the late eighteenth
century to 1914. Explores the intellectual and so-
cial background to the rise of German liberalism
and nationalism, the struggle with bureaucratic
absolutism, the revolutions of 1848, industrial
capitalism and the emergence of a class society,
unification under Bismarck, the role of the state,
culture, religion, and changes of mentality, the
development of mass politics, and the coming of
World War I.

HSTY 335. History of 20th Century Germany
(3)
Examines the tumultuous history of Germany
from 1914 to the unification of the two Germanys
in 1989-1990. From the totalizing and traumatic
experience of World War I, through a failed revo-
lution, the republican experiment of Weimar, the
National Socialist dictatorship under Hitler and
the divided Germany suspended between the su-
perpowers, to the newly unified democratic Feder-
al Republic. Examines the ways in which Germans
have tried to reconcile the state to their society,
economy, and individual lives.

HSTY 336. The Struggle for Justice in Latin
America (3)
This course looks at how indigenous peoples,
women, students, workers, peasants, and Afro-
Latin Americans struggled for justice in Latin
America. It will study how notions of justice have
changed from colonial times to the present. It will
also examine how different sectors of Latin Ameri-
can society understood the meaning of justice and
how that understanding evolved through time.
This class seeks to familiarize students with the
history of the idea of justice in Latin America. At
the end of this course students will understand the
complex intellectual and political differences be-
hind Latin America’s apparent chaotic and tumult-
uous political history. Second, it seeks to develop
students’ critical thinking by examining how an
abstract term, such as justice, changes across time
and space.
Offered as ETHS 336 and HSTY 336.

Global & Cultural Diversity

HSTY 342. Water (3)
This seminar will explore the history of the mean-
ing of water—that is, the social, cultural, and/or po-
itical significance placed on water by individuals
and governments in different times and places. It
will also examine how humans have acted upon
water, and how it has acted upon humans, with

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HSTY 344. Origins of the British Empire 1450-1570 (3)
How did early modern England come to rule an empire upon which the sun never set? What compelled individuals to seek their fortunes abroad, planting the flag of St. George in the outlying areas of the archipelago and hallway across the globe? This course examines the troubled birth of an empire and of a place called “Britain” at the same time. This seminar provides history majors with an experience of working with early modern primary documents of a wide variety; essays and book chapters will be paired with documents from early modern England itself. How do documents, images, and quantitative analyses help historians explain how the British Empire came into being? Offered as HSTY 344 and HSTY 444.

HSTY 348. History of Modern Political and Social Thought (3)
This course explores the responses of philosophers, economic theorists, culture critics, and public policy makers to changes in western society wrought by industrialization by focusing on their concerns with technological change. Offered as HSTY 348 and POSC 348.

HSTY 351. Colonial America 1607-1763 (3)
The formative years of American society and culture. Slavery and racism, expansionism, regionalism, the family, pluralism, sense of mission, and republican ideology.

HSTY 352. The Era of the American Revolution, 1763 - 1815 (3)
The causes and consequences of the American Revolution, the formation of the American Republic, and the early years of the new nation. Federalism and republicanism as theories and in application, and the role of the Americas’ experience in the age of democratic revolutions.

HSTY 353. Women in American History I (3)
The images and realities of women’s social, political, and economic lives in early America. Uses primary documents and biographers to observe individuals and groups of women in relation to legal, religious, and social restrictions. Offered as HSTY 353, WGST 353, and HSTY 453.

HSTY 354. Women in American History II (3)
With HSTY 353, forms a two-semester introduction to women’s studies. The politics of suffrage and the modern woman’s efforts to balance marriage, motherhood, and career. (HSTY 353 not a prerequisite.) Offered as HSTY 354, WGST 354, and HSTY 454.

HSTY 355. Age of American Civil War 1815-80 (3)
This course examines the causes and consequences of the Civil War, focusing on the rise of sectionalism, the dynamics of conflict, and reconstruction. Heavy emphasis is placed on archival research in relevant first person accounts from the period.

HSTY 356. Industrial America: 1880-1940 (3)
The social, economic, and political adaptation of American society to the industrial age. The impact of industrialism on such recurrent historical problems as technological change, race relations, social reform, urbanization, and political participation.

HSTY 358. America Since 1940 (3)
A comprehensive introduction to the recent history of the United States, organized around changes in national policy and politics. Special emphasis on the impact of World War II and the Cold War; the expansion of the federal government through the Great Society and beyond; the Civil Rights and Women’s Rights movements; challenges to the legitimacy of politics; and the efforts to maintain economic growth.

HSTY 360. American Foreign Policy since 1900 (3)
The underlying economic, political, and cultural forces that influenced policy formation from the end of the Spanish-American War through the aftermath of the Vietnam War. The development and function of the national and international apparatus of foreign relations from the consular service, world court and cartels to the CIA, United Nations, and international corporations.

HSTY 361. Crime and Popular Culture in Early America (3)
This course explores the intersection of crime, punishment, and popular culture in colonial British America and the early United States through 1860 by closely examining a series of popular crime genres, including execution sermons, criminal conviction narratives, criminal autobiographies, and trial reports. Readings in modern scholarship - drawing on several disciplines — will shed light on the popular literature and on underlying patterns of crime and punishment, while students will critically evaluate modern scholarly interpretations in light of the early crime publications. Types of crimes explored in the readings include witchcraft, piracy, burglary, robbery, and various types of murder, such as infanticide, filicide (cases of men murdering their wives and children), and sexual homicide. Each student will write several short analytical papers drawn from the shared readings and, at the end of the semester, produce an independent research paper. Offered as HSTY 361 and HSTY 461.

HSTY 362. American Social and Cultural History since 1865 (3)
The social and cultural history of the United States, organized around changes in national policy and politics. Special emphasis on the impact of World War II and the Cold War; the expansion of the federal government through the Great Society and beyond; the Civil Rights and Women’s Rights movements; challenges to the legitimacy of politics; and the efforts to maintain economic growth.

HSTY 366. Science, Technology, and Government (3)
Traces the development and influence of federal technology and science policies from colonial times to the present, with emphasis on the 20th century. Offered as HSTY 366 and POSC 365.

HSTY 368. Modern American Legal History (3)
Examines the workings of the modern American legal system from the Civil War to the present. Focus on the relationships between the law and social, economic, and professional change. Lectures, discussions, and analysis of legal documents.

HSTY 373. Advanced Topics in American Women’s History (3)
This advanced seminar is designed to allow students to investigate aspects of American women’s history that are not deeply explored in other courses. The two central purposes of the course are to move students forward in their study of American women’s history and to provide advanced study for graduate students and other students interested in women-focused topics. The topic is subject to change, but may be any of the following or something similar: women and medicine, images of women in popular culture, growing up female, women and political movements, women and war, etc. Recommended preparation: HSTY 353/453. Offered as HSTY 373, WGST 373, and HSTY 473.

HSTY 377. Nuclear Weapons and Arms Control (3)
National and international problems concerning nuclear weapons, and the past and present attempts both to control their spread and to prevent their use. Topics covered include the science and technology of fusion and fusion warheads and delivery vehicles; history, domestic policies, and international relations concerning nuclear weapons; and arms control treaties and their verification. Offered as HSTY 377 and POSC 375.

HSTY 378. Environmental History of North America (3)
Explores the way nature has shaped history as well as the ecological consequences of development. Focus is on the relationship between the natural and the cultural with special attention to such topics as economic growth, wilderness, disease, environmental justice, and the conquest of the American West.

HSTY 379. America in the '50s (3)
American life and culture in the decade of Elvis, Eisenhower, McCarthy and the beginnings of the Civil Rights Movement. Films, novels and recordings will supplement lectures and discussions on such topics as the Cold War, conformity, the role of women, television, the Korean War, and beatniks.

HSTY 380. The Sixties in America (3)
This course examines social, cultural, and political changes in the United States during the 1960s. We begin by examining the economic prosperity and “fragile” political consensus of the post-WWII period, as well as the undercurrent of poverty, dissent, and Cold War fears. We then cover the civil rights movement, student activism, the women’s movement, the growth of Liberal America and the welfare state, the Vietnam War, the counterculture and conservative youth movements, the growth of a national consumer-driven, mass-mediated market, and the music, art, and pop culture—as well as their growing reliance on technological intervention—during this period of creative efflorescence. We will do this through reading books, but also through “reading” contemporary evidence of life in America, including listening to music, viewing films, analyzing pictures and artifacts.

HSTY 381. City as Classroom (3)
In this course, the city is the classroom. We will engage with the urban terrain. We will meet weekly off-campus, interact with community members, and interface—both literally and figuratively—with the city as a way to examine the linkages between historical, conceptual, and contemporary issues, with particular attention paid to race and class dynamics, inequality, and social justice. This course will have four intersecting components, primarily focusing on American cities since the 1930s: the social and physical construction of urban space, the built environment, life and culture in the city, and social movements and grassroots struggles. Offered as HSTY 381, POSC 381, SOCI 381, HSTY 481, POSC 481, and SOCI 481.

HSTY 382. Chinese Business and Economic History (3)
This course explores China’s business and economic history from the opening of the treaty ports in the early 19th century to the post-war socialist economy, the market reforms in the 1980s and 1990s, and the most recent developments in the context of China’s social political transformation. One major focus of the course is a comparative approach to the issue of industrialization and the introduction of modern enterprises and economic structures into China. By examining the socio-economic background of Chinese business from family and personal networks to property rights, students learn about the institutional, cultural, and social aspects which are still relevant for business transactions and institutions in China today.

HSTY 383. The People’s Republic of China (3)
Now more than ever, the Chinese state and society are facing tremendous economic, social, and political challenges. This course presents an overview of the development of Chinese Communist theory and practice from 1949 to the present day. Among the topics covered are the Great Leap Forward, the Cultural Revolution, the economic reforms of the 1980s, the Tiananmen student protests, the Communist party’s crisis of legitimacy, the Taiwan problem, ecological challenges, the new socialist market economy, and current social and cultural developments from domestic migration to youth culture and new forms of nationalism. The class involves a mixture of lectures and discussion and draws on a combination of primary and secondary sources, including current news reports, films, documentaries, and fiction in translation. Offered as HSTY 383 and POSC 368.

HSTY 389. Senior Research Seminar in History of Philosophy of Science (3)
Directed independent research seminar for seniors who are majors in the History and Philosophy of Science program. The goal of the course is to develop and demonstrate command of B.A.-level factual content, methodologies, research strategies, historiography, and theory relevant to the field of history of science and/or philosophy of science. The course includes both written and oral components. Offered as HSTY 380 and PHIL 390. SAGES Senior Cap

HSTY 391. Food in History (3)
Food is inextricably interconnected with the development of agriculture and other technologies, with the rise and fall of empires, with increasing understanding of diet and nutrition, with laws and regulations, with the arts, with economic development and consumer culture, and with religious and ethnic identities. By examining selective and representative episodes pertaining to each of these topics, this course explores the global history of food, from the agricultural revolution of the neolithic era to the consumer revolution of the last generation. Offered as HSTY 391 and HSTY 491.

HSTY 392. Chinese Business and Economic History (3)
This seminar investigates 20th-century evolutionary theory, especially the Modern Evolutionary synthesis and subsequent expansions of and challenges to that synthesis. The course encompasses the multidisciplinary nature of the science of evolution, demonstrating how disciplinary background influences practitioners’ conceptualizations of pattern and process. This course emphasizes practical writing and research skills, including formulation of testable theses, grant proposal techniques, and the implementation of original research using the facilities on campus and at the Cleveland Museum of Natural History. Offered as ANTH 394, BIOL 394, GEOL 394, HSTY 394, PHIL 394, ANTH 494, BIOL 494, GEOL 494, HSTY 494, and PHIL 494.

HSTY 395. History of Medicine (3)
This course treats selected topics in the history of medicine, with an emphasis on social and cultural history. Focusing on the modern period, we examine illnesses, patients, and healers, with attention to the ways sickness and medicine touch larger questions of politics, social relations and identity. Offered as HSTY 395 and HSTY 495.

HSTY 397. Undergraduate Tutorial (1-3)
Individual instruction with members of the history faculty. Recommended preparation: 12 hours of History.

HSTY 398. Senior Research Seminar (3)
Training in the nature and methods of historical writing and research. Prereq: Majors only, Senior standing. SAGES Senior Cap

HSTY 399. Advanced Readings in Black History (3)
This is an advanced readings course that may change from semester to semester. This course will provide students with an opportunity to more deeply explore special themes and theoretical issues in the field of black history that are often quickly and briefly covered in broad survey courses. Readings may be organized around specific topics such as resistance and social protest, black intellectual history, black nationalism and identity, black film and historical literacy. Black cultural forms and politics, black urban history, or some such other combination. Students may take this course more than once and receive credit as long as the course topic differs. Students should contact the History Department for more details on course content during any given semester. Offered as HSTY 399, HSTY 499.

HSTY 400. Graduate Topical Seminar (3)
A rotating graduate seminar, offered every semester by a different faculty member. Each semester focuses on a topic of central historiographical or methodological importance.

HSTY 402. Survey of the History of Science
A graduate-level historiographic review of the history of the sciences from the seventeenth century to the present.

HSTY 404. Introduction to the Nonprofit Sector (3)
The United States has by far the largest and most important “nonprofit sector” in the world, a sector consisting of voluntary non-governmental organizations that provide health care, education and social services as well as arts, religious, and advocacy activities. Using mostly primary sources, this course considers the significance of the nonprofit sector in the U.S., its advantages and disadvantages, its uses for different groups of Americans, and current trends. Students have the option of writing either a standard term paper, or a study of strategic challenges facing a contemporary nonprofit organization.

Offered as HSTY 204 and HSTY 404.

HSTY 406. History Museums: Theory and Reality (3)
This course is an intensive summer internship (10 hours per week) at the Western Reserve Historical Society, complemented by extensive readings in museum/archival theory and public historical perception. It is designed both to introduce students to museum/archival work and to compare theoretical concepts with actual museum situations.

Interns will be assigned a specific project within one of the Society’s curatorial or administrative divisions, but will have the opportunity to work on ancillary tasks throughout the Historical Society’s headquarters in University Circle.

Offered as HSTY 306 and HSTY 406.

HSTY 410. Seminar: Early American Historiography (3)
This seminar examines the historiography of early America. It is designed to acquaint history doctoral students with the major themes, methods, and scholars of American history from the seventeenth century to the mid-nineteenth century. Students will be expected to read and report on major works in the field.

HSTY 411. Seminar: Modern American Historiography (3)
This seminar examines the approaches that professional historians of the United States have taken to the writing of American history in the past fifty years, with emphasis on changes in historical concerns, master debates among historians, and contemporary interests. Topics covered include national politics and government, economic development, social history, the history of ethnicity, race, and gender, and foreign policy and international relations. Each student will read widely and will prepare a series of reports on selected books and authors.

Offered as HSTY 311 and HSTY 411.

HSTY 422. Feminist Theory, Women’s History, Gender History (3)
A reading seminar designed to expose students to current theory and methods in feminist history, as well as feminist scholarship more generally. It includes a variety of topics representative of interests and concerns shared by feminist historians, as well as a range of methodological approaches and theoretical debates. The course aims to impart a sense of the ways in which feminist theory has been applied to and has transformed historical scholarship.

Offered as HSTY 322, WGST 322, HSTY 422, and WGST 422.

HSTY 427. Comparative Environmental History (3)
Environmental history is the study of how humans have influenced the environments around them and how the environment itself has influenced the course of human societies. This course provides students with the skill to identify and analyze these interactions. It introduces course participants to the main themes of environmental history literature and the driving questions guiding environmental history research by examining case studies drawn around the globe, including Pre-Columbian America, Medieval Japan, Colonial Africa, and Modern Germany. This course will help course participants recognize the important patterns and developments that have led to present day human-environmental relationships.

Offered as HSTY 327 and HSTY 427.

HSTY 429. Museums and Globalization
Museums are everywhere contested spaces today. Historically designed as agents of public education and community formation, now they are centers of public controversy on a global scale. From Paris to Nairobi museums figure in conflicts over urban redevelopment, national identity, cultural diversity, and global tourism. Questions we will consider in this course: what are the fundamental features of museums as institutions; how have they been structured; what ties have linked them to wider national and international communities, political, economic and social concerns; how have they used resources such as research, collecting, building, display technologies, and geographic location to carry out these functions; how do museums in Asia, Africa the Middle East and Latin America figure in the current international contention over the issue of heritage: This is an innovative course offered jointly by JHU and CWRU using web-based technologies that allow students to collaborate on projects and access museums across the globe through internet resources.

Offered as HSTY 329 and HSTY 429.

HSTY 440. Science and Society Through Literature (3)
This course will examine the interaction of scientific investigation and discovery with the society it occurred in. What is the effect of science on society and, as importantly, what is the effect of society on science? An introduction will consider the biocentric controversy with focus on Galileo. Two broad areas, tuberculosis and the Frankenstein myth, will then be discussed covering the period 1800-present. With tuberculosis, fiction, art and music will be examined to understand the changing views of society towards the disease, how society’s perception of tuberculosis victims changed, and how this influenced their treatments and research. With Frankenstein, the original novel in its historical context will be examined. Using fiction and film, the transformation of the original story into myth with different connotations and implications will be discussed. Most classes will be extensive discussions coupled with student presentations of assigned materials.

Offered as PHRM 340, BETH 440, PHRM 440, and HSTY 440.

HSTY 442. Water (3)
This seminar will explore the history of the meaning of water—that is, the social, cultural, and/or political significance placed on water by individuals and governments in different times and places. It will also examine how humans have acted upon water, and how it has acted upon humans, with great consequences for human life. This seminar will look at the history of water in the context of science, technology and society; public health; political science; and environmental history. Case studies will be drawn from a wide chronological and geographical range; from the ancient world to Renaissance Italy, nineteenth century India, modern Britain, Egypt, and the U.S. The course provides a wide perspective on the themes of the history of human-water interactions, but will also focus closely on some critical cases. Seminar participants will write a research paper on the topic of their choice in the environmental history of water.

Offered as: HSTY 342, HSTY 442, POSC 342, POSC 442.

HSTY 451. Seminar in the History of European Technology (3)
A graduate-level, research seminar on the history of European technology from the Industrial Revolution to the present. Special emphasis is on cultural history of technology with a transatlantic view. The themes of the seminar vary from year to year, but include: communications, industrialization, control, cultural and intellectual approaches to the history of technology. Required work includes a research paper based on original sources.

HSTY 452. Readings in the History of American Technology (3)
A graduate-level review of the history of American technology.

HSTY 453. Women in American History I (3)
The images and realities of women’s social, political, and economic lives in early America. Uses primary documents and biographers to observe indi-
An introduction to comparative method for historians. The topics will vary year to year, but the course will require exposure to historical contexts outside of the United States.

HSTY 477. Modern Policy History of the United States (3)
This course offers a historical perspective on policy and policy making in the United States since the late nineteenth century. It emphasizes the increasing role of the federal government, the persisting importance of the states, the significance of the courts, the revolutionary impact of the women’s and civil rights movements, and the consequences of the growth and transformation of the American economy. Each student selects a policy area for detailed exploration; students often choose topics related to civil rights, women’s rights, health care, environmental reform, non-profit and non-governmental organizations, the arts, and education, but other topics are also appropriate.

HSTY 479. Historical Research and Writing (3)
A research seminar for historians. Students will produce a research paper based on primary sources. There will be substantial attention to the mechanics of writing.

HSTY 480. Public Policy and Aging (3)
Overview of aging and the aged. Concepts in the study of public policy. Policies on aging and conditions that they address. The politics of policies on aging. Emergent trends and issues. Offered as ANTH 498, BETH 496, EPBI 408, GERO 496, HSTY 480, MPHP 408, NURS 479, NURS 579, POSC 480, and SOCI 496.

HSTY 481. City as Classroom (3)
In this course, the city is the classroom. We will engage with the urban terrain. We will meet weekly off-campus, interact with community members, and interface—both literally and figuratively—with the city as a way to examine the linkages between historical, conceptual, and contemporary issues, with particular attention paid to race and class dynamics, inequality, and social justice. This course will have four intersecting components, primarily focusing on American cities since the 1930s: the social and physical construction of urban space, the built environment, life and culture in the city, and social movements and grassroots struggles. Offered as HSTY 381, POSC 381, SOCI 381, HSTY 481, POSC 481, and SOCI 481.

HSTY 491. Food in History (3)
Food is inextricably interconnected with the development of agriculture and other technologies, with the rise and fall of empires, with increasing understanding of diet and nutrition, with laws and regulations, with the arts, with economic development and consumer culture, and with religious and ethnic identities. By examining selective and representative episodes pertaining to each of these topics, this course explores the global history of food, from the agricultural revolution of the neolithic era to the consumer revolution of the last generation. Offered as HSTY 391 and HSTY 491.

HSTY 494. Seminar in Evolutionary Biology (3)
This seminar investigates 20th-century evolutionary theory, especially the Modern Evolutionary synthesis and subsequent expansions of and challenges to that synthesis. The course encompasses the multidisciplinary nature of the science of evolution, demonstrating how disciplinary background influences practitioners’ conceptualizations of pattern and process. This course emphasizes practical writing and research skills, including formulation of testable theses, grant proposal techniques, and the implementation of original research using the facilities on campus and at the Cleveland Museum of Natural History. Offered as ANTH 394, BIOL 394, GEOI 394, HSTY 394, PHIL 394, ANTH 494, BIOL 494, GEOI 494, HSTY 494, and PHIL 494.

HSTY 495. History of Medicine (3)
This course treats selected topics in the history of medicine, with an emphasis on social and cultural history. Focusing on the modern period, we examine illnesses, patients, and healers, with attention to the ways sickness and medicine touch larger questions of politics, social relations and identity. Offered as HSTY 395 and HSTY 495.

HSTY 496. Graduate Independent Study (1-3)
Independent reading and research programs with individual members of the faculty.

HSTY 499. Advanced Readings in Black History (3)
This is an advanced readings course that may change from semester to semester. This course will provide students with an opportunity to more deeply explore special themes and theoretical issues in the field of black history that are often quickly and briefly covered in broad survey courses. Readings may be organized around specific topics such as resistance and social protest, black intellectual history, black nationalism and identity, black film and historical literacy black cultural forms and politics, black urban history, or some such other combination. Students may take this course more than once and receive credit as long as the course topic differs. Students should contact the History Department for more details on course content during any given semester. Offered as HSTY 399, HSTY 499.

HSTY 525. Intellectual Property and the Construction of Authorship (3)
“Authorship” and “invention” are among the West’s most powerful ideas—the categories by which creative production has been defined and valued for the last two centuries. We will investigate the emergence and consolidation of these ideas in the context of some of the institutions, technologies, and practices that have fostered and been fostered by them, such as printing and publishing, copy-
right and patent law, education curricula and disciplinary pedagogies. Then we will turn our attention to the varieties of authorship and invention in operation today—from the solitary ethos characteristic of the arts and humanities to the collaborative, even corporate, forms in ascendance in science and industry. How are ideas of authorship and invention employed in the various discursive spheres to assign credit and responsibility? May tensions be found with creative practice? What are the stakes? Who wins, who loses? And what will be the consequences of digitization and globalization? Our study will culminate in attendance at an interdisciplinary conference on “Con/texts of Invention” which will take place at Case Western Reserve on April 21-23. The goal of our study will be to identify worthy research topics within students’ own areas of interest.

HSTY 601. Independent Studies (1-18)
(Credit as arranged.)

HSTY 611. Introduction to Historiography (3)
Required seminar for all M.A. and Ph.D. students. Introduces students to historiographical and methodological issues. Recommended preparation: Graduate standing.

HSTY 651. Thesis M.A. (1-18)
(Credit as arranged.)

HSTY 701. Dissertation Ph.D. (1-18)
(Credit as arranged.) Limited to Ph.D. candidates actively engaged in the research and writing of their dissertations. Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

INTERNATIONAL STUDIES PROGRAM
111 Mather House
http://politicalscience.case.edu/international
Phone: 216-368-2425; Fax: 216-368-4681
Vincent E. McHale, Director
E-mail: vincent.mchale@case.edu

The International Studies program is a multidisciplinary program leading to the B.A. degree. Study in the program provides students with the ability to read beyond the headlines—to see world events in terms of how they got to be that way, how they fit into broader issues and systems, and how one might imagine their place in shaping the future. To attain this goal, students are introduced to the methods of conceptualizing international and global issues, as well as to the study of a society other than their own. They learn to think critically about contending and complementary methods and theories, developing an appreciation of both traditional disciplinary approaches and newer, cross-disciplinary approaches. Students also acquire skills that will enable them to recognize and deal with complexity: communicative and analytical skills in a language other than English (or other than their native language), and skills in statistics, computer-based global analysis, or negotiation.

It is strongly recommended that all international studies students participate in at least one of several off-campus programs that facilitate the international perspective: junior year abroad, summer internships in Washington, D.C., or professional, practicum-type work experiences in Cleveland that involve an international context. It is also recommended that students have a solid foundation in economics.

In addition to forming the groundwork for an evolving understanding of and lifelong engagement with the modern world, a background in international studies provides excellent, practical preparation for careers that deal with the emerging needs of our world. International studies majors go on to careers in international marketing and management, diplomatic service, health, law, social services, and journalism, as well as careers within the academic disciplines. The professional schools of business, medicine, nursing, law, and applied social sciences at Case Western Reserve all have significant international foci, and our students can explore careers in these areas during their undergraduate years. The skills, analytic abilities, and critical approaches of international studies should equip students as well for new employment patterns which may not fit into existing career descriptions.

PROGRAM ADVISORY COMMITTEE

Vincent E. McHale, Ph.D.
M. A. Hanna Professor of Political Science
Director, International Studies Program

Bo A. Carlsson, Ph.D.
Frank Tracy Carlton Professor of Economics

Kenneth E. Ledford, Ph.D., J.D.
Associate Professor of History

Kelly M. McMann, Ph.D.
Assistant Professor of Political Science

Mihajlo D. Mesarovic, Ph.D.
Cady Staley Professor of Systems Engineering
Case School of Engineering

UNDERGRADUATE PROGRAM

Major

The major in international studies requires a minimum of 33 credit hours, chosen from the list of approved topical and area studies courses, plus satisfaction of a language competency requirement. Each student will prepare a program of study indicating specific course selections to meet the six area requirements below. This plan must be approved by a member of the faculty advisory committee. Students should also discuss the choice of their minor or a second major with their advisor. Their course selections should include at least one course which involves the development of skills in computer applications, economic analysis, statistics, or other quantitative methods. Normally, no more than two courses taken for international studies credit may count simultaneously toward a minor or another major. Courses taken to satisfy the language competency requirement are exempted from this rule, and several international studies courses contribute to the completion of the Arts and Sciences General Education Requirements.

Requirements for the Major

1. Multidisciplinary Foundations (required courses; 12 hours). These courses provide an introduction to four major disciplinary understandings of society and culture, principles of economics, change over time, and interactions among nations, while exposing students to a variety of world societies and issues. International studies majors will be expected to have completed the multidisciplinary foundations courses before embarking on a study abroad program. These courses are:

   • ANTH 102 Being Human: An Introduction to Social and Cultural Anthropology (3)
   • ECON 102 Principles of Microeconomics (3)
   • HSTY 113 Introduction to Modern World History (3)
   • POSC 272 Introduction to International Relations (3)

2. Area Focus (6 hours): Two courses that concentrate on a single geographic or cultural area. Examples include Africa, North America, East Asia, Europe, Latin America, and the Middle East.

3. Topical Focus (6 hours): A related pair of courses that provide a discrete perspective on global issues and foster an appreciation for complexity through the study of particular issues and the methods appropriate to them. Examples include pairs of courses dealing with ethnicity, international health,
international economics, global and environmental analysis, or international relations. Cross-disciplinary approaches are encouraged.

4. Elective Area or Topical Courses (6 hours): Two additional courses within the topical and area studies course listings, providing an opportunity to experiment or to tailor the program toward particular interests in international or global issues, methodology, or other cultures.

5. Senior Colloquium (required course, 3 hours): The integration of prior topical and area foci in a colloquium (INTL 398) taken in the fall semester of the senior year and involving the writing of a substantial research paper. Selection of the topic and the research and writing are under the supervision of a faculty tutor. Peer evaluation will be obtained through regular sessions, supervised by the colloquium coordinator, at which students present their initial concepts, outlines, research, and drafts. Students will be expected to identify their faculty directors and topics by the end of their junior year. Exceptional papers may be considered for honors.

6. Language Competency (0 to 16 credit hours): In addition to the 33 credit hours of international studies course work, students must demonstrate competence in a language other than their native language. This may be done by (a) completing a language course at the 300 level or above, (b) demonstrating to the Department of Modern Languages and Literatures a non-native language competency equivalent to that attained by completing a 300-level or above course, or (c) completing four semesters in a single language.

The International Studies program currently recognizes more than 150 courses from which students may choose to satisfy the area and topical foci requirements. Course lists are available from the program advisors. Additional courses may be selected on the basis of individual student interest, in consultation with the faculty advisor. Courses may also be selected from within existing area studies programs: American Studies, Asian Studies, French and Francophone Studies, German Studies, and Japanese Studies.

There is no minor in international studies.

**COURSE DESCRIPTIONS**

**INTL 396. International Independent Study**

(1-3) Study of a topic within the scope of international studies. The student must complete a prospectus form, approved and signed by the supervising faculty member, no later than the second week of classes. The prospectus must outline the goals of the project and the research methodology to be used and is part of the basis for grading. Open to juniors and seniors majoring in international studies.

**INTL 398. International Senior Colloquium**

(3) Individual work with a faculty tutor leading to the writing of a major research paper. Regular class sessions are supervised by the colloquium coordinator, in which students present their initial concepts, outlines, research, and drafts. Open only to seniors majoring in international studies.

**JAPANESE STUDIES PROGRAM**

103 Guilford House  
www.case.edu/artsci/dmll/japanese.htm  
Phone: 216-368-2232, 216-368-6188; Fax: 216-368-2216  
Linda C. Ehrlich and Takao Hagiwara, Directors  
E-mail: linda.ehrlich@case.edu; takao.hagiwara@case.edu

Today’s students find themselves in a world of increasingly multi-ethnic, multi-religious, multicultural contexts. Through a long history of receiving, reworking, and incorporating influences from nearby cultural centers on the Asian mainland and surrounding Pacific islands and from the world beyond, including Europe and the Americas, Japan has developed a tradition of multiculturalism—a tradition that is best understood through interdisciplinary study. Following this thread, the Japanese Studies program seeks to foster the student’s global and interdisciplinary perspectives, while at the same time maintaining a flexibility that allows individuals to pursue their own areas of interest. To further foster the students’ linguistic and cultural development, the Japanese Studies program strongly encourages study abroad in Japan for a year, a semester, or a summer.

Students may pursue a major or a minor in Japanese Studies. The program offers a variety of courses to fulfill the requirements, ranging from four levels of the Japanese language to courses about Japanese cinema, literature, and pop culture. Besides these core courses, we encourage the student to take related courses in such interdisciplinary areas as Asian art, cinema, comparative literature of Japan and the West, Japanese religion and history, and international business. Taking advantage of the varied resources of the University and University Circle institutions, the Japanese Studies program makes the study of Japanese culture an integral part of the student’s undergraduate education. Furthermore, the Japanese Studies program provides an excellent foundation for graduate or professional school or for careers in international business and finance, careers involving technological or medical exchange, and careers in law, journalism, foreign service, or the arts.

**PROGRAM FACULTY**

Linda C. Ehrlich, Ph.D.  
Associate Professor of Modern Languages and Literatures; Co-Director, Japanese Studies Program

Takao Hagiwara, Ph.D.  
Associate Professor of Modern Languages and Literatures; Co-Director, Japanese Studies Program

Margaret M. Fitzgerald, M.A.  
Lecturer in Modern Languages and Literatures

Yoshiko Kishi, M.A.  
Lecturer in Modern Languages and Literatures

Hiroko Takada Amick, M.A.  
Lecturer in Modern Languages and Literatures

**PROGRAM ADVISORY COMMITTEE**

William E. Deal, Ph.D.  
Severance Professor of the History of Religion, Department of Religious Studies

Charlotte Ikels, Ph.D.  
Professor of Anthropology

Leonard H. Lynn, Ph.D.  
Professor of Management Policy, Weatherhead School of Management

**UNDERGRADUATE PROGRAM**

**Major**

The B.A. major in Japanese Studies requires a minimum of 33 credit hours. For students beginning the major at the 200 level, the course requirements are as follows:

1. JAPN 201 and 202 – Intermediate Japanese I, II
2. JAPN 301 and 302 – Advanced Japanese I, II
3. JAPN 350 and 351 – Contemporary Japanese Texts I, II (JAPN 350 and/or 351 may be replaced with JAPN 450 and/or 451 – Japanese in Cultural Context I, II. Permission of the instructor is required.)
4. JAPN 397 and 398 – Honors Thesis I, II (this course requires a substantial research paper in Japanese or English. Students are required to identify their faculty advisors and the topic of their paper by the end of the junior year. Exceptional papers may be considered for honors.)

5. Four Asian Studies, World Literature, or other related courses. “Other related courses” may include courses in Japanese literature, film, theater, art history, anthropology, philosophy, religion, sociology, political science, or history.

Students beginning the major at the 300 level do not take JAPN 201/202, but do take one “directed reading” in Japanese in an area related to their major research. All other requirements for the B.A. are the same.

Courses in other disciplines also form an important component of the Japanese Studies program. They provide an international, as well as interdisciplinary, perspective on Japanese culture. A faculty advisor supervises each student’s selection of these courses.

In addition to the courses required for the major, the following courses are offered in the Japanese Studies program:

- JAPN/WLIT 225 Japanese Popular Culture
- JAPN/WLIT 255 Modern Japanese Literature in Translation
- JAPN/WLIT 245 Classical Japanese Literature in Translation
- JAPN/WLIT 345 Japanese Women Writers
- JAPN/WLIT 355 Modern Japanese Novels and the West
- JAPN 399 Independent Study

PROGRAM HONORS

Exceptional papers written for the senior colloquium may qualify for program honors.

STUDY ABROAD

A year of study in Japan is highly recommended, as is additional study in another language. All efforts are made to grant appropriate credit for courses taken at a Japanese university during the year abroad.

Minor

For students beginning Japanese at the introductory level, the course requirements for the minor are as follows: JAPN 101, 102, 201, 202, and one 300-level course.

For students beginning Japanese at the 200 level, the requirements for the minor are five courses at the 200 and 300 level, approved by a program director.

JUDAIC STUDIES PROGRAM

110 Mather House
www.case.edu/artsci/jdst
Phone: 216-368-2741
Peter J. Haas, Director
E-mail: peter.haas@case.edu

The Judaic Studies Program offers an interdisciplinary approach to the study of the history, religion, social experience, and culture of the Jewish people. By bringing a variety of fields and disciplines to bear on its subject, the program intends to convey to students the complex interaction of forces that create and express Jewish ethnic identity. Students completing the program will have broad knowledge of the field along with the tools necessary for continued study of Jewish civilization in all its manifestations.

PROGRAM STEERING COMMITTEE

- Peter J. Haas, Ph.D.
  Abba Hillel Silver Professor of Jewish Studies, Department of Religious Studies; Director, Judaic Studies Program
- Ellen G. Landau, Ph.D.
  Severance Professor of the History of Religion, Department of Religious Studies
- Andrew W. Mellon Professor of the Humanities, Department of Art History and Art
- Miriam Levin, Ph.D.
  Professor of History
- Judith Neulander, Ph.D.
  Lecturer in Religious Studies
- Judith Oster, Ph.D.
  Professor of English
- Gillian Weiss, Ph.D.
  Assistant Professor of History
- Joseph White, Ph.D.
  Luxenberg Family Professor of Public Policy, Department of Political Science
- Yoram Daon, M.B.A.
  Lecturer in Modern Languages and Literatures

Only one course may be in the Department of Religious Studies. If the Rosenthal Visiting Professor’s course is cross-listed in RLGN, this will count as the one course.

1. Introduction to Judaic Studies (JDST 201)
2. Nine additional credit hours of courses with at least 1/3 Jewish content (no more than one from RLGN)

Currently offered courses that fulfill this requirement include:

- JDST 220 Jewish Traditional Art & Architecture
- JDST 228 The Jewish Image in Popular Film
- JDST 233 Introduction to Jewish Folklore
- JDST 350 Jewish Ethics
- JDST 392 Independent Research in Judaic Studies
- HBRW 201 Intermediate Modern Hebrew I
- HBRW 202 Intermediate Modern Hebrew II
- HBRW 301 Advanced Hebrew I
- HBRW 302 Advanced Hebrew II
- ENGL 365E Immigrant Experience
- ENGL 366G American Jewish Literature or Blacks and Jews in American Literature
- HSTY/JDST 218 Jews in Early Modern Europe
- HSTY 254 The Holocaust
- HSTY 257 Immigrants in America
- POSC 370K Nationalism, Ethnicity and Religion in World Politics
- POSC 379 Middle East: Politics, Economics and American Policy
- RLGN 223 Middle East Conflict
- RLGN 231 Jews in the Modern World
- RLGN 268 Women in the Bible
- SOCI 302 Race and Ethnic Minorities
- SOCI 355 Sociology of Religion

3. Two semesters of Hebrew (HBRW 101 and HBRW 102). Students who place out of both semesters of Hebrew must take another course from among those listed above.

COURSE DESCRIPTIONS

JDST 201. Introduction to Judaic Studies (3)

An introduction to the academic study of Judaic religion and culture, this course does not presuppose any previous study of, or experience with, Judaism. The course takes an interdisciplinary approach to Judaic Studies, drawing on a variety of
methods to examine the diverse issues that make up the current field of Judaic Studies. The course will examine the Jewish experience across time and space, and my include some “field” experience, such as a visit to a synagogue or to the Matz Mu-}


cuseum of Jewish Heritage. Required for the minor in Judaic Studies.

**JDST 218. Jews in Early Modern Europe (3)**
This course surveys the history of Jews in Europe and the wider world from the Spanish expulsion through the French Revolution. Tracking peregrinations out of the Iberian Peninsula to the British Isles, France, Holland, Italy, Germany, Poland-Lithuania, the Ottoman Empire and the Ameri-}
can colonies, it examines the diverse ways Jews organized their communities, interacted with their non-Jewish neighbors and negotiated their social, economic and legal status within different states and empires. What role did Jews play and what symbolic place did they occupy during a period of European expansion, technological innovation, artistic experimentation, and religious and politi-
cal turmoil? What internal and external dynam-}
ics affected Jewish experiences in the sixteenth, seventeenth and eighteenth centuries? Through a selection of inquisitorial transcripts, government records, memoirs and historical literature, we will explore topics such as persecution, conversion, messianic, toleration, emancipation and assimila-
tion. Offered as HSTY 218 and JDST 218, ETHES 218.

**JDST 220. Jewish Traditional Art and Architecture (3)**
Tradition and transformation in Jewish artistic expression over time and across space. Course will begin with the biblical period and continue down to the present day in Israel and America. Exami-
nation of how concepts such as “Jewish” and “art” undergo change within the Jewish community over this period. Offered as ARTH 220 and JDST 220. Global & Cultural Diversity

**JDST 228. The Jewish Image in Popular Film (3)**
Explores film as social practice for its makers and its audience from the silent era through Holly-
wood’s Golden Age, to the technological dazzle of the present day. Notes views of the Jews as stereo-
typical “Racial Other,” not only capable of Jewish self-representation, but also capable of representing any group widely believed to be non-white, non-
Christian or otherwise “alien.” By studying select films in historical context, the course will trace changes in this stereotype. By the end of the semes-
ter, students will understand how film is shaped by, and how it actively shapes, our constructions of American Selves vs. Ethnic Others. Global & Cultural Diversity

**JDST 231. Jews in the Modern World (3)**
Investigation of the impact of modernity on the Jewish community. In particular the course will examine the influence of the Emancipation and Enlightenment on the social situation of the Jews in Europe and America and the correspond-
ing changes in Judaic religion, philosophy, social structure, and culture. Attention will be paid to the creation of a modern Jewish identity in the secular culture of the post-Modern world. Offered as HSTY 231, JDST 231, and RLGN 231.

**JDST 233. Introduction to Jewish Folklore (3)**
Exploration of a variety of genres, research meth-
ods and interpretations of Jewish folklore, from antiquity to the present. Emphasis on how Jewish folk traditions and culture give us access to the spirit and mentality of the many different genera-
tions of the Jewish ethnic group, illuminating its past and informing the direction of its future de-
velopment. Offered as ANTH 233 and JDST 233. Global & Cultural Diversity

**JDST 280. Religion and Politics in the Middle East (3)**
An in-depth look at the relationship between poli-
tics and religion in the Middle East. Students will spend the first week on the Case Western Reserve campus and the last three weeks in Israel, where time will be divided between classroom teaching, guest lectures, and “field trips” to important sites. Students will have the opportunity to interact directly with members of the region’s diverse relig-
ious groups within the political, social, and cul-
tural contexts in which they live. A final research paper will be required. Knowledge of Hebrew is not necessary. Offered as JDST 280 and RLGN 280. Global & Cultural Diversity

**JDST 330. Classical Jewish Religious Thought (3)**
The thought of some major biblical and Rabbinic writings and of the classic age of medieval Jewish philosophy. Offered as JDST 330, PHIL 332, and RLGN 330.

**JDST 350. Jewish Ethics (3)**
An exploration of Jewish moral and ethical dis-
course. The first half of the course will be devoted to studying the structure and content of classical Jewish ethics on issues including marriage, abor-
tion, euthanasia and social justice. Students will read and react to primary Jewish religious texts. The second half of the course will focus on various modern forms of Judaism and the diversity of mor-
al rhetoric in the Jewish community today. Read-
ings will include such modern thinkers as Martin Buber and Abraham Joshua Heschel. Offered as JDST 350, RLGN 350, and RLGN 450. SAGES Dept Seminar

**JDST 392. Independent Study (1-3)**
Up to three semester hours of independent study may be taken in a single semester.

**DEPARTMENT OF MATHEMATICS**
220 Yost Hall

www.case.edu/artsci/math
Phone: 216-368-2880; Fax: 216-368-5163
Daniela Calvetti, Chair
E-mail: daniela.calvetti@case.edu

The Department of Mathematics at Case Western Reserve University is an active center for mathematical research. Faculty members conduct research in algebra, analysis, applied mathematics, convexity, dynamical systems, geometry, imaging, inverse problems, life sciences applications, mathematical biology, modeling, numerical analysis, probability, scientific computing, stochastic systems, and other areas.

The department offers a variety of programs leading to both undergraduate and graduate degrees in traditional and applied mathemat-
ics. Undergraduate degrees are Bachelor of Arts, Bachelor of Science in Mathematics, and Bachelor of Science in Applied Mathematics. Graduate degrees are Master of Science and Doctor of Philosophy. The BS/MS program allows a student to obtain a Bachelor of Sci-
ence in Applied Mathematics with a master’s degree from Mathematics or another depart-
ment in five years. The department, in coopera-
tion with John Carroll University, offers a program for individuals interested in pre-col-
lege teaching. It also offers a specialized pro-
gram with the Department of Physics.

Mathematics plays a central role in the physi-
cal, biological, economic, and social sciences. Because of this, employment prospects are always strong for individuals with degrees in mathematics, and there are excellent career opportunities. A bachelor’s degree in mathe-
matics offers a strong background for graduate school in many areas (including computer sci-
ence, medicine, and law, in addition to mathemat-
ics and science) or a position in the pri-
ivate sector. A master’s degree (in mathematics or applied mathematics, or an undergraduate degree in applied mathematics combined with a master’s in a different area) is an excellent basis for employment in the private sector in a technical field. A Ph.D. degree is usually nec-

erary for college teaching and research.

Students, both undergraduate and graduate, have opportunities to interact personally with faculty and other students, and research and other activities are available. In addition, under-
graduates can obtain teaching experience via the Department’s supplemental instruc-
tion program.

**DEPARTMENT FACULTY**
Daniela Calvetti, Ph.D.
(University of North Carolina)  
Professor and Chair  
Scientific computing; imaging, inverse problems; modeling and simulation in life science  
James C. Alexander, Ph.D.  
(Johns Hopkins University)  
Professor  
Dynamics; applied mathematics  
Christopher Butler, M.S.  
(Case Western Reserve University)  
Instructor  
Teaching of mathematics  
David Gurarie, Ph.D.  
(Hebrew University, Jerusalem, Israel)  
Professor  
Infectious diseases; epidemiology; mathematical biology; differential equations; gallery of fluid motions  
Michael Hurley, Ph.D.  
(Northwestern University)  
Professor  
Dynamical systems; dynamics of cellular automata; dynamics of numerical methods  
Steven H. Izen, Ph.D.  
(Massachusetts Institute of Technology)  
Professor  
Image reconstruction from projections, both theoretically and in applied situations  
Peter Kotelnikov, Ph.D.  
(University of Bremen)  
Professor  
Stochastic partial and ordinary differential equations; transitions from microscopic to macroscopic equations for particle systems; correlated Brownian motions and depletion phenomena in colloids; stochastic models in nanotechnology and complex systems  
Joel Langer, Ph.D.  
(University of California, Santa Cruz)  
Professor  
Static and dynamics of curves and related physical models; the interplay between geometry and integrable Hamiltonian systems; geometry of finite and infinite dimensional spaces of curves  
Marshall J. Leitman, Ph.D.  
(Brown University)  
Professor  
Continuum physics; integral equations; functional analysis; mechanics of materials  
Elizabeth Meckes, Ph.D.  
(Stanford University)  
Assistant Professor  
Quantitative limit theorems in probability; Stein’s method; high-dimensional phenomena in probability; geometry; statistics  
Mark Meckes, Ph.D.  
(Case Western Reserve University)  
Assistant Professor  
Geometry in high dimensions; random matrix theory; geometry probability  
David A. Singer, Ph.D.  
(University of Pennsylvania)  
Professor  
Geometry; dynamical systems; variational problems  
Erkki Somersalo, Ph.D.  
(University of Helsinki)  
Professor  
Modeling and simulation of complex biological systems; inverse problems and Bayesian scientific computing; medical imaging  
Stanislaw J. Szarek, Ph.D.  
(Mathematical Institute, Polish Academy of Science)  
Levi Kerr Professor in Mathematics  
Convex geometry; analysis; probability; applications to approximation theory, mathematical physics, quantum information theory  
Richard Varga, Ph.D.  
(University of Michigan)  
Adjunct Professor  
Computational electromagnetism; partial differential equation  
Carsten Schütt, Ph.D.  
(Christian-Albrecht Universität, Kiel)  
Adjunct Professor  
Convex geometry; analysis; probability; applications to approximation theory, mathematical physics, quantum information theory  
Mark Meckes, Ph.D.  
(Christian-Albrecht Universität, Kiel)  
Adjunct Professor  
Teaching of mathematics  
Instructor  
Case Western Reserve University. All undergraduate mathematics degrees are based on a four-course sequence in calculus and differential equations and a five-course mathematics core in analysis and algebra.  
UNDERGRADUATE PROGRAMS  
 Majors  
A Bachelor of Arts in Mathematics, a Bachelor of Science in Mathematics, a Bachelor of Science in Mathematics and Physics, and a Bachelor of Science in Applied Mathematics are available to students at Case Western Reserve University. All undergraduate mathematics degrees are based on a four-course sequence in calculus and differential equations and a five-course mathematics core in analysis and algebra.  
BACHELOR OF ARTS IN MATHEMATICS  
(1) Mathematics Requirements  
The B.A. degree requires at least 38 hours of mathematics courses, including:  
(a) MATH 121, 122, 223, and 224, or an equivalent sequence  
(b) Core mathematics for the B.A.  
(i) MATH 307, 308, 321, 322  
(ii) MATH 324 or 425  
(c) Three approved technical electives (9 credit hours), no more than one of which can be from outside the department  
(2) Non-Mathematics Requirements  
A 3-credit hour course in computer science (ENGR 131 or other approved course)  
TEACHER LICENSURE  
High school teaching certification is available
in the B.A. program in mathematics through a joint program with John Carroll University. The requirements are:

(a) Completion of the B.A. program in mathematics, including MATH 150, MATH 304, and STAT 312 as the three approved technical electives.

(b) The completion of a second major in teacher education. Students interested in this option should consult the description of the Teacher Licensure program elsewhere in this bulletin or contact the director of teacher education.

BACHELOR OF SCIENCE IN MATHEMATICS

(1) Mathematics Requirements

The B.S. degree in mathematics requires at least 50 hours of mathematics courses, including:

(a) MATH 121, 122, 223, and 224, or an equivalent sequence

(b) Core mathematics for the B.S. in mathematics
   i) MATH 307, 308, 321, 322
   ii) MATH 324 or 425

(c) 21 hours (normally seven courses) of approved technical electives, no more than 9 hours of which may be from outside the department

(2) Non-Mathematics Requirements

The B.S. degree in mathematics requires the following non-mathematics courses:

(a) PHYS 121, 122, 221, or an equivalent sequence

(b) A two-course science sequence from the following list of physical sciences: ASTR 201-202, CHEM 105-106, CHEM 111-ENGR 145, GEOL 110 and either 115 or 210

(c) A 3-credit hour course in computer science (ENGR 131 or other approved course).

(d) An approved science lab (usually 2 credit hours) (BIOC 314, BIOL 111, CHEM 113, GEOL 119, or PHYS 203)

BACHELOR OF SCIENCE IN APPLIED MATHEMATICS

The B.S. degree in Applied Mathematics requires at least 50 hours of course work in mathematics and related subjects, in addition to a professional core that is specific to the area of application of interest to the student. A student in this degree program must design a program of study in consultation with his or her academic advisor. This program of study must explicitly list the technical electives and the professional core in the area of application.

(1) Mathematics Requirements

(a) MATH 121, 122, 223, and 224, or an equivalent sequence

(b) Core mathematics for applied mathematics
   i) MATH 304, 307, 321, 322, 330
   ii) MATH 324 or 425

(c) Technical Electives: 18 credit hours (normally six courses) of technical electives as follows:
   i) Four approved courses, specific to the concentration area of interest to the student
   ii) Two other courses of MATH at the 300 level or higher

(2) Professional Core Requirement

The professional core requires 12 credit hours of course work specific to the area of application. This requirement is intended to promote scientific breadth and encourage application of mathematics to other fields.

(3) Non-Mathematics Requirements

The B.S. degree in applied mathematics requires the following non-mathematics courses:

(a) PHYS 121, 122, 221, or an equivalent sequence

(b) A two-course science sequence from the following list of physical sciences: ASTR 201-202, CHEM 105-106, CHEM 107-108, GEOL 110 and either 115 or 210

(c) A 3-credit hour course in computer science (ENGR 131 or other approved course)

(d) An approved science lab (usually 2 credit hours) (BIOC 314, BIOL 111, CHEM 113, GEOL 119, or PHYS 203)

Areas of research in applied mathematics well represented in the department include:

- Applied dynamical systems
- Applied probability and stochastic processes
- Imaging
- Life science
- Scientific computing

Study plans with emphasis on areas of application closely related to mathematics but centered in other departments will be also considered. Such areas might include engineering applications, biology, cognitive science, or economics.

BACHELOR OF SCIENCE IN MATHEMATICS AND PHYSICS

In contrast to an applied mathematics degree or the B.S. in physics with a mathematical physics concentration, this is a synergistic, coherent, and parallel education in mathematics and physics. To a close approximation, the challenging course work corresponds to combining the mathematics and physics cores, with the Physics Laboratory cluster replaced by a single, fourth-year laboratory semester. A student in this new program may use either of two official advisors, one available from each department, who would also constitute a committee for the administration of the degree and the approval of curriculum petitions.

The total number of required credits is 126 (35 MATH, 38 PHYS, 6 senior project, 11-13 ENGR and CHEM). There are 14 to 16 credits of open electives.

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<tr>
<th>Course</th>
<th>Year</th>
<th>Credit</th>
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<tr>
<td>PHYS 121 or 123</td>
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<td>Mechanics</td>
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<td>PHYS 122 or 124</td>
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<td>Electricity &amp; Magnetism</td>
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<td>MATH 121 or 123</td>
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<td>Calculus I</td>
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<td>MATH 122 or 124</td>
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<td>Calculus II</td>
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<td>MATH 223 or 227</td>
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<td>Calculus III</td>
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<td>CHEM 105 or 111</td>
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<td>CHEM 106 or ENGR</td>
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<td>Intro Chemistry</td>
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**An advanced physics course to be selected from the following list: PHYS 315, 316, 326, 328, 336, 365.

***The “M&P group” of four courses corresponds to two physics courses and two mathematics courses. The physics courses would be chosen from PHYS 315, 316, or 326, 328, and the mathematics courses are subject to approval by the advisory committee and are thereby referred to as ‘approved electives.’ They may be chosen from the general list of mathematics courses at the 300 level or higher. Also, subject to approval, students may choose a course from outside the mathematics and physics departments as a substitute in the M&P group.

****If approved by the M&P committee, other science sequence courses may be substituted.

*****The number of open electives will vary depending on whether students choose 3-credit or 4-credit courses to fulfill the chemistry/science requirement.

INTEGRATED B.S./M.S. PROGRAM IN MATHEMATICS AND/OR APPLIED MATHEMATICS

The integrated B.S./M.S. program is intended for highly motivated candidates for the B.S. in mathematics and applied mathematics who wish to pursue an advanced degree. Application to the B.S./M.S. program must be made after completion of 75 semester hours of course work and prior to attaining senior status (completion of 90 semester hours). Generally, this means that a student will submit the application during his/her sixth semester of undergraduate course enrollment and will have no fewer than two semesters of remaining B.S. requirements to complete. Applicants should consult the dean of undergraduate studies.

A student admitted to the program may, in the senior year, take up to nine hours of graduate courses (400 level and above) that will count towards both B.S. and M.S. requirements. The courses to be doubled-counted must be specified at the time of application. Any undergraduate course work that is to be applied to the M.S. must be beyond that used to satisfy B.S. degree requirements and must conform to university, graduate school, and department rules. Students may petition to transfer graduate course work taken prior to application to the B.S./M.S. Program subject to the rules of the graduate school.

Students for whom the master’s project or thesis is a continuation and development of the senior project should register for MATH 651 Thesis (or the appropriate project course) during the senior year and are expected to complete all other courses for the B.S. before enrolling in further M.S. course work and thesis (continuing the senior project). Students for whom the master’s thesis or project is distinct from the senior project will be expected to complete the B.S. degree before taking further graduate courses for the master’s degree.

MINORS

A minor in mathematics is available to all undergraduates. It consists of 17 credit hours of approved course work in mathematics. No more than two courses can be used to satisfy both minor requirements and the requirements of the student’s major field (meaning departmental degree requirements, including departmental technical electives and common course requirements of the student’s school). The 17 hours must be among the following MATH courses: 121 or 123 or 125, 122 or 124 or 126, 223 or 227, 224 or 228, 150, 201, 301, 302, 303, 304, 307, 308, 321, 322, 323, 324, 331, 338, 343, 345, 380, or any 400-level MATH course (only one of 201, 307).

GRADUATE PROGRAMS

The department offers programs leading to the Master of Science and Doctor of Philosophy degrees. At the master’s and at the doctoral levels, there are two degrees: the degree of Master of Science in Mathematics and the degree of Master of Science in Applied Math-
A student must satisfy all of the general requirements of the graduate school as well as the more specific requirements of the department to earn either a master’s or doctoral degree. Each graduate student is assigned an advisory committee consisting of faculty members during the first year of study. The committee’s primary responsibility is to help the student plan an appropriate and sufficiently broad program of course work and study, which will satisfy both the degree requirements and the special interests of the student. With the aid of the advisory committee, each student must present a study plan indicating how he or she intends to satisfy the requirements for a graduate degree.

The main requirements are as follows.

MASTER OF SCIENCE IN MATHEMATICS

A minimum of 27 credit hours of approved course work, at least 18 of which must be at the 400 level or higher, is required for the M.S. degree in mathematics. Courses in two of the following three basic areas must be included among the 27 credit hours required for graduation: Abstract Algebra (MATH 401 and MATH 402), Analysis (MATH 423 and one of MATH 424 or MATH 425), and Topology (MATH 461).

The student must pass a comprehensive oral examination on three areas, two of which must be selected from the basic ones listed above (although no particular courses are specified). The third area for the examination may be any approved subject.

A student in the M.S. program in mathematics may substitute the comprehensive exam examination requirement with an expository or original thesis, which will count as 6 credit hours of course work. The thesis will be defended in the course of an oral examination, during which the student will be questioned about the thesis and related topics. These two variants correspond to plan A and plan B in the graduate school literature.

MASTER OF SCIENCE IN APPLIED MATHEMATICS

The department offers specialized programs in applied mathematics. For each of the programs, there is a minimum requirement of 27 credit hours of course work, at least 18 of which must be at the 400 level or higher. Students in the program must complete course work requirement in each of the following disjoint groups:

- At least 15 hours offered by the Department of Mathematics
- At least 6 hours of courses offered outside the Department of Mathematics
- 6 hours of thesis work (see below) or successfully passing a comprehensive exam

Although individual programs of course work leading to a master’s degree in applied mathematics cannot have a large common core of requirements because of the great diversity of topics used in applications, all students pursuing a Master of Science in Applied Mathematics are strongly advised to take Introduction to Numerical Analysis (MATH 431) and Mathematical Modeling (MATH 441). In addition, to add breadth to the student’s education, the set of courses taken within the department must include three credit hours of approved course work in at least three of the following seven subjects. The courses listed are examples of suitable courses on the given subject. A course can be used to satisfy only one breadth area.

APPLIED MATHEMATICS BREADTH AREAS

- **Analysis and Linear Analysis.** MATH 471 (not suitable for credit towards the Ph.D. requirements), MATH 423, or MATH 405
- **Probability and its Applications.** MATH 439 (Bayesian Scientific Computing), MATH 487 (Stochastic Processes in Engineering and Science), or MATH 491 (Probability)
- **Numerical Analysis and Scientific Computing.** MATH 431 (Intro to Numerical Analysis), MATH 432 (Numerical Differential Equations), or MATH 433 (Numerical Optimization)
- **Differential Equations.** MATH 435 (Ordinary Differential Equations), MATH 445 (Intro to Partial Differential Equations), MATH 448 (Applied Partial Differential Equations), or MATH 449 (Dynamical Systems for Biology and Medicine)
- **Inverse Problems and Imaging.** MATH 439 (Bayesian Scientific Computing), MATH 440 (Computational Inverse Problems), or MATH 475 (Mathematics of Imaging)
- **Logic and Discrete Mathematics.** MATH 406 (Math Logic and Model Theory), MATH 408 (Cryptography), or MATH 410 (Automata and Formal Languages)
- **Life Science.** MATH 441 (Mathematical Modeling), MATH 449 (Dynamical Systems for Biology and Medicine), MATH 478 (Computational Neuroscience), or MATH 487 (Stochastic Processes in Engineering and Science)

Other suitable courses for students in applied mathematics include MATH 413 (Graph Theory), MATH 424 (Functional Analysis), MATH 425 (Complex Analysis), MATH 427 (Convexity), MATH 428 (Fourier Analysis), MATH 444 (Data mining and Pattern Recognition), MATH 469 (Calculus of Variations), MATH 475 (Mathematics of Imaging), MATH 492 (Probability), and MATH 495 (Combinatorics).

The student must pass a comprehensive oral examination on three areas, two of which must be in the list for the breadth requirement (although no particular courses are specified). The third area for the examination may be any approved subject.

A student in the M.S. program in applied mathematics may substitute the comprehensive examination requirement with an expository or original thesis, which will count as 6 credit hours of course work. The thesis will be defended in the course of an oral examination, during which the student will be questioned about the thesis and related topics. These two variants correspond to plan A and plan B in the graduate school literature.

MASTER OF SCIENCE IN APPLIED MATHEMATICS—ENTREPRENEURIAL TRACK

The Master of Science in Applied Mathematics—Entrepreneurial Track, obtained through the Entrepreneurial Program in Mathematics and Computation, is a degree designed to provide training in applied mathematics for entrepreneurs who have a business idea that depends heavily on mathematics. They wish to learn enough mathematics to refine their business idea and, at the same time, acquire the business skills needed to bring this idea to the marketplace. The Master of Science in Applied Mathematics—Entrepreneurial Track is also appropriate for industrial mathematicians who need to effectively utilize mathematical tools in a business context. It expands our basic Master of Applied Mathematics program by tightly integrating business training into the curriculum. The Entrepreneurial Track provides instruction and real business-world experience to students who have a background in mathematics and a vision for new
Candidates for the M.S. in Mathematics—Entrepreneurial Track must complete at least 27 hours of course work and present a master’s thesis. It is expected that a business plan be an integral part of the thesis. The two-year program includes these course requirements:

**MATH 483-4** Mathematics for Innovation I and II (6 hours)
**MATH 651** Thesis (9 hours)
**ENTP 429** New Venture Creation (3 hours)
**ENTP 441** Technology Entrepreneurship (3 hours)
Mathematics Technical Elective (3 hours)
Restricted Elective (3 hours)

The New Venture Creation and Technology Entrepreneurship courses will be offered by the Weatherhead School of Management. The Technical Elective is a 400-level or higher mathematics course or other technical elective appropriate to an individual student’s program of study, as approved by the Mathematics Entrepreneurship Program Committee. The Restricted Elective is a course in mathematics, science, engineering, or management appropriate to an individual student’s program of study, as approved by the Mathematics Entrepreneurship Program Committee.

**PH.D. PROGRAM**

The doctorate is conferred not merely upon completion of a stipulated course of study, but rather upon clear demonstration of scholarly attainment and capability of original research work in mathematics. A doctoral student may plan either a traditional program of studies in mathematics (mathematics track) or a program of studies oriented toward applied mathematics (applied mathematics track). In either case, each student must take 36 credit hours of approved courses with a grade average of B or better. For students entering with a master’s degree in a mathematical subject compatible with our program, as determined by the graduate committee, this requirement is reduced to 18 credit hours of approved courses.

In addition to the course work, all Ph.D. students in both tracks must complete the following specific requirements:

- **Pass the Ph.D. qualifying examination**, which consists of examinations on three different subjects. All examinations are general proficiency examinations which may or may not be connected to specific courses. The topics for each subject are spelled out in a syllabus, periodically updated, which is available to the student. Students are expected to take the qualifying examination by the end of the second year of study and to successfully pass all parts of it by the beginning of their sixth semester in the Ph.D. program. Each track requires examination in a different set of subjects. More specifically:
  - **Mathematics Track**: A doctoral student in this track must take examinations on abstract algebra and real analysis. The third subject is to be selected from the following list: complex analysis, control and calculus of variations, differential equations, dynamical systems, functional analysis, geometry, probability, and topology. The choice of the examination subjects should be finalized by the end of the first year of study.
  - **Applied Mathematics Track**: A doctoral student in this track must take examinations in an area of computational mathematics and in an area of mathematical modeling. The third area of examination may be a more applied subject, including but not restricted to fluid mechanics, statistical mechanics, epidemiology, neuroscience, or a more traditional field of mathematics.

- **Write an acceptable thesis that constitutes an original contribution to mathematical knowledge. It is the responsibility of the student to find a thesis advisor who is willing to help plan a program and guide his or her research. This should be done immediately after passing the qualifying examination. A copy of a student’s thesis is to be available no later than 10 days prior to the final oral examination (see below), and the student is required to deliver an expository lecture on the subject of his or her thesis sometime prior to the final oral examination. This lecture is open to all students and faculty.**

- **Pass a final oral examination consisting of a defense of the thesis. The examination committee, which consists of not fewer than four members of the faculty, including one whose appointment is outside the mathematics department, is responsible for certifying that the material presented in the thesis meets acceptable scholarly standards. The examination may also include an inquiry into the student’s competence in the major and related fields. All faculty members are welcome to attend.**

**COURSE WORK REQUIREMENTS**

**Mathematics Track**: A student in the traditional mathematics program must demonstrate knowledge of the basic concepts and techniques of algebra, analysis (real and complex), and topology. This must be done by taking all courses in the three basic areas: abstract algebra (MATH 401-MATH 402), analysis (MATH 423-MATH 424 and MATH 425), and topology (MATH 461). In addition, the student is required to take a minimum of 18 credit hours of approved course work.

A student with a master’s degree in a mathematical subject compatible with our program, as determined by the graduate committee, must take 18 credit hours of approved courses. The graduate committee will determine which of the specific course work requirements stated above have been satisfied by the master’s course work.

**Applied Mathematics Track**: A student in the applied mathematics track must demonstrate knowledge of scientific computing, mathematical modeling, and differential equations. This may be done by taking:

- **Introduction to Numerical Analysis** (MATH 431) and at least one of Numerical Differential Equations (MATH 432) or Numerical Nonlinear Systems and Optimization (MATH 433);
- **Mathematical Modeling** (MATH 441) and at least one of Ordinary Differential Equations (MATH 445), Introduction to Partial Differential Equations (MATH 445), or Partial Differential Equations (MATH 448).

In addition, a student in this track must take at least 24 credit hours of approved courses, which must include at least 9 credit hours of courses offered outside the Department of Mathematics, and at least 9 credit hours offered by the Department of Mathematics.

A student with a master’s degree in a mathematical subject compatible with our program, as determined by the graduate committee, must take 18 credit hours of approved courses, which must include at least 6 credit hours of courses offered outside the Department of Mathematics and at least 9 credit hours offered by the Department of Mathematics. The graduate committee will determine which of
the specific course work requirements stated above have been satisfied by the master’s course work.

Sample study plans for students with concentrations in scientific computing, imaging, mathematical biology, and stochastics follow. The graduate committee will entertain ideas for other serious study plans or qualifying exam subjects in addition to the most common variants specifically suggested.

<table>
<thead>
<tr>
<th>Scientific Computing Concentrations</th>
<th>Application area</th>
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<tbody>
<tr>
<td>MATH 431</td>
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<td>MATH 439/440</td>
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<td>MATH 448</td>
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<td>MATH 487</td>
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<td>MATH 449/469/478</td>
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<tr>
<th>Imaging Concentrations</th>
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<tr>
<td>MATH 431</td>
<td>PHYS 431</td>
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<td>MATH 432</td>
<td>PHYS 460</td>
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<td>MATH 433</td>
<td>EBME 410</td>
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<td>MATH 441</td>
<td>PHYS 431</td>
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<td>MATH 428</td>
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<td>MATH 475</td>
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<td>MATH 445</td>
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<td>MATH 439/440</td>
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<td>MATH 444</td>
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<th>Life Science Concentrations</th>
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<th>Stochastics Concentrations</th>
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<td>MATH 431</td>
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<td>MATH 441</td>
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<td>MATH 481</td>
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</table>

Ph.D. students entering with a bachelor’s degree are also subject to the breadth requirements for students in the program for the M.S. degree in applied mathematics.

PETITIONS
Any exceptions to departmental regulations or requirements must have the formal approval of the graduate committee of the department. Such exceptions are to be sought by a written petition, approved by the student’s advisory committee or thesis advisor, to the graduate committee.

Any exception to university rules and regulations must be approved by the dean of graduate studies. Such exceptions are to be sought by presenting a written petition to the graduate committee for departmental endorsement and approval prior to forwarding the petition to the dean.

COURSE DESCRIPTIONS

MATH 110. Introduction to Mathematical Communication and Software (1)

MATH 120. Elementary Functions and Analytic Geometry (3)
Polynomial, rational, exponential, logarithmic, and trigonometric functions (emphasis on computation, graphing, and location of roots) straight lines and conic sections. Primarily a precalculus course for the student without a good background in trigonometric functions and graphing and/or analytic geometry. Not open to students with credit for MATH 121 or MATH 125. Prereq: Three years of high school mathematics.

MATH 121. Calculus for Science and Engineering I (4)
Functions, analytic geometry of lines and polynomials, limits, derivatives of algebraic and trigonometric functions. Definite integral, antiderivatives, fundamental theorem of calculus, change of variables. Prereq: Three and one half years of high school mathematics.

MATH 122. Calculus for Science and Engineering II (4)
Continuation of MATH 121. Exponentials and logarithms, growth and decay, inverse trigonometric functions, related rates, basic techniques of integration, area and volume, polar coordinates, parametric equations. Taylor polynomials and Taylor’s theorem. Prereq: MATH 121 or MATH 123 or MATH 126.

MATH 123. Calculus I (4)
Limits, continuity, derivatives of algebraic and transcendental functions, including applications, basic properties of integration. Techniques of integration and applications. Students must have 31/2 years of high school mathematics.

MATH 124. Calculus II (4)

MATH 125. Math and Calculus Applications for Life, Managerial, and Social Sci I (4)
Discrete and continuous probability; differential and integral calculus of one variable; graphing, related rates, maxima and minima. Integration techniques, numerical methods, volumes, areas. Applications to the physical, life, and social sciences. Students planning to take more than two semesters of introductory mathematics should take MATH 121. Prereq: Three and one half years of high school mathematics.

MATH 126. Math and Calculus Applications for Life, Managerial, and Social Sci II (4)
Continuation of MATH 125 covering differential equations, multivariable calculus, discrete methods. Partial derivatives, maxima and minima for functions of two variables, linear regression. Differential equations; first and second order equations, systems, Taylor series methods; Newton’s method; difference equations. Prereq: MATH 121 or MATH 123 or MATH 125.

MATH 150. Mathematics from a Mathematician’s Perspective (3)
An interesting and accessible mathematical topic not covered in the standard curriculum is developed. Students are exposed to methods of mathematical reasoning and historical progression of mathematical concepts. Introduction to the way mathematicians work and their attitude toward their profession. Should be taken in freshman year to count toward a major in mathematics. Prereq: Three and one half years of high school mathematics.

MATH 201. Introduction to Linear Algebra (3)
Matrix operations, systems of linear equations, vector spaces, subspaces, bases and linear independence, eigenvalues and eigenvectors, diagonalization of matrices, linear transformations, determinants. Less theoretical than MATH 308. May not be taken for credit by mathematics majors. Only one of MATH 201 or MATH 308 may be taken for credit.
Prereq: MATH 122 or MATH 124 or MATH 126.

MATH 223. Calculus for Science and Engineering III (3)
Introduction to vector algebra; lines and planes. Functions of several variables: partial derivatives, gradients, chain rule, directional derivative, maxima/minima. Multiple integrals, cylindrical and spherical coordinates. Derivatives of vector valued functions, velocity and acceleration. Vector fields, line integrals, Green’s theorem.
Prereq: MATH 122 or MATH 124.

MATH 224. Elementary Differential Equations (3)
A first course in ordinary differential equations. First order equations and applications, linear equations with constant coefficients, linear systems, Laplace transforms, numerical methods of solution.
Prereq: MATH 223 or MATH 227.

MATH 227. Calculus III (3)
Prereq: MATH 124 or placement by the department.

MATH 228. Differential Equations (3)
Elementary ordinary differential equations: first order equations; linear systems; applications; numerical methods of solution.
Prereq: MATH 227 or placement by the department.

MATH 301. Undergraduate Reading Course (1-3)
Students must obtain the approval of a supervising professor before registration. More than one credit hour must be approved by the undergraduate committee of the department.

MATH 302. Departmental Seminar (3)
A seminar devoted to understanding the formulation and solution of mathematical problems. SAGES Department Seminar. Students will investigate, from different possible viewpoints, via case studies, how mathematics advances as a discipline—what mathematicians do. The course will largely be in a seminar format. There will be two assignments involving writing in the style of the discipline. Enrollment by permission (limited to majors depending on demand).

SAGES Dept Seminar

MATH 303. Elementary Number Theory (3)
Primes and divisibility, theory of congruencies, and number theoretic functions. Diophantine equations, quadratic residue theory, and other topics determined by student interest. Emphasis on problem solving (formulating conjectures and justifying them).
Prereq: MATH 122 or MATH 124.

MATH 304. Discrete Mathematics (3)
A general introduction to basic mathematical terminology and the techniques of abstract mathematics in the context of discrete mathematics. Topics introduced are mathematical reasoning, Boolean connectives, deduction, mathematical induction, sets, functions and relations, algorithms, graphs, combinatorial reasoning.
Offered as EECS 302 and MATH 304.
Prereq: MATH 122 or MATH 124 or MATH 126.

MATH 307. Introduction to Abstract Algebra I (3)
First semester of an integrated, two-semester theoretical course in abstract and linear algebra, studied on an axiomatic basis. The major algebraic structures studied are groups, rings, fields, modules, vector spaces, and inner product spaces. Topics include homomorphisms and quotient structures, the theory of polynomials, canonical forms for linear transformations and the principal axis theorem. This course is required of all students majoring in mathematics. Only one of MATH 201 or MATH 307 may be taken for credit.
Prereq: MATH 122 or MATH 124.

MATH 308. Introduction to Abstract Algebra II (3)
Continuation of MATH 307.
Prereq: MATH 307.

MATH 319. Applied Probability and Stochastic Processes for Biology (3)
Applications of probability and stochastic processes to biological systems. Mathematical topics will include: introduction to discrete and continuous probability spaces (including numerical generation of pseudo random samples from specified probability distributions), Markov processes in discrete and continuous time with discrete and continuous sample spaces, process types including homogeneous and inhomogeneous Poisson processes and Markov chains on graphs, and diffusion processes including Brownian motion and the Ornstein-Uhlenbeck process. Biological topics will be determined by the interests of the students and the instructor. Likely topics include: stochastic ion channels, molecular motors and stochastic ratchets, actin and tubulin polymerization, random walk models for neural spike trains, bacterial chemotaxis, signaling and genetic regulatory networks, and stochastic predator-prey dynamics. The emphasis will be on practical simulation and analysis of stochastic phenomena in biological systems. Numerical methods will be developed using both MATLAB and the R statistical package. Student projects will comprise a major part of the course.
Offered as BIOL 319, EECS 319, MATH 319, BIOL 419, EBM 419, and PHOL 419.
Prereq: MATH 224 or MATH 228 or BIOL 300 or BIOL 306.

MATH 321. Fundamentals of Analysis I (3)
Abstract mathematical reasoning in the context of analysis in Euclidean space. Introduction to formal reasoning, sets and functions, and the number systems. Sequences and series; Cauchy sequences and convergence. Required for all mathematics majors. Additional work required for graduate students. (May not be taken for graduate credit by graduate students in the Department of Mathematics.)
Offered as MATH 321 and MATH 421.
Prereq: MATH 223 or MATH 227.

MATH 322. Fundamentals of Analysis II (3)
Continuation of MATH 321. Point-set topology in metric spaces with attention to n-dimensional space; completeness, compactness, connectedness, and continuity of functions. Topics in sequences, series of functions, uniform convergence, Fourier series and polynomial approximation. Theoretical development of differentiation and Riemann integration. Required for all mathematics majors. Additional work required for graduate students. (May not be taken for graduate credit by graduate students in the Department of Mathematics.)
Offered as MATH 322 and MATH 422.
Prereq: MATH 321.

MATH 324. Introduction to Complex Analysis (3)
Properties, singularities, and representations of analytic functions, complex integration. Cauchy’s theorems, series residues, conformal mapping and analytic continuation, Riemann surfaces. Relevance to the theory of physical problems.
Prereq: MATH 224 or MATH 228.

MATH 326. Geometry and Complex Analysis (3)
The theme of this course will be the interplay between geometry and complex analysis, algebra and other fields of mathematics. An effort will be made to highlight significant, unexpected connections between major fields, illustrating the unity of mathematics. The choice of text(s) and syllabus itself will be flexible, to be adapted to the range of interests and backgrounds of pre-enrolled students. Possible topics include: the Mobius group and its subgroups, hyperbolic geometry, elliptic functions, Riemann surfaces, applications of conformal mapping, and potential theory in classical physical models.
Offered as MATH 326 and MATH 426.
Prereq: MATH 324.

MATH 327. Convexity and Optimization (3)
Introduction to the theory of convex sets and functions and to the extremes in problems in areas of mathematics where convexity plays a role. Among the topics discussed are basic properties of convex
sets (extreme points, facial structure of polytopes), separation theorems, duality and polars, properties of convex functions, minima and maxima of convex functions over convex set, various optimization problems.

Offered as MATH 327, MATH 427, and OPRE 427.

Prereq: MATH 223 or MATH 227.

**MATH 330. Introduction of Scientific Computing (3)**

Among the topics which will be covered in the course are solutions of linear systems and least squares, approximation and interpolation, solution of nonlinear systems, numerical integration and differentiation, and numerical solution of differential equations. Projects where the numerical methods are used to solve problems from various application areas will be assigned throughout the semester.

Prereq or Coreq: MATH 224 or MATH 228.

**MATH 338. Introduction to Dynamical Systems (3)**

Nonlinear discrete dynamical systems in one and two dimensions. Chaotic dynamics, elementary bifurcation theory, hyperbolicity, symbolic dynamics, structural stability, stable manifold theory.

Prereq: MATH 223 or MATH 227.

**MATH 342. Introduction to Research in Mathematical Biology (1)**

The purpose of this seminar is to introduce students to some of the research being done at Case Western Reserve that explores questions at the intersection of mathematics and biology. Students will explore roughly five research collaborations, spending two weeks with each research group. In the first three classes of each two-week block, students will read and discuss relevant papers, guided by members of that research group, and the two-week period will culminate in a talk in which a member of the research group will present a potential undergraduate project in that area. After the final group’s talk, students will divide themselves into groups of two to four people and choose one project for further exploration. Together, they will write up this project as a research proposal, introducing the problem, explaining how it connects to broader scientific questions, and outlining the proposed work. It is expected that students will use the associated research group as a resource, but the proposal should be their own work. Students will submit a first draft, receive feedback, and then submit a revised draft.

Offered as BIOL 309 and MATH 342.

**MATH 343. Theoretical Computer Science (3)**

Introduction to mathematical logic, different classes of automata and their correspondence to different classes of formal languages, recursive functions and computability, assertions and program verification, denotational semantics. MATH/ECECS 343 and MATH 410 cannot both be taken for credit.

Offered as ECECS 343 and MATH 343.

**MATH 351. Senior Project for the Mathematics and Physics Program (2)**

A two-semester course (2 credits per semester) in the joint B.S. in Mathematics and Physics program. Project based on numerical and/or theoretical research under the supervision of a mathematics faculty member, possibly jointly with a faculty member from physics. Study of the techniques utilized in a specific research area and of recent literature associated with the project. Work leading to meaningful results which are to be presented as a term paper and an oral report at the end of the second semester. Supervising faculty will review progress with the student on a regular basis, including detailed progress reports made twice each semester, to ensure successful completion of the work.

SAGES Senior Cap

**MATH 352. Mathematics Capstone (3)**

Mathematics Senior Project. Students pursue a project based on experimental, theoretical or teaching research under the supervision of a mathematics faculty member, faculty members from another Case Western Reserve department or a research scientist or engineer from another institution. A departmental Senior Project Coordinator must approve all project proposals and this same person will receive regular oral and written progress reports. Final results are presented at the end of the second semester as a paper in a style suitable for publication in a professional journal as well as an oral report in a public Mathematics Capstone symposium.

SAGES Senior Cap

**MATH 361. Geometry I (3)**

An introduction to the various two-dimensional geometries, including Euclidean, spherical, hyperbolic, projective, and affine. The course will examine the axiomatic basis of geometry, with an emphasis on transformations. Topics include the parallel postulate and its alternatives, isometries and transformation groups, tilings, the hyperbolic plane and its models, spherical geometry, affine and projective transformations, and other topics. We will examine the role of complex and hypercomplex numbers in the algebraic representation of transformations. The course is self-contained.

SAGE: Dept Seminar

**MATH 363. Knot Theory (3)**

An introduction to the mathematical theory of knots and links, with emphasis on the modern combinatorial methods. Reidemeister moves on link projections, ambient and regular isotopies, linking number tricolorability, rational tangles, braids, torus knots, seifert surfaces and genus, the knot polynomials (bracket, X, Jones, Alexander, HOMFLY), crossing numbers of alternating knots and amphicheirality. Connections to theoretical physics, molecular biology, and other scientific applications will be pursued in term projects, as appropriate to the background and interests of the students.

Prereq: MATH 223 or MATH 227.

**MATH 378. Computational Neuroscience (3)**

Computer simulations and mathematical analysis of neurons and neural circuits, and the computational properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course introduces students to dynamical systems theory for the analysis of neurons and neural learning, models of brain systems, and their relationship to artificial and neural networks. Term project required. Students enrolled in MATH 478 will make arrangements with the instructor to attend additional lectures and complete additional assignments addressing mathematical topics related to the course. Recommended preparation: MATH 223 and MATH 224 or BIOL 300 and BIOL 306.

Offered as BIOL 378, COGS 378, MATH 378, BIOL 478, EMBE 478, ECECS 478, MATH 478 and NEUR 478.

**MATH 380. Introduction to Probability (3)**


Prereq: MATH 223 or MATH 227.

**MATH 381. Introduction to Mathematical Methods in Finance (3)**


Prereq: MATH 380.

**MATH 399. Special Topics (3)**

Special Topics in Mathematics
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 400</td>
<td>Mathematics Teaching Practicum (1)</td>
<td>Practicum for teaching college mathematics. Includes preparation of syllabi, exams, lectures.</td>
</tr>
<tr>
<td>MATH 401</td>
<td>Abstract Algebra I (3)</td>
<td>Basic properties of groups, rings, modules, and fields. Isomorphism theorems for groups; Sylow theorem; nilpotency and solvability of groups; Jordan-Hölder theorem; Gauss lemma and Eisenstein's criterion; finitely generated modules over principal ideal domains with applications to abelian groups and canonical forms for matrices; categories and functors; tensor product of modules, bilinear and quadratic forms; field extensions; fundamental theorem of Galois theory, solving equations by radicals. PreReq: MATH 308.</td>
</tr>
<tr>
<td>MATH 402</td>
<td>Abstract Algebra II (3)</td>
<td>A continuation of MATH 401.</td>
</tr>
<tr>
<td>MATH 406</td>
<td>Mathematical Logic and Model Theory (3)</td>
<td>Propositional calculus and quantification theory; consistency and completeness theorems; godel incompleteness results and their philosophical significance; introduction to basic concepts of model theory; problems of formulation of arguments in philosophy and the sciences. Offered as PHIL 306, MATH 406 and PHIL 406.</td>
</tr>
<tr>
<td>MATH 408</td>
<td>Introduction to Cryptology (3)</td>
<td>Introduction to the mathematical theory of secure communication. Topics include: classical cryptographic systems; one-way and trapdoor functions; RSA, DSA, and other public key systems; Primality and Factorization algorithms; birthday problem and other attack methods; elliptic curve cryptosystems; introduction to complexity theory; other topics as time permits. Recommended preparation: MATH 303.</td>
</tr>
<tr>
<td>MATH 413</td>
<td>Graph Theory (3)</td>
<td>Building blocks of a graph, trees, connectedness, transversality connectedness, transversability, matching, coverings, planarity, and NP-complete problems; various applications and algorithms. PreReq: MATH 201 or MATH 308.</td>
</tr>
<tr>
<td>MATH 421</td>
<td>Fundamentals of Analysis I (3)</td>
<td>Abstract mathematical reasoning in the context of analysis in Euclidean space. Introduction to formal reasoning, sets and functions, and the number systems. Sequences and series; Cauchy sequences and convergence. Required for all mathematics majors. Additional work required for graduate students. (May not be taken for graduate credit by graduate students in the Department of Mathematics.) Offered as MATH 321 and MATH 421.</td>
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<td>MATH 422</td>
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<td>Continuation of MATH 321. Point-set topology in metric spaces with attention to n-dimensional space; completeness, compactness, connectedness, and continuity of functions. Topics in sequences, series of functions, uniform convergence, Fourier series and polynomial approximation. Theoretical development of differentiation and Riemann integration. Required for all mathematics majors. Additional work required for graduate students. (May not be taken for graduate credit by graduate students in the Department of Mathematics.) Offered as MATH 322 and MATH 422. PreReq: MATH 321 or MATH 421.</td>
</tr>
<tr>
<td>MATH 425</td>
<td>Complex Analysis I (3)</td>
<td>Analytic functions. Integration over paths in the complex plane. Index of a point with respect to a closed path; Cauchy's theorem and Cauchy's integral formula; power series representation; open mapping theorem; singularities; Laurent expansion; residue calculus; harmonic functions; Poisson's formula; Riemann mapping theorem. More theoretical and at a higher level than MATH 324. PreReq: MATH 322 or MATH 422.</td>
</tr>
<tr>
<td>MATH 426</td>
<td>Geometry and Complex Analysis (3)</td>
<td>The theme of this course will be the interplay between geometry and complex analysis, algebra and other fields of mathematics. An effort will be made to highlight significant, unexpected connections between major fields, illustrating the unity of mathematics. The choice of text(s) and syllabus itself will be flexible, to be adapted to the range of interests and backgrounds of pre-enrolled students. Possible topics include: the Mobius group and its subgroups, hyperbolic geometry, elliptic functions, Riemann surfaces, applications of conformal mapping, and potential theory in classical physical models. Offered as MATH 326 and MATH 426.</td>
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<td>MATH 427</td>
<td>Convexity and Optimization (3)</td>
<td>Introduction to the theory of convex sets and functions and to the extremes in problems in areas of mathematics where convexity plays a role. Among the topics discussed are basic properties of convex sets (extreme points, facial structure of polytopes), separation theorems, duality and polars, properties of convex functions, minima and maxima of convex functions over convex set, various optimization problems. Offered as MATH 327, MATH 427, and OPRE 427.</td>
</tr>
<tr>
<td>MATH 433</td>
<td>Numerical Solutions of Nonlinear Systems and Optimization (3)</td>
<td>The course provides an introduction to numerical solution methods for systems of nonlinear equations and optimization problems. The course is suitable for upper-undergraduate and graduate students with some background in calculus and linear algebra. Knowledge of numerical linear algebra is helpful. Among the topics which will be covered in the course are Nonlinear systems in one variables; Newton's method for nonlinear equations and un-</td>
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</table>
MATH 434. Optimization of Dynamic Systems (3)

MATH 435. Ordinary Differential Equations (3)
MATH 435 is a second course in ordinary equations. The course will begin with a quick review of one-dimensional ODE's with the idea of introducing tools for studying general systems that will be developed later in the course (this is the get-acquainted part of the course; topics will be selected from Parts I and II of the text). After this introduction we will turn to general features of abstract ODE's existence and uniqueness of solutions, dependence of solutions on parameters, and the idea of a flow. Next we will consider linear systems. The remainder of the semester will be spent on nonlinear systems: topics that will be discussed are linearization, stability, the Poincaré-Bendixson theory and bifurcations. Prereq: MATH 224 and either MATH 201 or MATH 367.

MATH 439. Integrated Numerical and Statistical Computations (3)
This course will embed numerical methods into a Bayesian framework. The statistical framework will make it possible to integrate a priori information about the unknowns and the error in the data directly into the most efficient numerical methods. A lot of emphasis will be put on understanding the role of the priors, their encoding into fast numerical solvers, and how to translate qualitative or sample-based information—or lack thereof—into a numerical scheme. Confidence on computed results will also be discussed from a Bayesian perspective, at the light of the given data and a priori information. The course should be of interest to anyone working on signal and image processing statistics, numerical analysis and modeling. Recommended Preparation: Math 431. Offered as MATH 439 and STAT 439.

MATH 440. Computational Inverse Problems (3)
This course will introduce various computational methods for solving inverse problems under different conditions. First the classical regularization methods will be introduced, and the computational challenges which they pose, will be addressed. Following this, the statistical methods for solving inverse problems will be studied and their computer implementation discussed. We will combine the two approaches to best exploit their potentials. Applications arising from various areas of science, engineering, and medicine will be discussed throughout the course.

MATH 441. Mathematical Modeling (3)
Mathematics is a powerful language for describing real world phenomena and providing predictions that otherwise are hard or impossible to obtain. The course gives the students prerequisites for translating qualitative descriptions given in the professional non-mathematical language into the quantitative language for mathematics. While the variety in the subject matter is wide, some general principles and methodologies that a modeler can pursue are similar in many applications. The course focuses on these similarities. The course is based on representative case studies that are discussed and analyzed in the classroom, the emphasis being on general principles of developing and analyzing mathematical models. The examples will be taken from different fields of science and engineering, including life sciences, environmental sciences, biomedical engineering and physical sciences. Modeling relies increasingly on computation, so the students should have basic skills for using computers and programs like Matlab or Mathematica. Prereq: MATH 224 or MATH 228.

MATH 444. Mathematics of Data Mining and Pattern Recognition (3)
This course will give an introduction to a class of mathematical and computational methods for the solution of data mining and pattern recognition problems. By understanding the mathematical concepts behind algorithms designed for mining data and identifying patterns, students will be able to modify to make them suitable for specific applications. Particular emphasis will be given to matrix factorization techniques. The course requires that the students have a working knowledge of basic linear algebra and proficiency in a computer language. Prereq: MATH 224 or MATH 228.

MATH 445. Introduction to Partial Differential Equations (3)
This course will give an introduction to a class of mathematical and computational methods for the solution of data mining and pattern recognition problems. By understanding the mathematical concepts behind algorithms designed for mining data and identifying patterns, students will be able to modify to make them suitable for specific applications. Particular emphasis will be given to matrix factorization techniques. The course requires that the students have a working knowledge of basic linear algebra and proficiency in a computer language. Prereq: MATH 224 or MATH 228.

MATH 446. Differential Geometry (3)
Manifolds and differentiable geometry. Vector fields; Riemannian metrics; curvature; intrinsic and extrinsic geometry of surfaces and curves; structural equations of Riemannian geometry; the Gauss-Bonnet theorem. Prereq: MATH 321.

MATH 447. Differentiable Manifolds (3)
Differentiable manifolds and structures on manifolds. Tangent and cotangent bundle; vector fields; differential forms; tensor calculus; integration and Stokes' theorem. May include Hamiltonian systems and their formulation on manifolds; symplectic structures; connections and curvature; foliations and integrability. Prereq: MATH 322.
MATH 469. Calculus of Variations (3)
Examples of variational problems; variation of a functional; linear spaces; Frechet derivative; Euler-Lagrange equations; Lagrange multipliers; Hamiltonian formulation; canonical coordinates; Noether's theorem; second variation; conjugate points; direct methods. Other topics such as existence and regularity of solutions; Sobolev spaces; depending on audience.
Prereq: MATH 224 or MATH 228.

MATH 471. Advanced Engineering Mathematics (3)
Prereq: MATH 224 or MATH 228.

MATH 475. Mathematics of Imaging in Industry and Medicine (3)
The mathematics of image reconstruction; properties of radon transform, relation to Fourier transform; inversion methods, including convolution, backprojection, rho-filtered layergram, algebraic reconstruction technique (ART), and orthogonal polynomial expansions. Reconstruction from fan beam geometry, limited angle techniques used in MRI; survey of applications. Recommended preparation: PHYS 431 or MATH 471.

MATH 478. Computational Neuroscience (3)
Computer simulations and mathematical analysis of neurons and neural circuits, and the computational properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course introduces students to dynamical systems theory for the analysis of neurons and neural learning, models of brain systems, and their relationship to artificial and neural networks. Term project required. Students enrolled in MATH 478 will make arrangements with the instructor to attend additional lectures and complete additional assignments addressing mathematical topics related to the course. Recommended preparation: MATH 223 and MATH 224 or BIOL 300 and BIOL 306.
Offered as BIOL 378, COGS 378, MATH 378, BIOL 478, EMBE 478, EECG 478, MATH 478 and NEUR 478.

MATH 481. Introduction to Mathematical Methods in Finance (3)
The pricing formula for European call options. Offered as MATH 381 and MATH 481.

MATH 487. Stochastic Processes in Engineering and Sciences (3)
Prereq: MATH 322.

MATH 491. Probability I (3)
Prereq: MATH 423.

MATH 492. Probability II (3)
Prereq: MATH 491.

MATH 495. Combinatorics (3)
Prereq: MATH 307.

MATH 499. Special Topics (3)
Special topics in mathematics.

MATH 501. Topics in Algebra (3)
Selected topics from fields, rings, and modules.
Prereq: MATH 402.

MATH 527. Functional Analysis (3)

MATH 528. Analysis Seminar (1-3)
Continuing seminar on areas of current interest in analysis. Allows graduate and advanced undergraduate students to become involved in research. Topics will reflect interests and expertise of the faculty and may include functional analysis, convexity theory, and their applications. May be taken more than once for credit. Consent of department required.

MATH 535. Applied Mathematics Seminar (1-3)
Continuing seminar on areas of current interest in applied mathematics. Allows graduate and advanced undergraduate students to become involved in research. Topics will reflect interests and expertise of the faculty and may include topics in applied probability and stochastic processes, continuum mechanics, numerical analysis, mathematical physics or mathematical biology. May be taken more than once for credit.

MATH 563. Topology Seminar (1-3)
Continuing seminar on areas of current interest in topology and geometry. Topics may include: minimal submanifolds; hyperbolic geometry and diffeomorphisms of surfaces; global analysis; discrete dynamical systems; gauge theory; symplectic geometry; closed geodesics. May be taken more than once for credit.

MATH 601. Reading and Research Problems (1-18)
Presentation of individual research, discussion, and investigation of research papers in a specialized field of mathematics.

MATH 651. Thesis (M.S.) (1-18)
Prereq: Predoctoral research consent or advanced undergraduate status. Allows graduate and advanced undergraduate students to become informed and liberally educated citizens of the world. Through the acquisition of language skills and cultural awareness, our students prepare for careers that have an international dimension. To that end, we strongly encourage them to spend their junior year abroad in order to immerse themselves in a foreign culture and perfect their language skills.
skills. We also run our own study abroad programs: one German program (“The Munich Experience”); two French programs (“The Paris Experience” and “The Montreal Experience”), two Spanish programs (“The Buenos Aires Experience” and “Advanced Spanish in Spain”), and one in Italy.

We work closely with other university departments and interdisciplinary programs as well as with the cultural institutions of University Circle to provide students with a broad understanding of the many opportunities that language and culture study offer. The department has strong interdisciplinary ties with Asian Studies, French and Francophone Studies, German Studies, International Studies, Women’s and Gender Studies, and World Literature. Students also gain practical experience in different cultural and language environments through service learning in the Spanish, French, and Russian communities of Cleveland.

DEPARTMENT FACULTY
Antonio Candau, Ph.D.
(University of Massachusetts, Amherst)
Associate Professor and Chair
19th- to 21st-century Peninsular Spanish culture; Golden Age literature

Per Aage Brandt, Docteur d’Etat
(Sorbonne I, Paris)
Emile B. de Sausset Professor of Modern Languages and Literatures
Romance philology; general and romance linguistics; comparative literature; structural linguistics and structural semantics, cognitive semiotics; cognitive poetics

Christine Cano, Ph.D.
(Yale University)
Associate Professor
19th- and 20th-century French literature and culture

Denise Caterinacci, M.A.
(Kent State University)
Instructor
Italian language and culture; language pedagogy; the role of motivation in language learning

M. Gabriela Copertari, Ph.D.
(Georgetown University)
Assistant Professor
Latin American literature and film, especially Argentinian; women’s writing; the modernista novel

Margaretmary Daley, Ph.D.
(Yale University)
Associate Professor
18th- and 19th-century German literature; German women writers; women’s studies; feminist literary criticism

Gilbert Doho, Docteur d’Etat
(University of the Sorbonne Nouvelle)
Associate Professor
French drama; African Francophone theater and film; people theater and social movements; playwriting; African performing arts

Linda C. Ehrlich, Ph.D.
(University of Hawaii/East-West Center)
Associate Professor
Asian (Japanese) cinema; traditional Asian theatre; set design, landscape architecture, and film; Japanese poetry; literature and film; cinema of Spain

Takao Hagiwara, Ph.D.
(University of British Columbia)
Associate Professor
Japanese literature, especially modern prose and poetry; classical and modern Japanese literature; pre-modern Japanese sensibilities and (post) modernism

Jutta Ittner, Ph.D.
(University of Hamburg)
Associate Professor
20th-century German literature; contemporary women writers; poetry; literary translation; German culture; representation of animals in contemporary literature

Marie Lathers, Ph.D.
(Brown University)
Elizabeth M. and William C. Treuhaft Professor of Humanities
Women and the visual arts; 19th-century French literature and the arts (painting, sculpture, photography, film); gender, science, and technology; feminist theory; space studies

Yuxiu Liang, M.A.
(Cleveland State University, Case Western Reserve University)
Instructor
Chinese language and culture; social theory

Jacqueline C. Nanfio, Ph.D.
(University of California, Los Angeles)
Associate Professor
Colonial and 19th-century Latin American literature; Golden Age Hispanic literature; literary theory; Chicano literature; contemporary Latin American women writers

Cheryl Toman, Ph.D.
(University of Illinois, Urbana-Champaign)
Assistant Professor
African and Middle Eastern Francophone literature, especially Cameroon; women’s writing; immigrant communities in France

Susanne Vees-Gulani, Ph.D.
(University of Illinois, Urbana-Champaign)
Assistant Professor
20th- and 21st-century literature and literary movements; German cultural studies; science and literature; medicine and literature; trauma studies; victim discourses; literary and cultural responses to World War II; German civil defense strategies in World War II

Peter Jianhua Yang, Ph.D.
(University of Utah)
Instructor
German literature, emphasis on 20th-century German literature; German theater; technology-enhanced language teaching; teaching pedagogy; business German; theatricality

Tatiana Zilotina, Ph.D.
(University of Virginia)
Lecturer
Russian literature, especially poetry; the poetry of Marina Tsvetaeva; women writers; Russian culture

Lecturers and Adjunct Faculty
Bernadette Beroud, M.A.
(Université Jean Moulin, Lyon III)
Lecturer (French)

Yoram Daon, M.B.A.
(Keller Graduate School of Management, DeVry University)
Lecturer (Hebrew)

Mauricio Duarte, M.A.
(Arizona State University)
Lecturer (Spanish)

Elena Fernández, M.A.
(Cleveland State University)
Lecturer (Spanish)

Margaret M. Fitzgerald, M.A.
(The Ohio State University)
Lecturer (Japanese)

Ramez Islambouli, M.A.
(Case Western Reserve University)
Lecturer (Arabic)

Yoshiko Kishi, M.A.
(New York University)
Lecturer (Japanese)

Clara Lipszyc-Arroyo, M.A.
(University of Western Ontario)
Lecturer (Portuguese and Spanish)
Enno Lohmeyer, Ph.D.  
(Lecture (German))

Carolina Perera Olivares, M.A.  
(University of South Florida)  
(Lecture (Spanish))

Fabienne Pizot-Haymore, M.A.  
(Université Paul Valéry, Montpellier III)  
(Lecture (French))

UNDERGRADUATE PROGRAMS
The Department of Modern Languages and Literatures offers courses of study leading to the Bachelor of Arts in French, German, Japanese Studies, and Spanish. In addition, the department offers minors in Chinese, Hebrew, Italian, and Russian, as well as course work in Arabic and Portuguese. Except in the case of courses cross-listed with the World Literature program, all courses in modern languages and literatures are taught primarily in the target language. In addition to class meetings, work outside of class with audio materials is an integral part of all elementary and intermediate language courses taught by the department. Career opportunities exist in college and university teaching, translation and interpretation, diplomatic and other government service, business, international nonprofit agencies, and the arts, and are often enhanced by a double major.

PLACEMENT PROCEDURE
Students with prior experience in French, German, or Spanish, however gained (e.g., in high school, with or without AP courses, at another institution, via study abroad), must take a placement examination before the first week of the semester in which they enroll in one of those languages. Placement depends both on examination results and on consultation with individual faculty members. The academic policy of Case Western Reserve University is to award credit for a 101 course in any language only upon completion of 102 in that language.

Majors
FRENCH, GERMAN, JAPANESE STUDIES, AND SPANISH
Majors in French, German, Japanese Studies, and Spanish are expected: 1) to acquire the ability to understand, speak, read, and write the language(s) of their choice; and 2) to develop a sound understanding of the relevant cultures and literatures. The major in French, German, Japanese Studies, or Spanish consists of 30-32 hours of course work and will vary based on students’ background in the language. Individual counseling and placement tests are provided by the department.

COURSE REQUIREMENTS ARE AS FOLLOWS:

For students placed into the 200 level: 201-202 and eight courses at the 300 level taught in the target language, or six 300-level courses plus two related courses

For students placed into the 300-level: ten 300-level courses taught in the language, or eight 300-level courses plus two related courses

Related courses are those outside the department which are closely related to French, German, Japanese, and Spanish cultures, as well as those departmental courses cross-listed with World Literature.

Departmental Honors
The departmental honors program is for especially talented and dedicated majors. Requirements for honors in modern languages and literatures are: 1) a GPA of at least 3.5 in the major, and 2) an honors thesis (FRCH, GRMN, JAPN, or SPAN 397 and 398, beyond the 30-32 hours required for the major) devoted to the investigation of a literary, linguistic, or cultural topic. The thesis is written in the target language, except in the case of Japanese Studies, which may permit papers in English. It must be read and approved by two readers and will be accepted for honors only if it achieves a grade of B or better. Students who qualify receive their degree “with Honors in Modern Languages and Literatures.” A registration form for students electing honors is available in the departmental office.

Integrated Graduate Studies (French)
The department participates in the Integrated Graduate Studies program, which makes it possible to complete both a B.A. and an M.A. in French in about five years of full-time study. The department particularly recommends the program to qualified students who are interested in seeking admission to highly competitive professional schools or Ph.D. programs. Interested students should note the general requirements and the admission procedures listed elsewhere in this publication.

Teacher Licensure Option (French and Spanish)
A program leading to Teacher Licensure in French and Spanish (K-12) is also available. Students participating in the teacher licensure program complete a 45- to 47-semester-hour major in French or Spanish, including course work in French or Spanish language, culture, and literature, and a 35-hour sequence in professional education. Course work in French and Spanish begins in the freshman year with a language course appropriate to the student’s proficiency level and continues until the student has completed a range of upper level courses and has met the goals of the program. Students are strongly urged to complete some of their course work in a French or Spanish-speaking country and are assisted in identifying opportunities for study abroad. Interested students should contact Professors Antonio Candau (Spanish) or Christine Cano (French). The professional education component (see Teacher Licensure description elsewhere in this bulletin) begins with a sequence taken at Case Western Reserve, followed by 20 semester hours (including student teaching) at John Carroll University.

SUBJECT AREA REQUIREMENTS

*Required only for students who begin their French major at the intermediate level.
**Students at the intermediate (200) level select five courses (15 credit hours); students entering the program at the advanced (300) level select seven courses (21 credit hours).


*Required only for students who begin their Spanish major at the intermediate level.
**Students at the intermediate (200) level select five courses (15 credit hours); students entering the program at the advanced (300) level select seven courses (21 credit hours).

Minors
CHINESE, FRENCH, GERMAN, HEBREW, ITALIAN, JAPANESE STUDIES, RUSSIAN, SPANISH
Course requirements for the minors are as fol-
For students placed into the introductory level (no previous knowledge of the language): 101, 102, 201, 202, and one 300-level course

For students placed into the 200 level or higher: five courses at the 200 and 300 levels

Hebrew language courses may also count toward the minor in Judaic Studies.

**GRADUATE PROGRAMS**

The department offers the Master of Arts degree in French and, together with the Departments of English and Classics, the Master of Arts degree in world literature.

- The M.A. in French requires 27-28 semester hours. The M.A. in French with a minor concentration in German, Japanese, or Spanish requires 36 hours.
- The M.A. in world literature (French and English) requires 27 hours.

Full-time students are expected to complete the M.A. within two academic years.

**COURSE DESCRIPTIONS**

**ARAB 101. Beginning Arabic I (4)**

The course introduces learners of Arabic to the sound and writing systems of this language and provides them with basic structural and lexical knowledge to enable them to say things in Arabic, such as greeting others, thanking someone, introducing oneself, describing one’s background, seeking and providing information and so forth. The ability to perform these language functions in real-life or lifelike situations is developed by engaging the learner in structured functional activities and grammatical exercises.

**ARAB 102. Beginning Arabic II (4)**

Arabic 102 builds on the proficiency that students should have acquired in Arabic 101. The course follows a student-centered communicative approach in which class time is used in active learning through pair or group activities, role-play, games, selective listening and reading and other activities. The course emphasizes the four basic skills, reading, speaking, listening and writing. Students will be exposed to real audiovisual material in order to enhance comprehension and they will have to develop short oral and written responses about it. Aspects of culture across the Arab world will be included as a element of learning the language. Recommended preparation: ARAB 101

**ARAB 201. Intermediate Arabic I (4)**

Intensive review of grammar and conversational skills in modern Arabic through readings, discussions and other activities that explore contemporary Arabic life and culture. Recommended preparation: ARAB 102 or equivalent.

**ARAB 202. Intermediate Arabic II (4)**

ARAB 202 is a continuation of ARAB 201 and will enable the students to develop advanced communicative skills for the use of Modern Arabic. It will focus on speaking, listening, reading and writing skills, and emphasize creative use of the language. Recommended preparation: ARAB 201 or equivalent.

**ARAB 301. Advanced Arabic I (3)**

This is a higher level of Arabic study. The course objectives are to enhance the student’s language skills and to develop ability to use high-level Arabic effectively. It is designed to help students move from the intermediate level of proficiency, which centers on daily life and the immediate world, to the advanced, which broadens to include topics of general and professional interest. Recommended preparation: ARAB 202 or equivalent.

**CHIN 101. Elementary Chinese I (4)**

(Credit for CHIN 101 only upon completion of CHIN 102.) Introductory course in speaking, understanding, reading and writing Chinese. Students are expected to achieve control of the sound system and basic sentence patterns of standard Mandarin Chinese. The course emphasizes speaking and aural comprehension.

**CHIN 102. Elementary Chinese II (4)**

Continuation of CHIN 101. Recommended preparation: Consent of department.

**CHIN 201. Intermediate Chinese I (4)**

Emphasizes basic structures of standard Mandarin Chinese; helps students improve reading, writing, listening and speaking abilities. Chinese culture, society, and people introduced through supplementary materials and activities. Recommended preparation: CHIN 102 or equivalent.

**CHIN 202. Intermediate Chinese II (4)**

Continuation of CHIN 201. Students must use course material offered by the Online Language Learning Center in addition to class meetings. Recommended preparation: CHIN 201.

**CHIN 301. Advanced Chinese I (4)**

Students work to achieve fluency in listening, speaking, reading and writing. Students must attend Language Resource Center in addition to class meetings. Recommended preparation: CHIN 202 or equivalent.

**CHIN 302. Advanced Chinese II (4)**

Continuation of CHIN 301.

**CHIN 303. Topics in Chinese (3)**


**CHIN 304. Topics in Chinese (3)**


**CHIN 315. Business Chinese (3)**

The Business Chinese course is designed to enhance students’ listening, speaking, reading, and writing skills in Chinese through a variety of activities. It will focus on China’s contemporary international business issues and practices. At the end of the semester, the students will have a basic knowledge of China’s socio-cultural values, trade policy, and role in the world economy after its entry into the WTO and the ability to hold conversations on selected business topics with correct business vocabulary and in a culturally appropriate manner; to read business-related materials; and to write basic business communications including letters, reports and resumes. It is taught in Chinese and English. Offered as CHIN 315 and CHIN 415. Prereq: CHIN 202 or equivalent.

**CHIN 399. Independent Study (1-3)**

Directed study for those students who have progressed beyond available course offerings.

**CHIN 415. Business Chinese (3)**

The Business Chinese course is designed to enhance students’ listening, speaking, reading, and writing skills in Chinese through a variety of activities. It will focus on China’s contemporary international business issues and practices. At the end of the semester, the students will have a basic knowledge of China’s socio-cultural values, trade policy, and role in the world economy after its entry into the WTO and the ability to hold conversations on selected business topics with correct business vocabulary and in a culturally appropriate manner; to read business-related materials; and to write basic business communications including letters, reports and resumes. It is taught in Chinese and English. Offered as CHIN 315 and CHIN 415. Prereq: CHIN 202 or equivalent.

**FRCH 101. Elementary French I (4)**

(Credit for FRCH 101 only upon completion of FRCH 102.) Emphasizes conversational skills. Students are expected to achieve control of sound system and basic sentence structures of French. Students must use the course material offered by the On-Line Language Learning Center in addition to scheduled class meetings.

**FRCH 201. Intermediate French I (4)**

Intensive review of grammar and usage through readings, discussions and other activities that emphasize contemporary French life. Students must attend Language Resource Center in addition to scheduled class meetings. Recommended preparation: FRCH 102 or equivalent.

**FRCH 202. Intermediate French II (4)**

A continuation of FRCH 201, the course focuses...
on the acquisition of intermediate-level skills in language and culture. Participation in multi-media activities in Language Resource Center is a requirement. Recommended preparation: FRCH 201 or equivalent.

FRCH 208. The Montreal Experience (1)
One-week immersion learning experience performing community service in Montreal, Canada. Students meet several times for orientation before spending spring break in French-speaking Montreal. Community service may include volunteering in a homeless center, a hospital, or school. Application available from Department office. This course may be repeated once. Prermq or Coreq: FRCH 202 or equivalent.

FRCH 295. The Francophone World (3)
The course offers an introduction to the Francophone World from a historical, cultural, and literary perspective. The Francophone World includes countries and regions around the globe with a substantial French-speaking population (and where French is sometimes, but not always, an official language): North America (Louisiana, Quebec, and Acadia); North Africa (Tunisia, Morocco, Algeria, and Egypt); the Middle-East (Lebanon, Syria); the Caribbean (Martinique, Guadeloupe, Haiti); South-East Asia (Vietnam); and Europe (France, Belgium, Switzerland, and Luxembourg).
FRCH 295 provides a comprehensive overview of the Francophone World, while focusing on a particular area or areas in any given semester. In this particular semester we will focus on the Caribbean, the Maghreb, and select countries of Sub-Saharan Africa (Senegal, Cameroon). Our inquiry will include the study of their colonization histories, of the Independences period (broadly speaking, the 1960s), and of the post colonial era through film, literature, and readings of significant political/theoretical texts. Offered as ETHS 295, FRCH 295, and WLIT 295.

Global & Cultural Diversity

FRCH 308. The Paris Experience (3)
Three-week immersion learning experience living and studying in Paris. The focus of the course is the literature and culture of the African, Arab, and Asian communities of Paris. Students spend a minimum of fifteen hours per week visiting cultural centers and museums and interviewing authors and students about the immigrant experience. Assigned readings complement course activities. Students enrolled in FRCH 308 do course work in French. WLIT 308 students have the option of completing course work in English. Graduate students have additional course requirements than those of undergraduates.
Offered as FRCH 308, WLIT 308, FRCH 408, and WLIT 408. Prermq: FRCH 202.

Global & Cultural Diversity

FRCH 310. Advanced Composition and Reading (3)
An initiation to the literature of Francophone ex-
pression with a focus on close reading. Students engage in the discussion of authentic, unabridged literary texts of compelling interest and progressive length and learn how to express their ideas both orally and in written form. Prermq: FRCH 202 or equivalent.

FRCH 311. Advanced Conversation I (3)
Designed to enhance pronunciation, speaking and listening-comprehension through the discussion of French literature and media for children. Required for Teacher Licensure candidates. Prermq: FRCH 202 or equivalent.

FRCH 312. Advanced Conversation II (3)
A functional approach to conversation. Students work to develop fluency in spoken French using current colloquial vocabulary and focusing on current issues. Practice in using speech appropriate to a variety of situations, including public debates. Prermq: FRCH 202 or equivalent.

FRCH 314. Translation Techniques (3)
Contrastive grammar analysis and stylistics are used to foster linguistic awareness and to introduce students to the methods and skills of translation. Recommended preparation: FRCH 310. Prermq: FRCH 202.

FRCH 315. Business French (3)
Business French is an upper-level course with a focus on the economic life of France and other Francophone countries. Students gain knowledge of the economic structures and the business organization of Francophone countries as they enhance the linguistic skills used in professional communication. Prermq: FRCH 202 or equivalent.

FRCH 316. Contemporary France (3)
A study of contemporary France, this course features discussions and lectures on a variety of topics (geography, political and social life, contemporary culture) to develop factual knowledge about France and a sound understanding of current issues as presented in the media. Prermq: FRCH 202 or equivalent.

FRCH 317. French Cinema (3)

FRCH 318. The Origins of France (3)
Examination through texts, films, and other media of major historical, intellectual, and artistic influences that have shaped the evolution of French civilization. Students will attempt to identify the values and myths that have contributed to the formation of modern France and continue to influence French actions. Recommended preparation: FRCH 310. Prermq: FRCH 202.

FRCH 319. Modern France (3)
A study of France’s political, social and cultural history from the French Revolution to World War II, with emphasis on the events, movements, and people that have shaped Modern France. Highly recommended for students of Nineteenth- and Twentieth-Century French culture. Recommended preparation: FRCH 310. Prermq: FRCH 202.

FRCH 320. Introduction to French Literature (3)
Taught in French. An introduction to literary analysis through the study of important works of French literature. Written assignments are designed to develop skills in close reading, to introduce students to literary terminology in French, and to develop a capacity for clear, precise communication of an argument. Classes are discussion-based. Recommended preparation: FRCH 310. Prermq: FRCH 202 or equivalent.

SAGES Dept Seminar

FRCH 331. Seventeenth-Century French Literature (3)
The Age of Classicism, from Racine to Mme de Lafayette. Authors, works and topics may vary. Prermq: FRCH 320.

FRCH 335. Women in Developing Countries (3)
This course will feature case studies, theory, and literature of current issues concerning women in developing countries primarily of the French-speaking world. Discussion and research topics include matriarchal traditions and FGM in Africa, the Tunisian feminist movement, women, Islam, and tradition in the Middle East, women-centered power structures in India (Kerala, Pondicherry), and poverty and women in Vietnam, Laos, and Cambodia. Guest speakers and special projects are important elements of the course. Seminar-style format, taught in English, with significant disciplinary writing in English for WGST, ETHS, and some WLIT students, and writing in French for FRCH and WLIT students. Writing assignments include two shorter essays and a substantial research paper. Offered as ETHS 335, FRCH 335, WLIT 335, WGST 335, FRCH 435 and WLIT 435.

SAGES Dept Seminar

FRCH 338. The Cameroon Experience (3)
Three-week immersion learning experience living and studying in Cameroon. The focus of the course is the culture, literature, and language of Francophone Cameroon, with some emphasis on Anglophone Cameroon. Students spend a minimum of fifteen hours per week visiting cultural sites and attending arranged courses at the University of Buea. Students will prepare a research paper. Course work is in French. To do course work in English, students should enroll in WLIT 338 or ETHS 338.
Global & Cultural Diversity

FRCH 341. Eighteenth Century French Literature (3)
Topics from the Age of Enlightenment, from libertinage to revolution. Authors and works may vary. Offered as FRCH 341 and FRCH 441. Prereq or Coreq: FRCH 320.

FRCH 351. Nineteenth-Century French Literature (3)
Romanticism, realism, and naturalism in the novel and the drama. Authors, works, and topics may vary. Offered as FRCH 351 and FRCH 451. Prereq or Coreq: FRCH 320.

FRCH 361. Twentieth-Century French Literature (3)
Study of representative novelists (e.g., Proust, Gide, Colette, Sartre, Beauvoir) and playwrights (e.g., Claudel, Beckett, Genet) in historical context. Authors, works, and topics vary. Offered as FRCH 361 and FRCH 461. Prereq or Coreq: FRCH 320.

FRCH 372. Topics in French Drama (3)
A topical approach to issues and problems specific to drama. Plays, playwrights, aesthetic theories, and historical periods studied in this course may vary. Offered as FRCH 372 and FRCH 472. Prereq or Coreq: FRCH 320.

FRCH 373. The Novel and the Novella (3)
A study of narrative fiction focused on either the analysis of a particular genre (the novel, the short story) or a particular type of novel (e.g., psychological novel, realist novel, detective novel); the tale (the fantastic tale, the fairytale) or novella. Offered as FRCH 373 and FRCH 473. Prereq or Coreq: FRCH 320.

FRCH 375. Francophone Literature (3)
An examination of Francophone literature focused on the problematic of identity within the colonial and post-colonial context. Writers and works may vary. Offered as FRCH 375 and FRCH 475. Prereq or Coreq: FRCH 320. Global & Cultural Diversity

FRCH 376. Women Writers (3)
Examination of important literary texts by French and Francophone women writers. Critical essays are also studied to introduce historical and theoretical perspectives. Offered as FRCH 376 and FRCH 476. Prereq or Coreq: FRCH 320.

FRCH 377. Special Topics (3)
The special topics course is designed to provide a forum for specific themes or subjects not otherwise covered in the curriculum. Approaches and content will vary. Maximum 6 credits. Offered as FRCH 377 and FRCH 477.

FRCH 379. Independent Study (1-3)
The course is for students who have special interests and commitments that are not addressed in regular courses, and who wish to work independently. Offered as FRCH 379, WLIT 379, FRCH 389, FRCH 489, and WLIT 489. Prereq: Graduate standing.

FRCH 408. The Paris Experience (3)
Three-week immersion learning experience living and studying in Paris. The focus of the course is the literature and culture of the African, Arab, and Asian communities of Paris. Students spend a minimum of fifteen hours per week visiting cultural centers and museums and interviewing authors and students about the immigrant experience. Assigned readings complement course activities. Students enrolled in FRCH 308 do course work in French. WLIT 308 students have the option of completing course work in English. Graduate students have additional course requirements than those of undergraduates. Offered as FRCH 308, WLIT 308, FRCH 408, and WLIT 408. Prereq: Graduate standing.

FRCH 435. Women in Developing Countries (3)
This course will feature case studies, theory, and literature of current issues concerning women in developing countries primarily of the French-speaking world. Discussion and research topics include matriarchal traditions and FGM in Africa, the Tunisian feminist movement, women, Islam, and tradition in the Middle East, women-centered power structures in India (Kerala, Pondicherry), and poverty and women in Vietnam, Laos, and Cambodia. Guest speakers and special projects are important elements of the course. Seminar-style format, taught in English, with significant disciplinary writing in English for WGST, ETHS, and some WLIT students, and writing in French for FRCH and WLIT students. Writing assignments include two shorter essays and a substantial research paper. Offered as ETHS 335, FRCH 335, WLIT 335, WGST 335, FRCH 435 and WLIT 435.

FRCH 438. The Cameroon Experience (3)
Three-week immersion learning experience living and studying in Cameroon. The focus of the course is the culture, literature, and language of Francophone Cameroon, with some emphasis on Anglophone Cameroon. Students spend a minimum of fifteen hours per week visiting cultural sites and attending arranged courses at the University of Buea. Students will prepare a research paper. Course work is in French. To do course work in English, students should enroll in WLIT 338 or ETHS 338. Offered as ETHS 338, FRCH 338, WLIT 338, ETHS 438, FRCH 438, and WLIT 438.

FRCH 441. Eighteenth Century French Literature (3)
Topics from the Age of Enlightenment, from libertinage to revolution. Authors and works may vary. Offered as FRCH 341 and FRCH 441.

FRCH 451. Nineteenth-Century French Literature (3)
Romanticism, realism, and naturalism in the novel and the drama. Authors, works, and topics may vary. Offered as FRCH 351 and FRCH 451.

FRCH 461. Twentieth-Century French Literature (3)
Study of representative novelists (e.g., Proust, Gide, Colette, Sartre, Beauvoir) and playwrights (e.g., Claudel, Beckett, Genet) in historical context. Authors, works, and topics vary. Offered as FRCH 361 and FRCH 461.

FRCH 471. Topics in French Poetry (3)
Nineteenth- and twentieth-century poetry. Topics include French romanticism, symbolism, and surrealism. Prereq: Graduate standing.

FRCH 472. Topics in French Drama (3)
A topical approach to issues and problems specific to drama. Plays, playwrights, aesthetic theories, and historical periods studied in this course may vary. Offered as FRCH 372 and FRCH 472.
FRCH 473. The Novel and the Novella (3)
A study of narrative fiction focused on either the analysis of a particular genre (the novel, the short story) or a particular type of novel (e.g., psychological novel, realist novel, detective novel); the tale (the fantastic tale, the fairy tale) or novella. Offered as FRCH 373 and FRCH 473.

FRCH 474. Major Writers and Literary Movements (3)
In-depth study of the work of a major writer, filmmaker, or intellectual figure; or of a significant literary, intellectual, or artistic movement. Approaches, content, and instructor will vary. Prereq: Graduate standing.

FRCH 475. Francophone Literature (3)
An examination of Francophone literature focused on the problems of identity within the colonial and post-colonial context. Writers and works may vary. Offered as FRCH 375 and FRCH 475.

FRCH 476. Women Writers (3)
Examination of important literary texts by French and Francophone women writers. Critical essays are also studied to introduce historical and theoretical perspectives. Offered as FRCH 376 and FRCH 476.

FRCH 477. Special Topics (3)
The special topics course is designed to provide a forum for specific themes or subjects not otherwise covered in the curriculum. Approaches and content will vary. Maximum 6 credits. Offered as FRCH 377 and FRCH 477.

FRCH 495. French Literature in Translation (3)
Topics vary according to student and faculty interest. May include Francophone literature, literature and cinema, women writers, contemporary literature. Counts toward French major only as related course. No knowledge of French required. Offered as FRCH 395, WLIT 395, FRCH 495, and WLIT 495. Coreq: Graduate standing.

FRCH 500. Seminar: Topics in Modern Literature and Culture (3)
Introduction to German literature and the cultural life through seminar discussions of texts, films, and other media. Along with oral presentations and essay tests, students must select a research topic of interest to the discipline and write an analytic essay in German on the topic. Prereq: Graduate standing.

FRCH 651. Thesis M.A. (6-9)
Thesis M.A. serves the graduate plan A of the Graduate Handbook.

GRMN 101. Elementary German I (4)
(Credit for GRMN 101 only upon completion of GRMN 102.) Introductory course emphasizing conversational skills. Students achieve control of the sound system and basic sentence structures of spoken and written German. Students must use the course material offered by the Online Language Learning Center in addition to class meetings.

GRMN 102. Elementary German II (4)
Continuation of GRMN 101, emphasizing conversational skills.

GRMN 201. Intermediate German I (4)
Emphasizes both language and culture and is taught in German. Review of grammar and usage of German while studying texts and videotapes which focus on contemporary life in Germany. Prereq: GRMN 102 or equivalent.

GRMN 202. Intermediate German II (4)
Continuation of GRMN 201; conducted in German. Study of texts and videotapes which focus on contemporary life in Germany. Prereq: GRMN 201 or equivalent.

GRMN 208. The Munich Experience: Intermediate Level (3)
A semester seminar class, conducted in German, which culminates with a three-week immersion learning experience spent living and studying in Munich. Students reside with German families, study German daily in a formal setting, and practice comprehension, speaking, reading, and writing. Regular visits to museums, galleries, and cultural events; first-hand observation of history, life, and architecture of a major cultural center; day trips to cultural phenomena and events in the German countryside.

GRMN 300. German Culture & Civilization (3)
Examines aspects of contemporary Germany, including political and social systems and cultural life through seminar discussions of texts, films, and other media. Along with oral presentations and essay tests, students must select a research topic of interest to the discipline and write an analytic essay in German on the topic. Prereq: GRMN 202.

GRMN 303. German Culture & Civilization (3)
Examines aspects of contemporary Germany, including political and social systems and cultural life through seminar discussions of texts, films, and other media. Along with oral presentations and essay tests, students must select a research topic of interest to the discipline and write an analytic essay in German on the topic. Prereq: GRMN 202.

GRMN 308. The Munich Experience: Intermediate Level (3)
A semester seminar class, conducted in German, which culminates with a three-week immersion learning experience spent living and studying in Munich. Students reside with German families, study German daily in a formal setting, and practice comprehension, speaking, reading, and writing. Regular visits to museums, galleries, and cultural events; first-hand observation of history, life, and architecture of a major cultural center; day trips to cultural phenomena and events in the German countryside.

GRMN 310. Advanced German Reading and Composition (3)
An advanced-level skills course focusing on reading and writing for students who have already studied intermediate German. Develops abilities to read authentic, unabridged texts, such as contemporary newspaper and magazine articles; readings increase progressively in length and vary in genre. Also practices composition skills by composing academic prose such as objective summaries, reviews, precis, letters, short creative texts, and analytic written forms such as short essays to produce increasingly sophisticated analytical compositions in German. Includes instruction on use of English- and German-language research tools, German-German dictionaries, and study guides. Taught in German.

GRMN 311. Advanced Conversation (3)
Students work to improve fluency in spoken German. Topics include contemporary issues; current vocabulary is stressed. Students practice using speech appropriate to various situations.

GRMN 312. German Proficiency Through Drama (3)
Readings begin with single scenes and progress to full length radio plays and theater plays which gradually increase in linguistic difficulty and complexity of central themes. Introduction to the elements of drama such as dialogue, character and dramatic structure, as well as the genres of tragedy, comedy, and tragicomedy. Focus: effective communication of critical, interpretative, and analytic ideas in discussion and in writing.

GRMN 313. Intro to German Literature (3)
Introduction to German literature and the cultural issues it addresses. Readings include the main literary and folk genres (short texts or excerpts), gradually increasing in linguistic difficulty and complexity of central themes. They cover the major literary periods from the 18th to the 21st centuries. Focus: effective communication of critical, interpretative, and analytic ideas in discussion and in writing.

GRMN 315. Business German (3)
This course is taught in German. It is designed to enhance students’ German listening, speaking, reading, and writing skills through a variety of activities. It also aims at developing students’ cross-
cultural awareness and communicative competence in the specialized field of German for Business and Economics in an increasingly global workplace. The course will explore German demography and economic geography; the European Union, the Euro, and Germany’s role in this union; German economic systems, industries, banking systems, advertising and sales, transportation and tourism; Germany’s corporate culture, industrial relations, codetermination in German companies, etc.

Prereq: GRMN 202 or equivalent.

GRMN 320. Topics in Narrative (3)
This course examines representative prose works (tales, novellas, short novels, letters, and essays) chosen to present reactions and impressions to social and aesthetic conditions in German-speaking countries and to introduce students to different styles and varieties of German prose.

Prereq: One 300-level GRMN course.

GRMN 326. Witches, Weddings, and Wolves (3)
Intensive study of German Folk Tales as collected and altered by the Brothers Grimm. The Maerchen as both children’s and adult literature.

Prereq: One 300-level GRMN course.

GRMN 330. Topics in German Cinema (3)
Overview of German Cinema from the beginning to the present. Film selection representative of major directors, major periods (such as expressionism or The New German Cinema), particular themes from different historical perspectives, and literature in film. All films are in German. Taught in German.

Prereq: One 300-level GRMN course.

GRMN 340. Topics in German Drama (3)
Overview of German drama from the beginning to the present. Explores German plays by applying different disciplinary approaches such as historical, cultural, and literary analyses. All plays are in German. Taught in German.

Prereq: One 300-level GRMN course.

GRMN 350. Topics in German Lyric (3)
This course presents a detailed study of German lyric through the frequent writing of critical papers and literary analysis of the formal elements of poetry: rhyme schemes, diction, meter, figures of speech. The poems selected cover a variety of styles, a range of historical periods, and a sampling of authors. Readings and discussions in German.

Prereq: One 300-level GRMN course.

GRMN 360. Topics in Major German Authors (3)
Concentrates on a specific author or small group of authors within an aesthetic or historical context, for example: Goethe, Heine, Bachmann, Junges Deutschland, or die Gruppe 47. Examines the breadth of themes and styles and may include literary, philosophical, biographical, and other kinds of texts. Readings and discussions in German.

Prereq: One 300-level GRMN course.

GRMN 365. German Literature in Translation (3)
Goethe defined “World Literature” (Weltliteratur) as “Intellectual Trade Relations” (geistiger Handelsverkehr). This course gives students the opportunity to study German literary works in translation and thus to trade intellectual relations with a literary culture previously unknown to them. Counts toward the German major only as a related course. No knowledge of German required. Offered as GRMN 365 and WLIT 365.

GRMN 367. German Classicism/Romanticism (3)
Selected works of Goethe, Schiller, Hoelderlin, von Kleist, and others.

Prereq: One 300-level GRMN course.

GRMN 370. Topics in Literary Periods (3)
Overview of German literary periods from the beginning to the present. Explores German literary works in all three major genres from the historical, social, and literary perspectives. All works are in German. Taught in German.

Prereq: One 300-level GRMN course.

GRMN 380. Topics in Advanced German Culture Studies (3)
Exploration of the culture of the arts, political culture, and the cultural self-expression of the German-speaking countries from their beginnings to the present. Focus: The cultural changes within certain historical periods. Examination of particular aspects such as culture as mass deception in fascist Germany and the GDR, the reflection of contemporary culture in literature and cinema, problems of cultural identity and multiculturalism, and the role of postmodern culture industry and the critical discourse today. Taught in German.

Prereq: One 300-level GRMN course.

GRMN 395. Special Topics in German Literature (3)
For majors and advanced students upon presentation of a written plan of investigation. Consent of department required.

Prereq: One 300-level GRMN course.

GRMN 396. Senior Capstone - German (3)
The Senior Capstone in German is an independent research project chosen in consultation with a capstone advisor. The capstone project should reflect both the student’s interest within German and/or German studies and the courses he or she has taken to fulfill the major. The project requires independent research using and approved bibliography and plan of action. In addition to written research, the student will also present the capstone project in a public forum that agreed upon by the project advisor and the students.

Prereq: One 300-level GRMN course.

SAGES Senior Cap

GRMN 397. Honors Thesis I (3)
Intensive study of a literary, linguistic, or cultural topic with a faculty member, leading to the writing of a research paper in German. Limited to senior majors. Permit required.

Prereq: One 300-level GRMN course.

GRMN 398. Honors Thesis II (3)
Continuation of GRMN 397. Limited to senior majors. Permit required.

Prereq: GRMN 397.

GRMN 399. Independent Study in German (1-3)
For majors and advanced students under special circumstances. Permit required.

HBRW 101. Elementary Modern Hebrew I (4)
Credit for HBRW 101 will be received only upon completion of HBRW 102. The course objective is to enable students to develop basic communicative skills in standard Modern Hebrew. Students will become acquainted with the Hebrew alphabet and vowels, and with basic grammar and vocabulary.

HBRW 102. Elementary Modern Hebrew II (4)
The course objective is to continue to develop the students’ basic communicative skills in standard Modern Hebrew. Students will be introduced to more complex grammatical constructs, linguistic forms and vocabulary.

Prereq: HBRW 101 or consent of department.

HBRW 201. Intermediate Modern Hebrew I (4)
The course objective is to advance the students’ Hebrew communicative skills by studying the language in its cultural context. The focus will be on speaking, reading, and writing, with an emphasis on the use of the language as reflected in Israeli culture.

Prereq: HBRW 102 or consent of department.

HBRW 202. Intermediate Modern Hebrew II (4)
The course objectives are to enhance the students’ language skills and to develop their ability to use an advanced level of Hebrew effectively. Classes will be conducted in Hebrew, and will focus on speaking, reading, and writing with an emphasis on active and creative use of the language.

Prereq: HBRW 202 or consent of department.

HBRW 301. Advanced Modern Hebrew I (3)
The course objectives are to enhance the students’ language skills and to develop their ability to use an advanced level of Hebrew effectively. Classes will be conducted in Hebrew, and will focus on speaking, reading, and writing with an emphasis on active and creative use of the language.

Prereq: HBRW 202 or consent of department.

HBRW 302. Advanced Modern Hebrew II (3)
The course objectives are to enhance the students’ language skills within the domain of Modern Hebrew literature, and to enable them to use their
Hebrew skills to perform detailed literary analyses in Hebrew. Classes will be conducted in Hebrew. Prereq: HBRW 301 or consent of department.

HBRW 399. Independent Studies (1-3)
The course is for students with special interests and commitments that are not fully addressed in regular courses, and who wish to work independently. Prereq: HBRW 301 or consent of department.

ITAL 101. Elementary Italian I (4)
(Credit for ITAL 101 only upon completion of ITAL 102.) Introductory course; stress on mastery of the sound system and basic sentence structure of spoken and written Italian. Independent laboratory practice is a requirement.

ITAL 102. Elementary Italian II (4)
Continuation of ITAL 101; independent laboratory practice is required in addition to scheduled class meetings.
Prereq: ITAL 101.

ITAL 201. Review and Progress in Italian (4)
Emphasizes language and culture. Review of Italian grammar and usage while studying written forms. Independent laboratory practice is required in addition to scheduled class meetings.
Prereq: ITAL 102 or equivalent.

ITAL 202. Read and Discuss Italian Texts (4)
Focus on increasing proficiency acquired in elementary Italian and on mastering short narratives. Review of Italian grammar and usage through reading, conversation, and media. Independent laboratory practice is required in addition to scheduled class meetings.
Prereq: ITAL 201 or equivalent.

ITAL 308. The Italian Experience (3)
A three-week summer study abroad course spent at a university in an Italian city well-known for its cultural and linguistic heritage and at other important sites during travel. Focus: Language immersion and processing of cultural experience. Main features: 1. Intense collaboration with an Italian university. Students interact with Italian peers; seminars are co-taught by Italian faculty. 2. Creation of an individual journal that synthesizes students’ perception of and reflections on their experience, records the progress of their final project, and documents their improvement in language proficiency. 3. Final project. Students meet M-F in a formal setting for advanced language study designed to improve proficiency in speaking, comprehension, reading, and writing. They attend seminars on varied topics in literature, history, and civilization. Visits to museums, galleries, and attendance at cultural events are included.
Prereq: ITAL 202 or equivalent.

ITAL 311. Conversation in Italian (3)
Focused on oral communication, ITAL 311 is designed to enhance listening/comprehension skills in Italian. Using audio-visual materials, students acquire the skills necessary to understand conversations between native-speakers and to emulate them. The situational and functional approach to the course facilitates progress towards advanced-level fluency in Italian.
Prereq: ITAL 202 or equivalent.

ITAL 370. Special Topics in Italian Literature (3)
Special topics in Italian literature, literary criticism, and culture.
Prereq: ITAL 202 or equivalent.

ITAL 399. Independent Study (1-3)
The course is for students with special interests and commitments that are not fully addressed in regular courses, and who wish to work independently.

JAPN 101. Elementary Japanese I (4)
(Credit for JAPN 101 only upon completion of JAPN 102.) Introduction to understanding, speaking, reading, and writing Japanese. Students learn to read and write hiragana and katakana syllabaries and 50 kanji characters. Students are expected to achieve control of the sound system and basic structure of the language. Emphasizes aural comprehension and speaking.

JAPN 102. Elementary Japanese II (4)

JAPN 201. Intermediate Japanese I (4)
Further study of fundamental structures of Japanese. Students improve aural comprehension, speaking, reading, and writing abilities and learn approximately 100 new characters. Recommended preparation: JAPN 102 or equivalent.

JAPN 202. Intermediate Japanese II (4)
Continuation of JAPN 201. Students learn an additional 100 kanji characters. With the completion of JAPN 201 - 202, students should have control of the fundamentals of modern Japanese and a firm foundation in the writing system. Recommended preparation: JAPN 201 or equivalent.

JAPN 225. Japanese Popular Culture (3)
This course highlights salient aspects of modern Japanese popular culture as expressed in animation, comics and literature. The works examined include films by Hayao Miyazaki, writings by Kenji Miyazawa, Haruki Murakami and Banana Yoshimoto, among others. The course introduces students to essential aspects of modern Japanese popular culture and sensibility. Offered as JAPN 225 and WLIT 225. Global & Cultural Diversity

JAPN 245. Classical Japanese Literature in Translation (3)
Readings, in English translation, of classical Japanese poetry, essays, narratives, and drama to illustrate essential aspects of Japanese culture and sensibility before the Meiji Restoration (1868).

Lectures explore the sociohistorical contexts and the character of major literary genres; discussions focus on interpreting the central images of human value within each period. Japanese sensibilities compared to and contrasted with those of Western and other cultures.
Offered as JAPN 245 and WLIT 245.

JAPN 255. Modern Japanese Literature in Translation (3)
Focus on the major genres of modern Japanese literature, including poetry, short story, and novel (shosetsu). No knowledge of Japanese language or history is assumed. Lectures, readings, and discussions are in English. Films and slides complement course readings.
Offered as JAPN 255 and WLIT 255.

JAPN 301. Advanced Japanese I (4)
Emphasizes conversational proficiency and reading. Students must use the course material offered by the Online Language Learning Center in addition to class meetings. Recommended preparation: JAPN 202 or equivalent.

JAPN 302. Advanced Japanese II (4)
Continuation of JAPN 301; emphasizes conversational proficiency and reading. Japanese life and culture introduced through supplemental materials and activities. Students must use the course material offered by the Online Language Learning Center in addition to class meetings. Recommended preparation: JAPN 301 or equivalent.

JAPN 345. Japanese Women Writers (3)
Contributions of women writers to the literature of pre-modern and modern Japan; investigations of how their works exemplify and diverge from “mainstream” literary practices. Emphasis on the social and cultural contexts of the texts.
Offered as JAPN 345 and WLIT 345.

JAPN 350. Contemporary Japanese Texts I (3)
The primary aim of this course is to develop communication skills in Japanese based on those that the students have acquired in JAPN 302 or equivalent. The students will read and discuss various texts such as daily conversations, essays, and news scripts with the assistance of vocabulary and kanji (Chinese character) lists and formal grammar explanations. Attention also will be given to enhancing the students’ writing and aural/oral proficiencies through regularly assigned homework, presentations, tape listening, video viewing, and classroom discussion. Recommended preparation: JAPN 302 or equivalent.

JAPN 351. Contemporary Japanese Texts II (3)
This course is a continuation of JAPN 350 and its primary aim overlaps with that of JAPN 350: to develop more sophisticated communication skills in Japanese. Students will read and discuss various texts such as daily conversations, essays, and news scripts largely with the assistance of vocabulary and kanji (Chinese character) lists. Attention
The students will read and discuss various texts in the original, such as essays, news scripts, and literary works both classical and modern. Classroom instruction and discussion will be conducted in Japanese. The students also will be required to write a research paper of 6000-8000 letters/characters (15-20 genkoyoshi pages) in Japanese on a topic related to Japan and the student's specialty. Recommended preparation: JAPN 450 or equivalent.

RUSN 197. Honors Thesis I (3)
Intensive study of a literary, linguistic, or cultural topic with a faculty member, leading to the writing of a research paper in English or Japanese. Limited to seniors. Permit required.

RUSN 198. Honors Thesis II (3)
Continuation of RUSN 197. Limited to seniors. Prepr: RUSN 197.

RUSN 199. Independent Study (1-3)
Directed study for students who have progressed beyond available course offerings.

RUSN 450. Japanese in Cultural Context I (3)
The primary aim of this graduate course is to develop sophisticated communication skills (listening, speaking, reading, and writing) in Japanese. The students will read and discuss various texts in the original, such as essays, news scripts, and literary works. Classroom instruction and discussion will be conducted in Japanese. The students also will be required to write a research paper of 4000-6000 letters/characters (10-15 genkoyoshi pages) in Japanese on a topic related to Japan and the student's specialty. Recommended preparation: JAPN 351 or equivalent.

RUSN 451. Japanese in Cultural Context II (3)
This course is a continuation of JAPN 450 and it aims at a further development of sophisticated communication skills (listening, speaking, reading, and writing) in Japanese. The students will read and discuss various texts in the original, such as essays, news scripts, and literary works both classical and modern. Classroom instruction and discussion will be conducted in Japanese. The students also will be required to write a research paper of 6000-8000 letters/characters (15-20 genkoyoshi pages) in Japanese on a topic related to Japan and the student's specialty. Recommended preparation: JAPN 450 or equivalent.

RUSN 101. Elementary Russian I (4)
(Credit for RUSN 101 only upon completion of RUSN 102.) Introductory course emphasizing conversational skills. Students achieve control of alphabet, sound system, and basic structures in spoken and written Russian. Students must use the course material offered by the Online Language Learning Center in addition to class meetings.

RUSN 102. Elementary Russian II (4)

RUSN 201. Intermediate Russian (4)
Furthers students' ability in four basic language skills: understanding, speaking, reading and writing; expands knowledge of Russian grammar and vocabulary. Recommended preparation: RUSN 102.

RUSN 202. Introduction to Contemporary Civilization (4)
Continuation of RUSN 201; introduces contemporary Russian culture through readings and discussion. Recommended preparation: RUSN 201.

RUSN 311. Advanced Conversation (3)
Students work to improve fluency in spoken Russian. Topics of conversation include aspects of contemporary civilization; current vocabulary is stressed. Recommended preparation: RUSN 202.

RUSN 319. Life in Modern Russia (3)
Examines aspects of life in modern Russia, between the 1917 Revolution and the present, including political and social systems and cultural life through the study of texts, films and other media. Recommended preparation: RUSN 202.

RUSN 320. Introduction to Russian Literature (3)
Introduction to major literary movements, principal writers, and outstanding works of Russian literary works. Recommended preparation: RUSN 202 or equivalent.

RUSN 375. Russian Literature in Translation (3)
Topics vary according to student and faculty interest. May include Russian classical and modern literature, cinema, women writers, individual authors. May count towards Russian minor. No knowledge of Russian required. Offered as RUSN 375 and WLIT 375.

RUSN 399. Independent Study (1-3)

SPAN 101. Elementary Spanish I (4)
(Credit for SPAN 101 only upon completion of SPAN 102.) Introductory course, students achieve control of the sound system and basic sentence structures of spoken and written Spanish. Students must use the course material offered by the Online Language Learning Center in addition to class meetings.

SPAN 102. Elementary Spanish II (4)
Continuation of SPAN 101, emphasizing conversational skills. Recommended preparation: SPAN 101.

SPAN 201. Intermediate Spanish I (4)
Intensive review of grammar and usage through readings, discussions, and other activities. Recommended preparation: SPAN 102 or equivalent.

SPAN 202. Intermediate Spanish II (4)
Continues grammar review of SPAN 201. Students will study texts and cultural documents which focus on contemporary life in Spanish countries. Recommended preparation: SPAN 201 or equivalent.

SPAN 285. The Hispanophone World (3)
A survey of the imaginative literatures in a variety of genres from the Spanish-speaking world, including texts authored by Hispanics living in the United States. The selections will help students gain a greater understanding and appreciation of the impact and adaptation of Spanish language and culture among diverse populations of the world over the past centuries. Counts towards Spanish major as related course. No knowledge of Spanish required. Offered as SPAN 285 and WLIT 285.

SPAN 308. Advanced Spanish in Spain (3)
Three week study-abroad intensive course that takes place in Valladolid, Spain. The course combines the unique advantages of a total immersion environment in Spanish with a classroom curriculum that includes grammar review, conversational practice, and study of relevant cultural issues. The focus of the course curriculum is the study of Spain's key historical moments through the city of Valladolid and nearby communities: their literature, visual arts, films, and music. The cultural component is enhanced by visits to historic and cultural sites and museums. Four different one-hour orientation meetings during Spring semester. Prepr: SPAN 202 or equivalent.

SPAN 309. The Buenos Aires Experience (3)
Three week study-abroad intensive course that takes place in Buenos Aires, Argentina. The course combines the unique advantages of a total immersion environment in Spanish with a classroom cur-
riculum that includes grammar review, conversation practice, and study of relevant cultural issues. The focus of the culture curriculum is the study of the city of Buenos Aires' history and culture through its literature, visual arts, films, and music. The cultural component is enhanced by visits to historic and cultural sites and museums. Four different one-hour orientation meetings during Spring semester. Prereq: SPAN 202 or equivalent.

SPAN 310. Advanced Composition and Reading (3)
Designed to facilitate the transition between lower and upper division courses in Spanish, and focus upon the simultaneous development of the reading and writing skills expected of students in all advanced Spanish courses. Prereq: SPAN 202.

SPAN 311. Advanced Spanish Conversation (3)
Engages students in conversation so that they develop oral proficiency. Short essays and newspaper articles dealing with everyday activities, socio-cultural roles and experiences, and self-awareness and life goals discussed; some literary materials discussed. Prereq: SPAN 202.

SPAN 313. Spanish for Health Professionals (3)
Designed for students who are majoring in, or considering a major in, a health-related field. Focus on the vocabulary and expressions needed for the workplace, task-based practical skills, and grammatical structures. Prereq: SPAN 202 or equivalent.

SPAN 314. Practice of Translation (3)
Students learn necessary skills and techniques for solving linguistic problems in translation. Texts with a variety of contents, including articles from current press, will be translated from English into Spanish and occasionally from Spanish into English. Prereq: SPAN 202.

SPAN 315. Latin American Cultural Conflicts (3)
Evolution of Latin American socioeconomic characteristics and artistic production up to the present. Class discussions of diverse literary works, social research essays, and testimonials focus on conflicting elements in class structures, ethnicity, and urban modernization as well as family ethos, religious trends, cultural identity, and educational problems. Prereq: SPAN 202. Global & Cultural Diversity

SPAN 316. Studies in Civilization (3)
Major historical, intellectual, and artistic influences that have shaped the evolution of Spanish civilization. Prereq: SPAN 202.

SPAN 317. Contemporary Latin American Culture (3)
An intensive study of Latin American culture and civilization through the examination of its arts: literature, music, film, painting, photography, popular art. Designed to bring together the various strands of Latin American realities, emphasis is placed on the predominant view among Latin American intellectuals that artists and intellectuals have the power and the obligation to modify society. Prereq: SPAN 202.

SPAN 318. Contemporary Spanish Culture (3)
Study of several key historical moments and several key aspects in contemporary Spain: Spanish civil war, Franco’s dictatorship, and democratic Spain; rural-urban differences, industrialization and migratory movements; nationalism and terrorism; foreign immigration and tourism, the cultural renaissance and the cultural wars in Madrid and Barcelona. Feature films and literary texts will illustrate the issues under study. Prereq: SPAN 202.

SPAN 320. Introduction to Readings in Hispanic Literature (3)
Introduction to major literary movements and genres, and the works of outstanding authors of Spanish and Latin American literature through close readings and seminar-based discussions of the texts, as well as to disciplinary modes of inquiry and presentation. Requirements include active participation in seminar discussions, oral presentations, tests, and several written assignments, such as response papers, in-class writing exercises, and an analytic essay in Spanish on a research topic of interest to the discipline. Prereq: SPAN 202. SAGES Dept Seminar

SPAN 322. Latin American Short Story (3)
The history and development of the Latin American short story from the nineteenth century to the present. Intertextuality, rise of the Nuevo Cuento, and major characteristics of the works. Prereq: SPAN 320.

SPAN 326. The Fantastic in Latin American Prose (3)
Introduction to a distinctive trend in contemporary Latin American literature, the prose portrayal of the “fantastic,” a new narrative mode in Latin America. Critical examination of selected texts reveals new concepts of space and time and an increasing complexity of structure and style, one which juxtaposes and analyzes fantasy and reality. Offered as SPAN 326 and SPAN 426. Prereq: SPAN 320.

SPAN 331. Spanish Golden Age Literature (3)
Through close reading and discussion of representative texts, we will study different examples of Spanish and Latin American writing from the Middle Ages, Renaissance and Baroque periods. We will stress connections between Spain and Latin America, as well as cultural and literary topics of special relevance for contemporary Hispanic cultures. Prereq: SPAN 320.

SPAN 333. Contemporary Caribbean Literature (3)
In addition to developing a general familiarity with the literature and history of this region, students will acquire an awareness of the interrelation of national identity, memory, and language in the texts produced by contemporary Caribbean authors, and of the cultural hybridity characteristic of this production. The themes treated by these authors include colonialism and postcolonialism, cultural and religious syncretism, and sexual politics. Prereq: SPAN 320.

SPAN 336. Chicana/o Literature (3)
An introduction to Chicana/o literature written after 1945. Literary history, clarification of terminology and an examination of the cultural components of each work. Readings, discussions, and lectures in Spanish. Prereq: SPAN 320.

SPAN 339. Latin American Poetic Revolt (3)
Introduction to most important poets in contemporary Latin America, a region home to a significant number of eminent poets, including Nobel Laureates from Chile, Gabriela Mistral and Pablo Neruda. The course focuses on detailed textual analysis of pivotal works, combined with historical-literary perspective, so students gain insight into the diverse styles and tendencies that reflect the tumultuous history of poetry’s development in a relentless search for a Latin American cultural identity. Prereq: SPAN 320. Global & Cultural Diversity

SPAN 340. Contemporary Latin-American Narrative (3)
Students explore the most significant narrative techniques since 1945 in Latin American fiction: Borges, Cortazar, Garcia Marquez, Vargas Llosa, Isabel Allende. Prereq: SPAN 320.

SPAN 342. Latin American Feminist Voices (3)
Examination of the awakening of feminine and feminist consciousness in the literary production of Latin American women writers, particularly from the 1920s to the present. Close attention paid to the dominant themes of love and dependency; imagination as evasion; alienation and rebellion; sexuality and power; the search for identity and the self-preservation of subjectivity. Readings include prose, poetry, and dramatic texts of female Latin American writers contributing to the emerging of feminist ideologies and the mapping of feminist
identities. Prereq: SPAN 320. Global & Cultural Diversity

SPAN 343. The New Drama in Latin American (3)
Representative works of contemporary Latin American drama. Critical examination of selected dramatic works of twentieth-century Latin America provides students insight into the nature of drama and into the structural and stylistic strategies utilized by Latin American dramatists to create the “new theater,” one which is closely related to Latin American political history. Prereq: SPAN 320. Global & Cultural Diversity

SPAN 345. Hispanic Autobiographical Writing (3)
The course studies issues of self-representation through the reading of autobiographical works from different periods from Latin America, Spain, and the U.S., and of theoretical works that address topics of first-person narratives, autobiography, and sub-alternity. Offered as SPAN 345 and SPAN 445. Prereq: SPAN 320.

SPAN 350. Spanish Fiction (3)
Narrative masterpieces from Cervantes and the picaresque (El Lazarillo) to the short stories and novels of 19th and 20th century authors. Prereq: SPAN 320.

SPAN 351. Hispanic Turn of the Century Literature (3)
Cultural and political transitions between 19th and 20th Century, between Spain and Latin America, and between literary models. Study of Spanish and Latin American writers and their literary connections (Generation of 1898, modernistas) in the context of colonial conflicts and economic changes. Offered as SPAN 351 and SPAN 451. Prereq: SPAN 320.

SPAN 353. Transatlantic Vanguard (3)
Presentation of transatlantic tendencies of the early vanguard movements represented by poets from Spain, Central and South America. Beginning with the advent of Modernism in Latin America and Symbolism in Spain, this course will trace the development of resulting movements in the early twentieth century. Surrealism, Creationism, Futurism, Ultraism and Dadaism forged a vital link between poets and artists from the Americas and their European counterparts. We will focus on the similarities and differences between these “isms” while drawing conclusions about the uniqueness of vanguard movements on both sides of the Atlantic. Offered as SPAN 353 and SPAN 453. Prereq: SPAN 320.

SPAN 356. Afro-Hispanic Literature (3)
This course will survey the literary and cultural production of writers and artists of African descent in Latin America and the Caribbean, paying attention to both their creative and theoretical texts. Discussion of questions of race and ethnicity will allow students to explore the ways in which these texts reframe the idea of national identity and cultural belonging in the context of the nation-state, whose traditional centrality is being weakened through the effects of migration and exile. Readings include works by writers from Cuba, Puerto Rico, Dominican Republic, Costa Rica, Colombia, Panama, Ecuador, and Peru. Prereq: SPAN 320 or equivalent. Global & Cultural Diversity

SPAN 358. Latin American Cinema (3)
This course is designed to introduce students to the basic tools of film analysis as well as to the major trends and movements in Latin American cinema from the 1960s to the present. Through the analysis of representative films from Latin America, the course will examine the development of a variety of cinematic styles, paying particular attention to the historical contexts in which the films were produced and to the political, cultural, and aesthetic debates that surrounded their production. Prereq: SPAN 320 or equivalent.

SPAN 370. Special Topics in Spanish (3)
This course is designed to respond to students’ and faculty interest in specific themes or issues not otherwise covered in the curriculum. Approaches, content, and instructor will vary and this course may have a focus that crosses generic, artistic, historical, disciplinary, and geographical boundaries. The honing of analytical and interpretative skills as well as the further development of Spanish language skills also are integral objectives of this course. The class is conducted in Spanish. Prereq: SPAN 320 or equivalent.

SPAN 385. Hispanic Literature in Translation (3)
Critical analysis and appreciation of representative literary masterpieces from Spain and Latin America, and by Hispanics living in the U.S. Texts cover a variety of genres and a range of literary periods, from works by Cervantes to those of Gabriel Garcia Marquez. The course will examine the relationship between literature and other forms of artistic production, as well as the development of the Hispanic literary text within the context of historical events and cultural production of the period. Counts toward Spanish major only as related course. No knowledge of Spanish required. Offered as ETHS 385, ETHS 485, SPAN 385, SPAN 485, WLIT 385, and WLIT 485.

SPAN 396. Senior Capstone - Spanish (3)
The Senior Capstone in Spanish is an independent study project chosen in consultation with a capstone advisor. The capstone project should reflect both the student’s interest within Spanish and the courses he or she has taken to fulfill the major. The project requires independent research using an approved bibliography and plan of action. In addition to written research, the student will also present the capstone project in a public forum that is agreed upon by the project advisor and the student. Senior status required. Major in Spanish required. SAGES Senior Cap

SPAN 397. Honors Thesis I (3)
Intensive study of a literary, linguistic, or cultural topic with a faculty member, leading to the writing of a research paper in Spanish. Limited to senior majors.

SPAN 398. Honors Thesis II (3)
Continuation of SPAN 397. Limited to senior majors. Permit required. Prereq: SPAN 397.

SPAN 399. Independent Study (1-3)
The course is for students with special interests and commitments that are not fully addressed in regular courses, and who wish to work independently.

SPAN 426. The Fantastic in Latin American Prose (3)
Introduction to a distinctive trend in contemporary Latin American literature, the prose portrayal of the “fantastic,” a new narrative mode in Latin America. Critical examination of selected texts reveals new concepts of space and time and an increasing complexity of structure and style, one which juxtaposes and analyzes fantasy and reality. Offered as SPAN 326 and SPAN 426.

SPAN 445. Hispanic Autobiographical Writing (3)
The course studies issues of self-representation through the reading of autobiographical works from different periods from Latin America, Spain, and the U.S., and of theoretical works that address topics of first-person narratives, autobiography, and sub-alternity. Offered as SPAN 345 and SPAN 445.

SPAN 451. Hispanic Turn of the Century Literature (3)
Cultural and political transitions between 19th and 20th Century, between Spain and Latin America, and between literary models. Study of Spanish and Latin American writers and their literary connections (Generation of 1898, modernistas) in the context of colonial conflicts and economic changes. Offered as SPAN 351 and SPAN 451.

SPAN 453. Transatlantic Vanguard (3)
Presentation of transatlantic tendencies of the early vanguard movements represented by poets from Spain, Central and South America. Beginning with the advent of Modernism in Latin America and Symbolism in Spain, this course will trace the development of resulting movements in the early twentieth century. Surrealism, Creationism, Futurism, Ultraism and Dadaism forged a vital link between poets and artists from the Americas and their European counterparts. We will focus on the similarities and differences between these “isms” while drawing conclusions about the uniqueness of vanguard movements on both sides of the Atlantic.

Face Western Reserve University
the Cleveland Museum of Art, the Cleveland Music School Settlement, and some forty other cultural institutions.

The department offers special areas of concentration at both the undergraduate and the graduate levels. One such area is early music performance practices, where musical research in early music, instruments, and performance problems is directly applied to performance. The supporting performance organizations are the Case Western Reserve University Collegium Musicum, the Case/CIM Baroque Orchestra, and the Case Early Music Singers. Faculty, staff and visiting artists provide professional instruction and coaching. The Collegium Musicum and Case/CIM Baroque Orchestra use the Kulas Collection of Historical Instruments.

DEPARTMENT OF MUSIC

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The Department of Music provides a range of educational opportunities and professional programs that balance humanistic knowledge of music with excellence in performance. The department offers the following degree programs:

- Music (Bachelor of Arts within the context of liberal arts; see list of concentrations under "Majors" below)
- Music education (Bachelor of Science, Master of Arts, Master of Arts for Teacher Licensure, Doctor of Philosophy)
- Early music performance practices (Master of Arts, Doctor of Philosophy, Doctor of Musical Arts)
- Music history and literature (Master of Arts)
- Musicology (Doctor of Philosophy)

Since 1968, the department has participated in a Joint Music Program with the Cleveland Institute of Music (CIM), which allows undergraduate and graduate students at both institutions to pursue studies at both schools. Students thus benefit from the specialization of a professional conservatory and the resources of a major university. Both institutions share a campus setting in University Circle, one of the nation’s richest concentrations of cultural life, which is home to the Cleveland Orches-

SPAN 485. Hispanic Literature in Translation (3)
Critical analysis and appreciation of representative literary masterpieces from Spain and Latin America, and by Hispanics living in the U.S. Texts cover a variety of genres and a range of literary periods, from works by Cervantes to those of Gabriel García Márquez. The course will examine the relationship between literature and other forms of artistic production, as well as the development of the Hispanic literary text within the context of historical events and cultural production of the period. Counts toward Spanish major only as related course. No knowledge of Spanish required. 
Offered as ETHS 385, ETHS 485, SPAN 385, SPAN 485, WLIT 385, and WLIT 485. Prereq: Graduate standing.

DEPARTMENT FACULTY

Mary E. Davis, Ph.D.
(Harvard University)
Associate Professor and Chair
20th-century music; music and fashion; popular music

William I. Bauer, Ph.D.
(Kent State University)
Associate Professor; Director, Music Education
Music teacher education; research; technology

L. Peter Bennett, D Phil
(Oxford University)
Assistant Professor
17th-century French music; early music performance

Francesca Brittan, Ph.D.
(Cornell University)
Assistant Professor
19th-century France; Romantic aesthetics; popular music

Gary M. Ciepluch, Ph.D.
(University of Wisconsin, Madison)
Associate Professor
Director of bands; conducting; music teacher education

Georgia J. Cowart, Ph.D.
(Rutgers University)
Professor
17th and 18th centuries; music, the arts, and politics

Ross W. Duffin, D.M.A.
(Stanford University)
Fynette H. Kulas Professor
Early music performance practices; Shakespeare

Daniel Goldmark, Ph.D.
(UCLA)
Associate Professor
American popular music; film music; history of the music industry

Stephen E. Heffing, Ph.D.
(Yale University)
Professor
Mahler; 18th and 19th centuries; chamber music; analysis

Kathleen A. Horvath, Ph.D.
(Ohio State University)
Associate Professor
Music teacher education; string education and pedagogy

Lisa L. Koops, Ph.D.
(Michigan State University)
Assistant Professor
Music teacher education; general music

David J. Rothenberg, Ph.D.
(Yale University)
Assistant Professor
Medieval; Renaissance; musical symbolism

Full-time Lecturers

Julie Andrijeski, D.M.A.
(Case Western Reserve University)
Jazz ensembles; jazz history; performance practice

Paul Ferguson, M.M.
(Eastman School of Music)
Jazz ensembles; jazz history; orchestration

Juanita Karpf, D.M.A.
(University of Georgia)
Music history; admissions and undergraduate advising

Adjunct Instructor

Bruce Egge
(Northwestern University)
Audio recording

Cleveland Institute of Music Academic Faculty
See: www.cim.edu/colFaculty.php

UNDERGRADUATE PROGRAMS

Majors

Students who wish to major in music must pass a performance audition on an acceptable instrument or in voice and take a music theory placement test. Arrangements for this audition and test must be made directly with the department. Once admitted as a music
major, a student is required to participate in one or more of the university’s musical organizations each semester and to attend recital class. Performance juries and other requirements are detailed in the Undergraduate Music Handbook.

Double Major and Dual-Degree Opportunities. The department encourages qualified students to consider a double or dual major in music and another subject. More than one half of music majors at Case Western Reserve pursue a double major. Typical combinations include the Bachelor of Arts in music with theater, English, classics, psychology, sociology, or the natural sciences. Once the Arts and Sciences SAGES requirements (39 hours) have been met, a B.A. student can add another major by meeting the course and hour requirements found in this bulletin under the appropriate department. In most cases, it is possible to finish a double major with music in four years.

It is also possible to receive two degrees, although this usually takes five years. Typical combinations of dual degrees include the Bachelor of Arts in music with the Bachelor of Science in engineering, or the Bachelor of Science in music education with the Bachelor of Music degree from the Cleveland Institute of Music. All admissions requirements must be met for each school, and course and hour requirements for each degree must be fulfilled. Students interested in dual degrees should declare their intent as early as possible and receive advice from faculty about both degrees.

BACHELOR OF ARTS IN MUSIC

The Bachelor of Arts degree in music stresses a humanistic orientation and situates music study in the context of the liberal arts.

Approximately one half of the total 120 semester credit hours necessary for the degree are devoted to music study, with the remaining credits devoted to the SAGES requirements (39 hours), a possible minor program, and a liberal selection of elective courses. The specific program of study differs from student to student.

The department offers several concentrations within the music portion of the degree: music history, music theory, early music performance practices, performance, general musicianship, and audio recording technology. The general musicianship concentration is particularly suitable for students interested in music as part of a double major or dual degree.

Core courses for the Bachelor of Arts in music are as follows:

1. Music theory: MUTH 107, 108, 207, 208 (or 101/105, 102/106, 201/205, 202/206), and 320 (19 hours)
2. Music history and literature: MUHI 301, 302, and 303 (9 hours)
3. Performance instruction: MUAP (applied music) for a minimum of 10 semester hours
4. Additional requirements:
   - Participation in assigned musical ensemble every semester of major (6 semesters for audio concentration)
   - Participation in additional musical ensemble for one year (audio concentration excepted)
   - Recital class attendance and performance every year of principal MUAP study
   - Two semesters of eurhythmics (fulfills physical education requirement)

Additional course requirements for each concentration are as follows:

MUSIC HISTORY
1. Additional applied music study at the 200 level (2)
2. Three electives from music history or literature courses at the 300 level or above (9
3. Foreign language (6-8)

MUSIC THEORY
1. Additional applied music study at the 200 level (2)
2. MUTH 311, 312, Counterpoint I and II (4)
3. One elective from music history or literature courses at the 300 level or above (3)

EARLY MUSIC PERFORMANCE PRACTICES
1. Additional applied music study at the 200 level (2)
2. MUHI 341, Introduction to Early Music Performance Practices (3)
3. MUHI 342, Seminar in Early Music Performance Practices (3)
4. One elective from music history or literature courses at the 300 level or above (3)
5. Foreign language (6-8)

PERFORMANCE
1. Additional applied music study at the 300 and 400 levels (6)
2. One elective from music history or literature courses at the 300 level or above (3)
3. Foreign language (6-8)

GENERAL MUSICIANSHIP
1. One elective from music history or literature courses at the 300 level or above (3)

AUDIO RECORDING TECHNOLOGY
1. MUAR 151B, 152B, 153B, 154B, Case Audio Internship I, II, III, IV (1,1,1,1)
2. MUAR 251B, 252B, 253B, 254B, Case Audio Recording Internship I, II, III, IV (0,0,0,0)
3. MUAR 200, 201, Audio Recording I and II (2,2)
4. MUAR 300, 301, Advanced Recording Techniques I and II (2,2)
5. MUAR 302, 303, Multi-track Recording Techniques I and II (2,2)
6. MUAR 310, 311, Recording Studio Maintenance I and II (1,1)
7. MUAR 380, Junior Audio Recording Thesis (3)
8. MUAR 390, Senior Audio Recording Thesis (6)
9. MUAR 320, 321, Acoustics of Music I and II (1,1)
10. MUAR 385, Recording Studio Internship (Commercial) (4)
11. MUAR 322, 323, Recording Workshop I and II (1,1)

A minor in electronics is available from the Department of Electrical Engineering and Computer Science in the Case School of Engineering. A five-year, dual-degree program is also available in which the student earns a B.A. in music/audio and a B.S. in an elective field of engineering.

BACHELOR OF SCIENCE IN MUSIC EDUCATION

The mission of the Music Education program is to prepare proactive scholar-practitioners who will develop into leaders, teachers, and talented musicians in the field of music education. The nationally recognized program faculty specialize in research in music education, music technology, string pedagogy, and wind conducting and repertoire. The faculty are ac-
tive in their respective professional organizations and as clinicians, conductors, lecturers, and authors.

The Bachelor of Science degree in music education requires a total of 122 credits and is designed to educate professional teachers of music education for public and private schools. The program meets the requirements of the Ohio Department of Education to prepare students to take the state-mandated teacher exam (Praxis II) and apply for teaching licensure. Most states recognize the Ohio teaching license through reciprocity.

Music education students benefit from a wide range of instrumental, vocal, and general classroom methods courses. As an additional part of the program, students benefit from plentiful “hands-on” experiences by teaching sample lessons and conducting rehearsals in actual teaching situations.

Requirements for the Bachelor of Science in music education are as follows:

A. Core courses (51 hours):
1. Music theory/musicianship; eurhythmics (19)
   MUTH 107 (4) or (101/105)
   MUTH 108 (4) or (102/106)
   MUTH 207 (4) or (201/205)
   MUTH 208 (4) or (202/206)
   MUTH 320 (3)
   MUDE 101 [Fulfills SAGES Phys Ed requirement]
   MUDE 102 [Fulfills SAGES Phys Ed requirement]
2. Music history/literature (9 hours)
   MUHI 302 [Fulfills SAGES Arts and Humanities requirement]
   MUHI 303 [Fulfills SAGES Arts and Humanities requirement]
   MUED 305 [Fulfills SAGES Global and Cultural Diversity requirement]
3. Applied music lessons (14 hours, every semester except student teaching)
   MUAP 121 (2), 122 (2), 221 (2), 222 (2), 321 (2), 322 (2), 421 (2)
4. Recital Class (MUAP 011 - 0 hours - every semester except student teaching)
5. Ensembles (MUEN - 9 Hours)
   • Required Home Ensemble* (7 hours, required every semester except student teaching)
   • Added ensemble (2 hours, one full year) (keyboard students may sign up for 386 as their added ensemble)
      (Voice students must also sign up for MURP 387, Voice Rep Seminar, but it does not count as an added ensemble)
   *Home Ensembles:
      • Strings: Case University Circle Orchestra (MUEN 385) or Case Camerata Chamber Orchestra (MUEN 386)
      • Winds/Percussion: Symphonic Winds (MUEN 383)
      • Piano: Keyboard Seminar (MURP 386)
      • Voice: Case Concert Choir (MUEN 382) or University Singers (MUEN 387); in some cases Early Music Singers (MUEN 396)
      • Guitar: Guitar Ensemble (MUEN 355)

B. Music Education Sequence (40 hours):
1. Methods (15 hours)
   MUED 240 (3)
   MUED 320 (3)
   MUED 350 (3)
   MUED 355 (3) [Fulfills SAGES Departmental Seminar requirement]
   MUED 352 (3) or MUED 353 (3)
2. Conducting and arranging (7 hours)
   MUED 275 (2), MUED 276 (2), MUED 310 (3)
3. Secondary instrument classes (6 hours required)
   MUED 200A Basic Skills & Pedagogy: Voice (1)
   MUED 200B Basic Skills & Pedagogy: Guitar (1)
   MUED 200C Basic Skills & Pedagogy: Upper Brass (1)
   MUED 200D Basic Skills & Pedagogy: Low Brass (1)
   MUED 200E Basic Skills & Pedagogy: Clarinet & Saxophone (1)
   MUED 200F Basic Skills & Pedagogy: Double Reeds & Flute (1)
   MUED 200G Basic Skills & Pedagogy: Violin (1)
   MUED 200H Basic Skills & Pedagogy: Strings (1)
   MUED 200P Basic Skills & Pedagogy: Percussion (1)

C. Professional Education Courses (9 hours):
   • MUED 352

D. Student Teaching (12 hours)
   MUED 396A (9), MUED 396B (3) [Fulfills SAGES Senior Capstone]

E. Professional Education Courses (9 hours):
   • EDUC 301 (3)
   • EDUC 304 [Fulfills SAGES Social Sciences requirement; PSCL 101 is a prerequisite (3)]
   • EDCC 255 (3)

SAGES Requirements (22 hours in addition to those major courses that fulfill SAGES requirements)

Admission and Retention in Music Education

There are four decision points in the Music Education program. For each of the decision
points, there are three possible outcomes: unconditional admission; conditional admission with a prescribed remedial plan which when successfully completed will result in unconditional admission; or denial of admission. Denial of admission at any decision point means the student is no longer able to pursue a music education degree at Case Western Reserve.

DEcision Point 1: Application for Admission to the Program
Official admission to the Music Education program generally occurs at the end of the freshman year. Admission to the program requires: (1) being accepted to Case Western Reserve; (2) being accepted as a music major through an audition process before matriculation; (3) successful completion of MUED 240, Foundations of Music Education, including evaluation of an initial Teaching ePortfolio; (4) a cumulative Case Western Reserve GPA of 2.5 or better; (5) submission of a signed Statement of Assurance of Good Moral Character, and (6) a satisfactory interview with music education faculty, documented on the Teacher Licensure Admission Assessment Form.

DEcision Point 2: Application for Advanced Standing
Application for Advanced Standing should be submitted by week 10 of the second semester after Decision Point 1 (usually the spring of the sophomore year). Application for Advanced Standing requires: (1) a successful review of the updated Teaching ePortfolio; (2) submission of a current Academic Requirements report documenting the following: a cumulative GPA of 2.5 or better, a music GPA of 2.5 or better, and an education GPA of 3.0 or better; (3) a passing score on the Candidate Disposition Assessment Inventory completed by the music education faculty; (4) an audition process before matriculation; (5) successful completion of MUED 240, Foundations of Music Education, including evaluation of an initial Teaching ePortfolio; (6) a cumulative GPA of 2.5 or better; (7) submission of a signed Statement of Assurance of Good Moral Character, and (8) a satisfactory interview with music education faculty, documented on the Teacher Licensure Admission Assessment Form.

DEcision Point 3: Application for Student Teaching
Application for Student Teaching should be completed by Week 4 of the semester prior to student teaching. The application requires: (1) a successful review of the updated Teaching ePortfolio; (2) submission of a current Academic Requirements report documenting the following: a cumulative GPA of 2.5 or better, a music GPA of 2.5 or better, and an education GPA of 3.0 or better; (3) a passing score on the Candidate Disposition Assessment Inventory completed by the music education faculty; (4) passing a TB test; (5) presenting documentation of Hepatitis B vaccination; and (6) passing an official criminal background check.

DEcision Point 4: Application for Initial Licensure
Application for Initial Licensure occurs after successful completion of all degree requirements. Application for Initial Licensure must be submitted by week 10 of the second semester after Decision Point 1 (usually the spring of the sophomore year). Application for Initial Licensure requires: (1) a successful review of the updated Teaching ePortfolio; (2) submission of a current Academic Requirements report documenting the following: a cumulative GPA of 2.5 or better, a music GPA of 2.5 or better, and an education GPA of 3.0 or better; (3) a passing score on the Candidate Disposition Assessment Inventory completed by the music education faculty; (4) achievement of state-mandated scores on the two Praxis II national teacher exams; (5) completion of the Case Student Teaching Final Assessment by the cooperating teacher and university supervisor with a grade of B or better (MUED 396A and 396B; 496A and 496B for master’s students seeking licensure); and (6) completion of the Case Teacher Licensure Exit Interview and Survey.
After successfully completing all requirements at the four decision points, the student is recommended by the university’s director of teacher education for the Ohio Provisional Music (Pre-K-12) License to teach music in the public schools in Ohio and more than 40 reciprocating states.
Completion of the Bachelor of Science degree exists separately from the assurance that the State of Ohio music teacher license will be awarded. Additional information is available from the Teacher Licensure program.

Departmental Honors
Departmental honors programs for the Bachelor of Arts and Bachelor of Science degrees have the following admission and completion requirements:
For all students, admission to honors status requires an overall GPA of at least 3.2, a music GPA of at least 3.5, evidence of exceptional musicianship and scholarly interests, petition to the music faculty, nomination by a faculty member, and acceptance by the music faculty. The honors project must first be approved by the faculty project advisor, with the specific project timeline to be determined in consultation with the advisor. The student must submit a proposal to the faculty before the project start date, typically by the midpoint of the spring semester preceding the senior year.
For B.A. students, second-semester sophomore or junior standing is required for admission to honors status. The honors project should then be completed as part of the SAGES Capstone Seminar. For B.S. students, admission to honors status requires advanced standing in music education. The student must register for independent study or an approved seminar during the project period, and the honors project may not be pursued or completed during student teaching.

Minor
A minor in music requires a minimum of 15 credit hours, usually 6 in music theory (generally MUTH 103, 104), 6 in music history (either MUGN 201 and MUGN 202, or MUHI 301 and MUHI 302), and at least 3 additional hours of credit, which may be in applied music or ensembles (MUAP, MUEN). A minor in music education may be devised in consultation with a music education advisor. CIM students may pursue a minor in music history by taking 15 hours of MUHI courses. The department welcomes students’ initiative in the development of minor programs suited to their needs.

Electives for Non-Music Majors
Electives designed for students not majoring in music are MUTH 103, 104, and MUGN 201, 202, and 215. MUGN 308 is designed for music majors but is open to non-music majors with the permission of the instructor. Non-music majors may also audition for admission to music ensembles (MUEN). Individual instruction (MUAP) in keyboard, voice, and orchestral instruments is available with consent of the department. See further information below under Applied Music.

GRADUATE PROGRAMS
The following graduate degree programs, administered by the university, are offered as part of the Joint Music Program with The Cleveland Institute of Music. General descriptions are given here; complete information on all degrees is available from the department. Admission to each degree follows established guidelines of the School of Graduate Studies. Scores from the Graduate Record Examination are required for admission to programs in music history, musicology, and early music performance practices, and an audition is necessary for students interested in the early music performance practices program.

Master of Arts Degree
The Master of Arts degree is offered in the
fields of (1) music history and literature, and
(2) music education. Within music history and literature, students may choose concen-
trations in music history and literature or in early music performance practices. Master’s
degree candidates in music education may also choose to add course work that will qual-
ify them to take teaching licensure exams for the State of Ohio.

MASTER OF ARTS IN MUSIC HISTORY AND LITERATURE

The concentration in music history and litera-
ture emphasizes research, history, literature, and
the theory of music. Within the 30 hours
required, the following are minimum require-
ments: music history (9 hours); research (6-9
hours); theory-analysis (6 hours); electives
(6-9 hours).

The concentration in early music performance practices presupposes the same strong liberal
arts training as the music history and litera-
ture concentration, plus a strong performance interest and background. Research and its ap-
lication to music performance are stressed.

Within the 27 hours required, the following are minimum requirements: bibliography
and research (3 hours); performance practice (6 hours); notation theory (6 hours); lecture-
tical and document (6 hours).

In both concentrations, remaining hours are
freely elected in music history and research
with advisor’s approval. For students pursu-
ing the degree in early music performance practices, however, at least two semesters of
applied music (0 credits) are required, in addi-
tion to the 6 hours of lecture-rectical and doc-
ument (MUAP 651), near the completion of
the degree program. Ensemble participation is also required for performance practices stu-
dents but does not earn credit hours toward
the degree.

Examinations include initial placement tests
in history and theory, and a reading test in
a foreign language pertinent to the student’s field. In addition, performance practices stu-
dents must audition as part of the admissions
process. At least 18 credit hours must be at the
400 level or higher.

FAST TRACK M.A./PH.D. PROGRAM

Students in the M.A. in music history and litera-
ture program are eligible for a fast track
option to the Ph.D. in historical musicology.
To qualify for this option, students must com-
plete 36 hours in the M.A. program and are
advised to pursue the thesis option. By the
end of the third semester of study (prior to the
completion of the 36 hours), the student must
inform the director of graduate studies of his/
her desire to enter the Ph.D. program, and, in
consultation with the director, must present a
petition to the musicology faculty for candi-
dacy. Once faculty consent is secured, all re-
mainning requirements of the degree program,
as detailed above, remain the same.

MASTER OF ARTS IN MUSIC EDUCATION

This degree is built on a set of foundation
courses in philosophy, curriculum, psychol-
ogy, research, evaluation, and musicianship.

Additional courses and independent studies
enable students to tailor programs to their in-
terests and needs.

Three degree options are available. Students
who choose Plan A (thesis option) write a the-

sis based on original research and defend the
thesis in an oral examination. Students who
choose Plan B (comprehensive exam option)
complete a comprehensive examination in
music education. Applicants for Plans A or B
should have a bachelor’s degree in music educa-
ation, an undergraduate GPA of 3.0 or better,
and at least one year of successful music teach-
ing experience, usually in the public schools.

Students seeking teacher licensure credentials
pursue Plan C (M.A. for Licensure, or MAL).

The program includes a core of graduate mu-
sic education courses, graduate music courses,
undergraduate music education methods
courses, and one semester of student teaching.

Applicants for MAL should have a bachelor’s
degree in music (B.A. or B.M.), an under-
graduate GPA of 3.0 or better, and some prior
experience in working with children. The
regulations for students in the B.S. program
regarding advanced standing, grade point av-
erages, and the Praxis II exam apply to gradu-
ate students in Plan C as well. Completion of
the Plan C degree exists separately from the
assurance that the State of Ohio music teacher
license will be awarded.

Foundation courses for Plan A and Plan B in-
clude a music education core of philosophy,
curriculum, and research (12 hours); a music
core of history, theory, and applied music (9-
12 hours); and electives (0-9 hours). Students
in Plan A receive 6 credit hours for thesis re-
search. Students in Plan B complete a compre-
hensive written examination at the conclusion
of course work, whereas students in Plan C
complete a comprehensive oral examination.

A minimum of 30 credit hours is required for

Plans A and B. Plan C requires a minimum of
65 hours, including a music education li-
censure core (35 hours), a teacher licensure
professional education core (9 hours), a gradu-
ate music education core (12 hours), and a
graduate music core (9 hours). To remain in
Plan C’s MAL program, students must meet
GPA and professional standards each year.

For more information, contact the director of
music education.

Doctor of Philosophy Degree

The Doctor of Philosophy degree is offered
in two fields: (1) musicology (with concentra-
tions in music history and early music perfor-
mance practices), and (2) music education.

Doctor of Philosophy in Musicology

The Ph.D. in historical musicology is granted
in recognition of superior scholarly ability and
attainment. Award of the degree is based not
only on computation of time or enumeration of
courses, but also upon distinguished work.

Highly qualified applicants may enter this pro-
gram directly upon completion of a bachelor’s
degree. All programs of study are formulated
to suit the individual needs of the student and
require the consent of the advisor.

Music History Concentration. The Ph.D.
requires 36 credit hours of course work and an
additional 18 hours of dissertation research
credit hours. Required course work includes
MUHI 610 (Bibliography) and MUTH 424
(Schenkerian Analysis) as well as three doc-
toral seminars. In the first two years, students
will be expected to take three courses (or 9
credits) per semester, for a total of 36 hours.

Students admitted to the program will take
diagnostic examinations prior to the start of
classes in their first year. Based on these ex-
aminations, students may be required to enroll in
specific courses to address deficiencies; these
course credits may be applied toward the de-
gree requirements. At the end of the first year
of study, the musicology faculty will conduct
a formal review with each student. This pro-
cess will include an evaluation of progress to
date and advisement regarding the remainder
of the program.

A written summary of this review, along with
course grades and materials, will constitute
the beginnings of the portfolio maintained
by the director of graduate studies that will
be the basis for considering each student’s ad-
vancement into the Ph.D. program.

At the end of the second year of course work,
Examinations include initial placement tests, which will be added to the portfolio. At the beginning of the fall in the third year of study, students will take comprehensive examinations, which will also function as qualifying exams for advancement to the Ph.D. program. These examinations will consist of written and oral sections, and will be conducted and evaluated by the musicology faculty. Following the examinations, the faculty will review each student’s portfolio and, based on work contained therein, make a decision regarding advancement to candidacy in the Ph.D. program. Students who do not advance but who have done satisfactory work will be eligible to receive the M.A. in music history at this juncture.

Students who advance to candidacy for the Ph.D. will register for dissertation research credits and begin research for the dissertation. Working with a faculty advisor, each student will develop a proposal for the dissertation, which will be presented in writing to the faculty no later than the end of the third year of study. It is expected that the fourth and possibly fifth year of study will be devoted to work on the dissertation. Upon completion of the thesis, each student will present a formal defense to the musicology faculty.

Under the rules of the School of Graduate Studies, a student must complete the thesis no later than five years after registering for the first dissertation research (701) credits.

Early Music Performance Practices Concentration. The Ph.D. in historical musicology with a concentration in early music performance practices requires a minimum of 36 hours of course work, seminars, and tutorials, and an additional 18 hours of dissertation research credit hours. Course distribution is as follows: bibliography and research (3 hours); performance practices (9 hours); notation-theory (9 hours); doctoral seminars (6 hours); lecture-recital (MUAP 751) (3 hours). Remaining hours are freely elected in music history and research with the advisor’s approval. At least three semesters of applied music (0 credits) are required. Ensemble participation is also required for performance practices students but does not earn credit hours toward the degree.

For other musicology students, private lessons at the 400 level, although not required, may be counted up to a maximum of six credits, at the discretion of the advisor.

Examinations include initial placement tests in history and theory; reading tests in two foreign languages pertinent to the student’s field; and comprehensive examinations in history and theory, including written and oral sections, prior to admission to candidacy. Upon completion of the dissertation, an oral defense is held. In addition, performance practices students must audition as part of the admissions process. The candidate must teach a college-level course in music history and literature (or early music performance practices) under the supervision of a faculty member, or have had the equivalent experience before the dissertation is completed.

Doctor of Philosophy in Music Education

The doctorate in music education is offered to persons who have shown a strong and continuing dedication to music teaching and scholarship. Applicants must have completed at least three years of full-time music teaching, usually in the public schools. The degree is designed to prepare professionals to assume leadership in elementary, secondary, and collegiate instruction. Prior to graduation, doctoral students demonstrate competence in teaching, research, and musicianship. Every effort will be made to plan a program based on individual student needs and interests while maintaining standards of musical and scholarly excellence. Electives, therefore, will be chosen in consultation with a faculty advisor in order to ensure a balance between individual interests and traditional graduate expectations. To remain in the program, students must meet GPA and professional standards each year. For more information, contact the director of music education.

A total of 60 credit hours is required for the doctoral degree beyond the master’s level. Courses include:

1. Music education: research, philosophy, cognition/psychology, curriculum, and assessment (15 hours)
2. Music: theory, history, applied music (9-12 hours)
3. Outside cognate (6 hours)
4. Music education electives (9-12 hours)
5. Dissertation (18 hours)

A comprehensive examination follows the completion of course work, prior to beginning research for the dissertation. Upon completion of the dissertation, an oral defense is held. The dissertation topic is chosen by the student in consultation with the faculty.

Doctor of Musical Arts in Early Music

This doctorate is granted in recognition of outstanding performing ability in early music combined with superior scholarly ability in the field of early music performance practices. All programs are formulated to suit the needs of the individual student and require the consent of a faculty advisor.

A minimum of 36 hours of course work, seminars, and tutorials is required. Distribution is as follows: bibliography and research (3 hours); performance practices (6-9 hours); notation-theory (9 hours); doctoral seminars (3-6 hours); first two lecture-recitals and documents (MUAP 751, 752) (6 hours). Remaining hours are freely elected in music history and research with advisor’s approval. In addition, the final lecture-recital and document (MUAP 753) must be taken for 6 hours, as well as applied music for zero credit every semester the student is on campus. Ensemble participation is required but does not earn credit hours toward the degree.

Examinations include a performance audition; initial placement tests in history and theory; reading tests in two foreign languages pertinent to the student’s field; and a comprehensive examination with history, theory, performance practices, and oral sections. Exceptional students may be admitted to a combined M.A./D.M.A. degree program in early music.

FACILITIES

Harkness Chapel

Harkness Chapel, built in 1902, features neo-Gothic architecture, antique oak and Georgia pine woodwork, and Tiffany windows. It is a warm, intimate, and acoustically resonant space for the performance of vocal and instrumental chamber music. The building provides space for concerts, music classes, and departmental recitals, and is the home of the department’s early music concert series.

Kulas Music Library

Kulas Music Library is a satellite library of Kelvin Smith Library, the university’s main library. It contains more than 45,000 items, including music scores, books on music, sound recordings, video recordings, microforms, and music periodicals. The library also contains a listening room for the use of the sound recording and video collections. Music majors at the university also have access to the Robinson Music Library of the Cleveland Institute of Music. The Case Western Reserve University Kulas Music Li-
library and the CIM Robinson Music Library coordinate acquisitions and services, and their collections reflect institutional strengths as well as support the CWRU-CIM Joint Music Program.

Center for Music and Technology

The Department of Music’s Center for Music and Technology houses ten Macintosh computers and is classified as a level II Technology-Enhanced Classroom. By supporting the most current music notation software, the center provides a resource for the production of professional typeset-quality scores and papers by faculty and students. The center also works closely with faculty in providing support facilities for the department’s technology-related courses. For example, students enrolled in Computers and Music (MUGN 308) use the center to explore computerized notation, music sequencing, film scoring, and internet multimedia creation, while students enrolled in Technology Assisted Teaching and Learning (MUED 3/420) discuss and experience new ways to incorporate technology into their K-12 music classrooms. While it is designed to meet music-specific needs, the center supports an array of non-musical software, including word processing, graphic and web design, and video editing. It also provides state-of-the-art video and audio recording equipment and a professional video editing workstation.

Kulas Collection of Early Instruments

The department maintains an impressive collection of modern reproductions of early instruments. The instruments are used by the Collegium Musicum, the Case/CIM Baroque Orchestra, and the department’s program in early music performance practices. The collection includes medieval, Renaissance, and baroque strings, as well as brass, woodwinds, and keyboards.

Music Education Resource Center

The department provides a resource center for music education students to prepare educational materials and research projects. The center contains a variety of audiovisual media, including a library of education-oriented music software. Students may borrow items from a large collection of music textbooks, educational recordings, testing materials, vocal and instrumental books, curriculum guides, and classroom instruments.

The Music Education and Technology Software Registry (MET) is a collection of instructional software packages designed for all ages of learners and for a wide range of musical tasks. Both Macintosh and PC workstations are available to all music education students and area music teachers so they can use and evaluate most of the music software that is commercially marketed today. Use of the MET is encouraged, and sometimes required, for many of the projects and assignments in courses throughout the music education curriculum.

APPLIED MUSIC

Private Instruction

The Department of Music offers private instruction on the usual orchestral instruments, piano, and voice, as well as on Renaissance and baroque instruments. Students have the opportunity to study with outstanding teachers, most of whom are faculty at the Cleveland Institute of Music. Music majors should consult with their advisors before registering for lessons. Non-major students interested in private instruction should visit the department office (Haydn 201) to begin the lesson registration process and learn further details.

Private lessons carrying credit are available to all university students. Permission for study, level of study, and amount of credit are determined by the faculty of the Department of Music in consultation with the Cleveland Institute of Music. Charges for private lessons are covered by the university tuition rate for undergraduate music and music education majors only; all other students pay an additional fee. The amount of the fee depends on the faculty involved and the length of the lessons. For fee schedule, contact the Cleveland Institute of Music. Students normally earn 1 or 2 semester hours of credit for private instruction based on either half-hour or hour lessons.

All Master of Arts and Doctor of Philosophy degree students in the department must satisfy the applied music requirements specified in their degree programs. Undergraduate students who anticipate private lesson instruction in their programs should consult an advisor before registration. Students register for individual applied music instruction in courses titled Principal Performance Area and Secondary Performance Area.

Ensembles

A number of music ensembles are open to all students. Entrance into ensembles may be subject to space limitations, and an audition may be required. Students may elect to earn one credit per semester for participation. Auditions for ensembles are generally held during the first week of classes each semester. Dates and times are available from the department.

COURSE DESCRIPTIONS

MUAP 11. Recital Class (0)

MUAP 651. M.A. Lecture - Recital and Document (6)

MUAP 751. DMA Recital Document I (3)

MUAP 752. DMA Recital Document II (3)

MUAP 753. DMA Recital Document III (3)

MUAR 151B. Case Audio Internship I (1)

MUAR 152B. Case Audio Internship II (1)

MUAR 153B. Case Audio Internship III (1)

MUAR 154B. Case Audio Internship IV (1)

MUAR 251B. Case Audio Recording Internship I (0)

MUAR 252B. Case Audio Recording Internship II (0)

MUAR 253B. Case Audio Recording Internship III (0)

MUAR 254B. Case Audio Recording Internship IV (0)

MUCP 11. Recital Class (0)

MUCP 11. Undergraduate Independent Studies (1–3)

MUCP 751. Composition Document-D.M.A. (3)

MUED 200A. Basic Skills and Pedagogy: Voice (1)

Designed for music education majors to provide the fundamentals of teaching methods for various

MUED 200B. Basic Skills and Pedagogy: Guitar (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Recommended preparation: Music education majors. Non-music majors accepted with consent of department.

MUED 200C. Basic Skills and Pedagogy: Upper Brass (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Recommended preparation: Music education majors. Non-music majors accepted with consent of department.

MUED 200D. Basic Skills and Pedagogy: Lower Brass (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Recommended preparation: Music education majors. Non-music majors accepted with consent of department.

MUED 200E. Basic Skills and Pedagogy: Clarinet and Saxophone (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Recommended preparation: Music education majors. Non-music majors accepted with consent of department.

MUED 200F. Basic Skills and Pedagogy: Double Reeds and Flute (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Recommended preparation: Music education majors. Non-music majors accepted with consent of department.

MUED 200G. Basic Skills and Pedagogy: Violin (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Recommended preparation: Music education majors. Non-music majors accepted with consent of department.

MUED 200H. Basic Skills and Pedagogy: Strings (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Recommended preparation: Music education majors. Non-music majors accepted with consent of department.

MUED 200P. Basic Skills and Pedagogy: Percussion (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Recommended preparation: Music education majors. Non-music majors accepted with consent of department.

MUED 240. Foundations of Music Education (3)
An introduction to and overview of the music education profession. Philosophical, historical, and psychological perspectives on music education in schools, including contemporary topics and trends. Introduction of Ohio academic content standards and curriculum model for music, along with K-12 National Music Standards. Observation of area music teachers and peer-teaching experience. Recommended preparation: Music education major or permission.

MUED 275. Elements of Conducting (2)
This course is designed to develop the physical tools, and philosophical and aesthetic ideologies necessary for students to conduct in an effective and appropriate manner. Students develop baton technique through systematic physical pattern exercises, and class and field conducting experiences (elementary through adult). Observations and written evaluations of Cleveland Orchestra rehearsals and concerts, along with video analysis/self-evaluation of personal conducting experiences are among the activities required in this course. Topics and content include: philosophical foundations for the conductor, considerations for selecting repertoire and creating a supportive learning environment; rehearsal techniques; planning for the rehearsal and record keeping; rehearsal management; group motivation; score analysis and preparation; participation in professional activities; effective use of technology for the conductor; and national, state, and professional standards. Clinical/Field experiences (all ages) required.

MUED 276. Advanced Conducting (2)
This course continues in-depth development of the physical tools, and philosophical and aesthetic ideologies presented in MUED 275. Students develop baton techniques (with experiences in complex and changing time signatures) through systematic physical/pattern exercises, along with continuous evaluations, from their class and field conducting experiences (elementary through adult), observations and written evaluations of Cleveland Orchestra Rehearsals and Concerts, written critiques from historically significant Master Conductors (from videos in the University’s Music Library), along with video analysis of personal class and field conducting, are among the activities required in this course. Topics and content include: philosophical foundations for the conductor, considerations for selecting repertoire and creating a supportive learning environment; rehearsal techniques; planning for the rehearsal and record keeping; rehearsal management; group motivation; score analysis and preparation; participation in professional activities; effective use of technology for the conductor; and national and state standards. Clinical/Field experiences (all ages) required.

MUED 305. World Music in Education (3)
This course acquaints students with the use of world music, or multicultural music, in the music education classroom. Students are given an overview of the history of world music within American music education, discuss topics related to world music in education, research diverse world music practices, and lead lessons based on this research. Topics and content include: definitions of world/multicultural music; philosophical basis for world music in education; diversity in our Cleveland community; authenticity; ethnomusicology; informal/formal music learning; international perspectives; pedagogical approaches; addressing the State and National Standards through world music in education; and the development of culturally informed music pedagogy based on the study of diverse music. Throughout the course students will become acquainted with the music of diverse cultures and people groups; these will be chosen in part based on student’s own research interests. In addition to the musical cultures chosen by students for study and presentation, the music of The Gambia, West Africa; the Caribbean; and India will be highlighted during in-class activities and lessons. Recommended preparation: MUED 240. Global & Cultural Diversity

MUED 310. Instrumental and Choral Arranging (3)
Techniques of writing and arranging for instruments of the band and orchestra and voice. Study of scoring problems for school instrumental and vocal groups of all ages and abilities.

MUED 320. Technology Assisted Music Teaching and Learning (3)
Fundamental concepts and skills for using technology in music teaching and learning. This project-oriented class will develop knowledge and competencies related to electronic musical instruments, MIDI sequencing, music notation software, computer-assisted instruction, digital media, the Internet, information processing, computer systems, and lab management as they relate to music education in K-12 schools. Recommended preparation: MUED 240. Offered as MUED 320 and MUED 420.

MUED 350. General Music Methods A (3)
General Music A introduces student to methods and materials for planning and implementing general music experiences for all ages, with concentration on Pre-K through sixth grade children. Topics of the course include: multiple meanings of music for children; characteristics/needs of young children and creating a supportive learning environment; theories of music learning and teaching; learning styles and collaborative learning; assorted teaching methods, rhythm, pitch, listening, movement, performing, composing; curriculum design; technology for music instruction; multicultural music; music for exceptional children; integrating music with the arts and other curricula; motivation and classroom management; lesson planning and record keeping; developing a personal philosophy of music education, professional, state and professional standards; and assessment. Clinical/Field experiences (Clinical-all ages; Field-focus on Pre-K through elementary) required.
MUED 352. Instrumental Methods and Materials (3)
This course acquaints students with effective ways to develop, organize and maintain a successful instrumental program for any age group, based on a comprehensive instrumental music education model. Students are given a "womb to tomb" view of the instrumentalists' development, including physiological development and age appropriate instrumental exceptions. Topics and content include: philosophical basis for music education, considerations for selecting repertoire including multicultural music; rehearsal techniques; assessment and record keeping; planning for the rehearsal; recruitment; auditioning, and placement; motivation and classroom management; team teaching and collaborative learning; managing an instrumental program; participation in professional activities; effective use of technology in the instrumental program; philosophy; and national, state, and professional standards. Clinical/Field experiences (all ages) required.

MUED 353. Choral Methods and Materials (3)
This course acquaints students with effective ways to develop a successful choral program for any age group, based on a comprehensive choral music education model. Students are given a "womb to tomb" view of the singing voice, including physiological development, age appropriate vocal expectations, and establishing and maintaining vocal health. Topics include: philosophical basis for vocal music education; the child voice, the adolescent voice, and the adult voice; vocal tone; considerations for selecting repertoire including ensemble assembly, music evaluation, and multicultural music; rehearsal techniques, collaborative learning, and motivation; planning for the rehearsal; developing conducting technique; recruitment, auditioning, placement, score analysis and preparation; classroom management; managing a choral program; participation in professional activities; effective use of technology in a choral program; and national state, and professional standards. Clinical/Field experiences (all ages) required. Recommended preparation: MUED 276.

MUED 355. Instructional Design in Music Education (3)
This Music Education Department Seminar brings together all strands of the Music Education program by focusing on curriculum as the organizational element of instruction. Topics and content include: understanding the issues presented by special learners; techniques for integrating special learners into the music teaching environment; developing learning outcomes; designing instruction; planning classroom experiences; defining assessment and measurement; assessment techniques and instruments for the music classroom; and exploring elements of school music program organization and administration. Professional writing and clinical and field experiences will be a large part of the activities in this course. This course is presented in a seminar format that provides for discussions of classroom topics and commentary on field experiences. SAGES Dept Seminar

MUED 396A. Student Teaching in Music Education (9)
Teaching music in both elementary and secondary schools, full-time five days a week for 15 weeks. Closely supervised field experiences of all types with a wide variety of students. Emphasis on planning lessons and organizing materials, teaching methodologies, motivation, and student assessment. Topics addressed include communications and the arts, technology in learning, interdisciplinary organization of instruction, collaborative learning and teaching, creating a supportive environment, and professional development. Development of skills needed for self-assessment as well as student assessment. Clinical/Field experiences (all ages) required. Recommended preparation: Concurrent enrollment in MUED 396B.
Offered as MUED 396A and MUED 496A.
SAGES Senior Cap

MUED 396B. Student Teaching Seminar in Music Education (3)
This is the SAGES Senior Capstone requirement for students majoring in Music Education. Taken at the same time as the student teaching experience (MUED 396A/496A), this seminar will guide students through preparation for entering the professional world of music education, and mentor them in their preparation of their Senior Capstone Project and Presentation. Recommended preparation: Concurrent enrollment in MUED 496A.
Offered as MUED 396B and MUED 496B.
SAGES Senior Cap

MUED 399. Undergraduate Independent Studies (1-3)
Each student develops a topic of interest to be explored with a faculty member.

MUED 400. Clinical/Field Experience (3)
This provides clinical/field experiences with all ages of students in all teaching areas. Students from a variety of socioeconomic and cultural backgrounds are encountered. Clinical/Field experiences (all ages) required.

MUED 420. Technology Assisted Music Teaching and Learning (3)
Fundamental concepts and skills for using technology in music teaching and learning. This project-oriented class will develop knowledge and competencies related to electronic musical instruments, MIDI sequencing, music notation software, computer-assisted instruction, digital media, the Internet, information processing, computer systems, and lab management as they relate to music education in K-12 schools. Recommended preparation: MUED 249.
Offered as MUED 320 and MUED 420.

MUED 441. Philosophical Foundations of Music Education (3)
In this course, students explore major aesthetic philosophies that have influenced contemporary music education, and discuss current issues central to our field. Among topics included: basic views about art/music; creating art/music; meaning in art/music, experiencing art/music; music and aesthetic education; criticism in music; multicultural music; and critical theories and inquiry regarding music education. Students are asked to assess their own roles in music education, as well as their obligations and potential capacities for leadership in the profession. Students will work toward development of a personal professional philosophy of music education.

MUED 442. Curriculum and Assessment in Music Education (3)
This course is designed to give graduate music education students thorough knowledge of the overarching role of curriculum and assessment as the organizational elements of instruction. In depth coverage of such topics as: the role of assessment and measurement in teaching; epistemology; scope and sequence; backward design; instructional goals; validity; reliability; performance assessments; measuring assessment; curriculum design; and teaching for understanding. These concepts and procedures will be explored in depth to give daily music instruction a global framework in the larger organizational structure of profession, state, national, and accreditation standards for P-12 and college music settings.

MUED 443. Music Cognition and Learning (3)
Survey and critical review of the literature as it relates to music teaching and learning, and music performance. Specific topics may include basic psychoacoustical processes, auditory perception, cognitive organization of musical sound, tonal and musical memory, neuromusical research, affective and physiological responses to music, learning theory, musical aptitude, developmental processes, and motivation.

MUED 444. Research in Music Education (3)
Paradigms and methods in music education research. Specific topics and assignments include research-related resources, tools and materials; research problems; research literature; research procedures, research proposals; qualitative and quantitative research studies; computer-assisted data analysis; and empirical research reports.

MUED 496A. Student Teaching in Music Education (9)
Teaching music in both elementary and secondary schools, full-time five days a week for 15 weeks. Closely supervised field experiences of all types with a wide variety of students. Emphasis on planning lessons and organizing materials, teaching methodologies, motivation, and student assessment. Topics addressed include communications and the arts, technology in learning, interdisciplinary learning, collaborative learning and teaching, creating a supportive environment, and professional development. Development of skills needed for self-assessment as well as student assessment.
Clinical/Field experiences (all ages) required. Recommended preparation: Concurrent enrollment in MUED 396B.
Offered as MUED 396A and MUED 496A.
SAGES Senior Cap

MUEN 496B. Student Teaching Seminar in Music Education (3)
This is the SAGES Senior Capstone requirement for students majoring in Music Education. Taken at the same time as the student teaching experience (MUED 396A/496A), this seminar will guide students through preparation for entering the professional world of music education, and mentor them in their preparation of their Senior Capstone Project and Presentation. Recommended preparation: Concurrent enrollment in MUED 496A.
Offered as MUED 396B and MUED 496B.
SAGES Senior Cap

MUED 501. Special Reading (M.A. and M.M.) (1–18)

MUED 544. Advanced Research in Music Education (3)
Advanced studies in models and methods of music education research. Research projects using data analysis. In-depth examination of selected quantitative and/or qualitative research designs according to student interests. Discussion of thesis and dissertation proposal format process. Recommended preparation: MUED 444.

MUED 591. Music Education Seminar in Conducting (3)
In this course, students focus on advanced score study, preparation, and analysis. In depth conducting techniques on contemporary music and mixed meter compositions, along with the development of a comprehensive conducting bibliography are the major components in this seminar. Historical research, analytical evaluation, and the practical elements of the physical techniques required for one to conduct a chosen composition are all addressed for each composition studies. Seminar discussions include aesthetic and philosophical ideologies, and the practical issues a conductor faces when put in control of the advanced ensemble.

MUED 601. Special Readings (Ph.D./D.M.A.) (1–18)

MUED 651. Thesis (M.A. and M.M.) (1–6)

MUED 696. College Teaching Practicum (0)

MUED 701. Dissertation Ph.D. (1–18)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

MUEN 324. Case Percussion Ensemble (0–2)
The Case Percussion Ensemble is open to all interested Case-affiliated individuals who seek to continue their musical development by performing percussion ensemble literature. Membership is contingent on an audition that demonstrates moderate percussion ability and the ability to read music. Audition materials can be acquired through the director. Recommended preparation: Audition required.

MUEN 356. University Circle Wind Ensemble (1)
Designed for the most advanced woodwind, brass, and percussion players. Stresses the single-performance concept utilizing only players needed for a given piece. Audition required.

MUEN 373. Jazz Ensemble I (0–1)
Recommended preparation: Audition required.

MUEN 374. Jazz Ensemble II (0–1)

MUEN 382. Case Concert Choir (0–1)
This select choral group performs a wide variety of a cappella and accompanied choral works. Membership is gained only through an audition with the director. Recommended preparation: Audition required.

MUEN 383. Symphonic Winds (0–1)
Performance of advanced symphonic band repertoire. Open to all Case students, faculty and staff. Audition required for part placement only.

MUEN 384. Spartan Marching Band (0–1)

MUEN 385. Case/University Circle Orchestra (0–1)
The orchestra is comprised of Case students, faculty and staff and community players who play strings, woodwinds, brass and percussion. Recommended preparation: Audition required.

MUEN 386. Case Camerata Chamber Orchestra (0–1)
This chamber string ensemble is open to all interested Case affiliated individuals who seek to continue their music development by performing orchestral literature. Each person is required to audition to determine initial placement, section assignment, and seating. All members are required to perform a minimum of 2 concerts per academic year. Recommended preparation: Audition required.

MUEN 387. University Singers (0–1)
Chorus performing a wide variety of traditional and popular choral works. Open to all Case students. No audition required.

MUEN 393. Baroque Chamber Ensembles (0–1)
Designed for students interested in exploring baroque music in a chamber setting on historical instruments. Prereq: Audition required.

MUEN 394. Baroque Dance Ensemble (0–1)
This course allows musicians and dancers alike to explore historical dance steps and notation. History of dance and its relationships to music will be emphasized as students learn and perform historical dances. Prereq: MUH 342 or MUH 442 or permission of Instructor.

MUEN 395. Collegium Musicum (0–1)
Recommended preparation: Audition required.

MUEN 396. Early Music Singers (0–1)
Recommended preparation: Audition required.

MUEN 397. Baroque Orchestra (0–1)
Recommended preparation: Audition required.

MUEN 398. Cleveland Orchestra Chorus (0–1)
Recommended preparation: Audition required.

MUGN 201. Introduction to Music: Listening Experience I (3)
A flexible approach to the study of the materials and literature of music. Aural and analytical skills primarily for classical music.

MUGN 202. Introduction to Music: Listening Experience II (3)
Application of the skills developed in MUGN 201 to the understanding of historical and stylistic content of Western music. Focus is on particular works in context of the era of composition. Recommended preparation: MUGN 201 or consent of department.

MUGN 215. History and Styles of Jazz (3)
Musical styles and structures of jazz and American popular music since 1900. Recommended preparation: MUGN 201.

MUGN 308. Computers and Music (3)
Emphasis on development of music notation and sequencing skills with some attention to word-processing and graphics. Introduction to data management and page layout software. Designed primarily for music majors but also open to non-majors with sufficient background in music theory. Use of the University’s software library, CWRU Net and the music department’s Center for Music and Technology. No formal training in computers required. Recommended preparation: Music majors only.

MUGN 319. Jazz Skills I (3)
This class is designed to teach students basic skills in jazz improvisation, jazz keyboard, arranging/composition and pedagogy. Basic theory is required. Students will eventually arrange their own composition for big band, which will feature them as the improvising soloist. Recommended preparation: MUTH 102/MUTH 106, MUH 108 or permission of instructor.

MUGN 320. Jazz Skills II (3)
This course will build on the foundational skills developed in Jazz Skills I, providing a more intensive study of jazz harmony, improvisation and me-
lodic construction. It is designed to give students an advanced experiential understanding of the theory and performance of jazz. Recommended preparation: MUGN 319.

MUGN 399. Undergraduate Independent Studies (1–3)
Each student develops a topic of interest to be explored with a faculty member.

MUGN 501. Special Reading (M.A. and M.M.) (1–18)

MUGN 651. Thesis: (M.A. and M.M.) (1–6)

MUGN 751. Recital Document I-D.M.A. (1–3)

MUGN 752. Recital Document II - D.M.A. (1–3)

MUHI 301. History of Western Music I (3)
Developments in Western music from early Christian times to c1700. Recommended preparation or concurrent enrollment: MUTH 102, MUTH 104, or MUTH 108.

MUHI 302. History of Western Music II (3)
Developments in Western music from c1700 to c1900. Recommended preparation: MUTH 102, MUTH 104, or MUTH 108.

MUHI 303. History of Western Music III (3)
Music of the twentieth century, covering history, analysis, and aesthetic issues. Recommended preparation: MUHI 301 or MUHI 302, MUTH 104 or MUTH 108.

MUHI 310. Music Cultures of the World: Music of Asia and Africa (3)
A one-semester introduction to musics of Asia and Africa, focusing on the relationship of musical traditions and practices to culture and society. Recommended preparation: MUTH 106.

Global & Cultural Diversity

MUHI 311. Music Cultures of the World II: Music of the Americas (3)
Introduction to selected multicultural musics of North America and Latin America, focusing on the relationship of musical traditions and practices to culture and society. Recommended preparation: MUTH 106.

Global & Cultural Diversity

MUHI 315. History of Jazz and American Popular Music (3)
Musical styles and structures of jazz and American popular music; emphasis on music since 1900. Recommended preparation: MUTH 202 or MUHI 302.

MUHI 341. Introduction to Early Music Performance Practice (3)
Summary and perspective of the problems and issues associated with the field of early music performance practices. Recommended preparation: MUHI 301 and MUHI 302.

Offered as MUHI 341 and MUHI 441.

MUHI 342. Seminar in Early Music Performance Practice (3)
Seminar in a specific instrument and/or vocal area of performance practices, such as baroque vocal, instrumental, or keyboard practices. May be repeated because topics vary. Recommended preparation: MUHI 301.

Offered as MUHI 342 and MUHI 442.

MUHI 350. Topics in Music History (3)
Close study of a theme or aspect of music such as “Music and Gender,” “Symphonies of Mahler,” and “Wagner’s Ring.” Offered as MUHI 350 and MUHI 450.

MUHI 390. Undergraduate Seminar in Music History (3)
An intensive research seminar in music history for music majors. SAGES Dept Seminar

MUHI 395. SAGES Capstone for Music Majors (3–6)
Required for music majors, except in the case of double majors or dual-degree candidates who opt to fulfill the capstone in the area of the second major. Course consists of projects varying according to the student’s area of study and interests, but each must include a document of appropriate length and scope. The project must be presented publicly in an appropriate forum. SAGES Senior Cap

MUHI 399. Undergraduate Independent Studies (1–3)
Each student develops a topic of interest to be explored with a faculty member.

MUHI 401. Methodologies of Music History (3)
Introduction to the scholarly study of music, including principles of music bibliography, techniques of library research, and evaluation of editions. Special emphasis given to the relationship between musical performance and research in the history and criticism of music. Attention will also be given to design of program notes and essays. Required of first-year students in the Master of Music degree program.

MUHI 405. Topics in Music History (3)
Close study of a theme or aspect of music such as “Music and Gender,” “Symphonies of Mahler,” and “Wagner’s Ring.” Offered as MUHI 350 and MUHI 450.

MUHI 414. Introduction to Early Music Performance Practice (3)
Summary and perspective of the problems and issues associated with the field of early music performance practices. Recommended preparation: MUHI 301 and MUHI 302.

Offered as MUHI 341 and MUHI 441.

MUHI 441. Seminar in Early Music Performance Practice (3)
Seminar in a specific instrument and/or vocal area of performance practices, such as baroque vocal, instrumental, or keyboard practices. May be repeated because topics vary. Recommended preparation: MUHI 301.

Offered as MUHI 342 and MUHI 442.

MUHI 445. Medieval/Renaissance Notation (3)
Theory of chant, modal, mensural, and tablature notations. Practice in making literal transcriptions, editing, and preparing scores for performances.

MUHI 450. Topics in Music History (3)
Close study of a theme or aspect of music such as “Music and Gender,” “Symphonies of Mahler,” and “Wagner’s Ring.” Offered as MUHI 350 and MUHI 450.

MUHI 501. Special Reading (M.A. and M.M.) (1–18)

MUHI 590. Seminar in Musicology (3)
Problems in musical criticism, aesthetics, and analysis, as well as interdisciplinary methodologies.

MUHI 601. Special Readings Ph.D./D.M.A. (1–18)

MUHI 610. Bibliography and Research Methods in Music (3)
Seminar in research methods and techniques, stressing the analytic and functional approaches to Vocal polyphonic music from the Burgundian school through the Elizabethan madrigal.

MUHI 433. Music of the Baroque (3)
Musical developments from Monteverdi to Bach and Handel.

MUHI 434. Viennese Classicism (3)
Development of the symphony, concerto, chamber music, and opera in the works of the Mannheim composers, Haydn, Mozart, and Beethoven.

MUHI 435. Nineteenth Century Music (3)
Romanticism and other 19th century trends in music up to impressionism.

MUHI 436. Twentieth Century Music (3)
Critical and analytical study of music since 1900. Examination and discussion of stylistic characteristics and aesthetic aims of contemporary composers.

MUHI 441. Introduction to Early Music Performance Practice (3)
Summary and perspective of the problems and issues associated with the field of early music performance practices. Recommended preparation: MUHI 301 and MUHI 302.

Offered as MUHI 341 and MUHI 441.

MUHI 442. Seminar in Early Music Performance Practice (3)
Seminar in a specific instrument and/or vocal area of performance practices, such as baroque vocal, instrumental, or keyboard practices. May be repeated because topics vary. Recommended preparation: MUHI 301.

Offered as MUHI 342 and MUHI 442.

MUHI 443. Medieval/Renaissance Notation (3)
Theory of chant, modal, mensural, and tablature notations. Practice in making literal transcriptions, editing, and preparing scores for performances.

MUHI 450. Topics in Music History (3)
Close study of a theme or aspect of music such as “Music and Gender,” “Symphonies of Mahler,” and “Wagner’s Ring.” Offered as MUHI 350 and MUHI 450.

MUHI 501. Special Reading (M.A. and M.M.) (1–18)

MUHI 590. Seminar in Musicology (3)
Problems in musical criticism, aesthetics, and analysis, as well as interdisciplinary methodologies.

MUHI 601. Special Readings Ph.D./D.M.A. (1–18)

MUHI 610. Bibliography and Research Methods in Music (3)
Seminar in research methods and techniques, stressing the analytic and functional approaches to Vocal polyphonic music from the Burgundian school through the Elizabethan madrigal.
bibliography.

MUHI 611. Doctor of Musical Arts Seminar (3)
Recommended preparation: MUHI 610.

MUHI 651. Thesis (M.A. and M.M.) (1–6)

MUHI 701. Dissertation Ph.D. (1–18)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

MUHI 751. Recital Document I - D.M.A. (1–3)

MUHI 752. Recital Document II - D.M.A. (1–3)

MUHI 753. Recital Document III - D.M.A. (1–6)

MULI 399. Undergraduate Independent Studies (0)
Each student develops a topic of interest to be explored with a faculty member.

MUDP 363. Principles of String Playing and Teaching I (2)
This course is designed to give an overview of historical pedagogy and its relationship to contemporary teaching practice. Students will survey teaching methodologies in relation to the foundational elements of performance technique for their instrument and investigate how to impart this information in an instructional setting. All students enrolled in the course will have the opportunity to teach students in a supervised situation and implement the concepts covered in class. Offered as MUDP 363 and MUDP 463.

MUDP 364. Principles of String Playing and Teaching II (2)
This course is a continuation of MUDP 363/463 and will foster further integration of the application of pedagogy to the teaching environment by the development of a conceptual rubric for instruction. This will include: expanding teaching strategies for a specific instructional environment or element of technique: principles of delivery; picking repertoire; diagnostic evaluation and assessment; and the creation of a personal style of teaching and reflection. Offered as MUDP 364 and MUDP 464.

MUDP 501. Special Reading (M.A. and M.M.) (1–18)

MURP 386. Keyboard Repertory Seminar (0–1)
Intensive study of the repertory for keyboard instruments, including solo literature, chamber music, and other collaborative genres. Master class format with regular performances by enrolled students. Enrollment limited to Case Western Reserve keyboard majors.

MUTH 399. Undergraduate Independent Studies (1–3)
Each student develops a topic of interest to be explored with a faculty member.

MUTH 416. Pre-common Practice Theory and Analysis (3)
An exploration of treatises and analytical methods appropriate to music of the Medieval and Renaissance eras.

MUTH 501. Special Reading (M.A. and M.M.) (1–18)

NATURAL SCIENCES PROGRAM

Natural sciences is available as a second major for the B.A.; the first major must be in a department or program within the arts, humanities, or social sciences, excluding the programs in American Studies, Asian Studies (Track 2), Environmental Studies, Gerontological Studies, Pre-Architecture, and Women’s and Gender Studies. For a student who completes a B.S. degree in management or accounting, natural sciences may serve as the sole major for the B.A. degree.

The program requires a minimum of 50 semester hours of work in natural sciences and mathematics. The departments included in the major are Astronomy, Biology, Chemistry, Geological Sciences, and Physics. The student must complete a minimum of 20 hours in one of these departments, a minimum of 8 hours in each of the two other departments, and 3 hours each in the remaining two departments. In addition, all natural sciences majors must complete MATH 125 and 126 or MATH 121 and 122. The courses used to satisfy the natural sciences major should be courses that would satisfy requirements of an existing science major. However, any 200-level or higher astronomy course is acceptable for the natural sciences major.

Minor

A minor is achieved through completion of the requirements listed below in any four of the six participating departments.

ASTRONOMY
One of the following sequences:
ASTR 201 and any other 200-level ASTR course
ASTR 221 and 222

BIOLOGY
Any two of the following:
BIOL 214 and 214L
BIOL 215 and 215L
BIOL 216 and 216L

CHEMISTRY
One of the following sequences:
CHEM 105, 106, 113
CHEM 111, 113, ENGR 145

GEOLOGICAL SCIENCES
Any one of GEOL 101, 110, 115 or 117; and
GEOL 119; and any one additional GEOL course (can be one of those listed or any other GEOL course)

MATHEMATICS
One of the following sequences:
MATH 125 and 126
MATH 121 and 122

PHYSICS
One of the following sequences:
PHYS 115 and 116
PHYS 121, 122, 221

NUTRITION
The College of Arts and Sciences awards the Bachelor of Arts and Bachelor of Science degrees in nutrition and nutritional biochemistry and metabolism. The required courses for the majors and minor are offered by the Department of Nutrition in the School of Medicine. For details about the department’s undergraduate programs, please consult the School of Medicine section of this bulletin.

DEPARTMENT OF PHILOSOPHY
203 Clark Hall
www.case.edu/artsci/phil
Phone: 216-368-2810; Fax: 216-368-0814
Colin McLarty, Chair
E-mail: colin.mclarty@case.edu

The Department of Philosophy offers an undergraduate major leading to the Bachelor of Arts degree. A student majoring in philosophy must satisfy the Arts and Sciences General Education Requirements. The department also offers minor programs for undergraduates as well as graduate-level courses for candidates for the Master of Arts degree in such fields as biomedical ethics, history, English, mathematics, and the sciences.

The department’s course offerings are designed not only to provide knowledge and skills required for students whose main interest is in philosophy, but also to educate students in general about the intellectual issues that a reflective person is likely to encounter in various contexts of civilized life. The department emphasizes the relevance of philosophy to mathematics, computer science, the natural sciences, the social sciences, the humanities and arts, and law.

The major program in philosophy, besides offering a solid foundation for advanced study in philosophy and enriching programs in other disciplines, develops the skills for analytical and critical thinking, effective communication, and rational decision making needed in a wide range of endeavors. The program thus provides majors with unusual flexibility in the choice of subsequent careers, including law, medicine, and management, while complementing the pursuit of career objectives with a greater perspective and a richer quality of intellectual life.

In collaboration with the Department of History, the department participates in an interdisciplinary major program in the history and philosophy of science and technology, leading to the Bachelor of Arts degree. The department also participates in, and contributes courses to, the interdisciplinary minor in artificial intelligence.

DEPARTMENT FACULTY
Colin McLarty, Ph.D.
(Case Western Reserve University)
Truman P. Handy Professor of Intellectual Philosophy; Associate Professor and Chair
Logic; philosophy of logic; philosophy of mathematics; philosophy of science; contemporary French philosophy

Shannon D. French, Ph.D.
(Brown University)
Inamori Professor of Ethics; Associate Professor
Military ethics; leadership ethics; professional ethics; moral psychology; biomedical and environmental ethics

Laura E. Hengehold, Ph.D.
(Loyola University)
Associate Professor
Political and social philosophy; philosophy of feminism; Foucault; contemporary continental philosophy

Chin-Tai Kim, Ph.D.
(University of Michigan)
Professor
History of philosophy (17th, 18th, and 19th centuries); theory of knowledge; metaphysics; ethics; phenomenology

Adjunct Faculty
Joel Levin, D. Phil.
(University of Oxford, U.K.)
Adjunct Associate Professor; Adjunct Professor,
Case Western Reserve University School of Law
Philosophy of law; political philosophy; ethical theory

Rosalind Simson, Ph.D.
(Yale University)

Adjunct Associate Professor; Associate Professor,
Case Western Reserve University School of Law
Theory of knowledge; feminist philosophy; issues at the interface of law and philosophy

Secondary Faculty
Anthony Jack, Ph.D.
(University College London)
Assistant Professor of Cognitive Science
Cross-cultural study of theory of mind and moral reasoning

Deepak Sarma, Ph.D.
(University of Chicago)
Associate Professor of Religious Studies
Hinduism; Indian philosophy; philosophy of religion; method and theory

Lecturer
Jerry S. Piven
(Syracuse University)
Comparative myth and religion; psychoanalytic theory; psychology and philosophy of religion; psychohistory

Visiting Faculty
Stephenson, Jeffrey E.
(City University of New York)
Visiting Assistant Professor
Ethical theory; social and political philosophy; professional ethics

UNDERGRADUATE PROGRAMS

Major
The major consists of 30 hours (ten 3-credit courses) in philosophy, including PHIL 101, 201, 301, 302, and six other elective philosophy courses to be determined in consultation with the department’s undergraduate advisor. However, a student may request permission to take up to 6 hours (two 3-credit courses) of the required 18 hours of philosophy electives in another field or other fields. Such a request should be supported by considerations showing how the substitution(s) would strengthen the student’s major in philosophy. The advisor must approve the substitution(s) in advance.

Departmental Honors
The department offers an honors program for students pursuing a major in philosophy. Students in this program must complete a substantial thesis, pass an oral examination on the thesis, and maintain a B average in philosophy courses. To be eligible for admission, a student should have an overall grade point average of B or better, and a grade of B or better in each philosophy course already taken.
A student normally should have taken at least four, and at most seven, philosophy courses at the time of application for admission. An honors student should register for PHIL 399, Directed Study (3), to do honors work. Interested students should apply for admission to the program during the first semester of junior year.

Minor

The department offers a range of possible minor programs, each of which must include PHIL 101 and four other courses in philosophy at the 200 or 300 level (excluding PHIL 390 and 399), chosen to meet the specific needs of students majoring in other fields. The undergraduate advisor will assist students in devising minor programs.

COURSE DESCRIPTIONS

PHIL 101. Introduction to Philosophy (3)
Basic problems of philosophy and methods of philosophical thinking. Problems raised by science, morality, religion, politics, and art. Readings from classical and contemporary philosophers. Normally given in multiple sections with different instructors and possibly with different texts. All sections share core materials in theory of knowledge, metaphysics, and ethics despite differences that may exist in emphasis.

PHIL 102. Ethics, An Interdisciplinary Introduction (3)
This course will introduce methods and literature of several disciplines, including philosophy, that bear on contemporary ethical issues. The goal is to prepare students for a lifetime of ethical reflection, discussion, and problem-solving, as well as to more advanced study in the disciplines introduced by enhancing their understanding of ethical concepts and moral reasoning. Topics include lying, moral responsibility, and power, specifically rights and responsibilities of citizens, students, teachers, engineers, health care providers, and accountants.

PHIL 201. Introduction to Logic (3)
Presentation, application, and evaluation of formal methods for determining the validity of arguments. Discussion of the relationship between logic and other disciplines.

PHIL 203. Natural Philosophy I (3)
Historical and philosophical interpretation of some epochal events in development of science. Copernican revolution, Newtonian mechanics, Einstein’s relativity physics, quantum mechanics, and evolutionary theory; patterns of scientific growth; structure of scientific “revolutions” in science and “pseudo-science.” First half of a year-long sequence. Offered as HSTY 203 and PHIL 203.

PHIL 204. Natural Philosophy II (3)
Conceptual, methodological, and epistemological issues about science: concept formation, explanation, prediction, confirmation, theory construction and status of unobservables; metaphysical presuppositions and implications of science; semantics of scientific language; illustrations from special sciences. Second half of a year-long sequence. Offered as HSTY 207 and PHIL 204.

PHIL 205. Contemporary Moral Problems (3)
Examination of selected contemporary moral problems and contemporary faces of perennial moral problems such as: when, if ever, lying is justified; the value of honesty and of confidentiality; under what circumstances, if any, various types of killing (suicide, execution, in war, euthanasia, killing of lower animals or ecosystems) are justified. Additional moral problems raised by new knowledge (such as genetic information) or new technology (such as rights to digital information, or the ability to), and responsible uses of these and other sources of power. Clarification of the concepts of value, ethical evaluation and justification, ethical argument, moral relevance, and the notion of a moral problem itself. Readings will draw on classical and contemporary sources in philosophy.

PHIL 221. Indian Philosophy (3)
A survey of Indian philosophical thought with emphasis on the Vedas, early Hindu, and Jain literature. Offered as PHIL 221 and RLGN 221. Global & Cultural Diversity

PHIL 225. Evolution (3)
Multidisciplinary study of the course and processes of organic evolution provides a broad understanding of the evolution of structural and functional diversity, the relationships among organisms and their environments, and the phylogenetic relationships among major groups of organisms. Topics include the genetic basis of micro- and macro-evolutionary change, the concept of adaptation, natural selection, population dynamics, theories of species formation, principles of phylogenetic inference, biogeography, evolutionary rates, evolutionary convergence, homology, Darwinian medicine, and conceptual and philosophical issues in evolutionary theory. Offered as ANTH 225, BIOL 225, GEOL 225, HSTY 225, and PHIL 225.

PHIL 270. Introduction to Gender Studies (3)
This course introduces women and men students to the methods and concepts of gender studies, women’s studies, and feministic theory. An interdisciplinary course, it covers approaches used in literary criticism, history, philosophy, political science, sociology, anthropology, psychology, film studies, cultural studies, art history, and religion. It is the required introductory course for students taking the women’s studies major. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 270, HSTY 270, PHIL 270, RLGN 270, and WGST 201. Global & Cultural Diversity

PHIL 271. Bioethics: Dilemmas (3)
We have the genetic technology to change nature and human nature, but should we? We have the medical technology to extend almost any human life, but is this always good? Should we clone humans? Should we allow doctor-assisted suicide for the terminally ill? This course invites students from all academic disciplines and fields to examine current and future issues in bioethics—e.g., theory and methods in bioethics; death and dying; organ transplantation; genetics; aging, and dementia; fertility and reproduction; distributive justice in health care access. The course will include guest lecturers from nationally-known Bioethics faculty. Offered as BETH 271, PHIL 271.

PHIL 301. Ancient Philosophy (3)
Western philosophy from the early Greeks to the Skeptics. Emphasis on the pre-Socratics, Plato and Aristotle. Recommended preparation: PHIL 101 and consent of department. Offered as CLSC 301 and PHIL 301.

PHIL 302. Modern Philosophy (3)

PHIL 303. Topics in Philosophy of Science (3)
In-depth study of selected topics in general philosophy of science or philosophy of physical, biological, or social science. Topics may include: theories of explanation, prediction, and confirmation; semantics of scientific language; reductionism; space, time and relativity; philosophical issues about quantum mechanics; philosophical issues about life sciences (e.g., evolution, teleology, and functional explanation); explanation and understanding in social sciences; value in social science. Recommended preparation: PHIL 101 or PHIL 201 or PHIL 203. Offered as PHIL 303 and PHIL 304.

PHIL 304. Science and Engineering Ethics (3)
This course prepares students to recognize ethical problems that commonly arise in the scientific and engineering workplace, to understand ethical concepts, to evaluate ethical arguments, and to critically examine responses to problems and their ethical ramifications. It addresses questions such as: What are the criteria of fairness in crediting contributions to research? How safe is safe enough? What are professional responsibilities, and how do they change over time? What is research misconduct? When is ignorance culpable? What is intellectual property and what protections does it deserve? When is biological testing of workers justified? What are responsible ways of raising concerns, and what supports do good organizations give for raising them? What treatment counts as harassment or as an expression of prejudice? What are good means for controlling it? What are scientists’ and engineers’ responsibilities for environmental protection? What is a "conflict
of interest" and how is it controlled? What protections for human research subjects are warranted? What, if any, use of animals in research is justified? Recommended preparation: PHIL 101 or PHIL 102 or PHIL 205. Offered as PHIL 304 and PHIL 404.

PHIL 305. Ethics (3)
Analysis of ethical theories and concepts of goodness, right, and obligation. Discussion of nature of justice, problem of justification of moral principles, and relation between facts and values. Recommended preparation: PHIL 101, PHIL 102 or PHIL 205. Offered as PHIL 305 and PHIL 405.

PHIL 306. Mathematical Logic and Model Theory (3)
Propositional calculus and quantification theory; consistency and completeness theorems; godel incompleteness results and their philosophical significance; introduction to basic concepts of model theory; problems of formulation of arguments in philosophy and the sciences. Offered as PHIL 306, MATH 406 and PHIL 406.

PHIL 309. Philosophical Issues in Genetics (3)
A philosophical examination of the history and cultural connections of the science of genetics and its precursors. Genetics is a phenomenon of the twentieth century. Thus, it is new. Yet, its implications and dilemmas are enmeshed in old traditions and stereotypes, and the dynamics of cultural change. To explore the breadth of philosophical repercussions of genetics, this course will draw on science, technology, medicine, and their histories, but will also range wider to include aspects of the social history of racism and class relations, changing attitudes toward sexuality, the intricacies of big business and international cooperation, and other such diverse areas. Recommended preparation: PHIL 101 or PHIL 203 or PHIL 204. Offered as PHIL 309 and PHIL 409.

PHIL 313. Philosophy of Mathematics (3)
Logical paradoxes and their effects on foundations of mathematics. Status of mathematical entities and nature of mathematical truths. Formalist, logicist, and intuitionist positions. Recommended preparation: PHIL 101 or PHIL 201. Offered as PHIL 313 and PHIL 413.

PHIL 314. Animal Cognition and Consciousness (4)
This course examines the notions of intelligence, cognition, reasoning, consciousness, and mental content as they appear in the philosophical views and empirical studies of animals in individual and social contexts. We will review scientific findings that suggest striking likenesses and intriguing differences in the (apparent) thought processes of humans and animals, and ask whether the research techniques that brought us these results are fully adequate to measuring such unobservable entities as conscious experience and thought. Techniques of measurement range from naturalistic observation, to the processing of vocalizations, to memory and problem solving tasks, and the imaging of brain processes through fMRI scans, etc. Students will face the challenges and rewards of practicing these techniques and reworking philosophical theories in the service component of the course. Students will participate in veterinary or shelter work to provide needed animal care while studying animal behavior using cognitive ethological methods. We will compare methods for measuring consciousness and intelligence in animals to those used for human beings, and ask questions about the possibility of machine consciousness and the emergent property of group consciousness. Offered as BIOL 314, COGS 314, PHIL 314 and PHIL 414.

PHIL 315. Selected Topics in Philosophy (3)
Examination of views of a major philosopher or philosophical school, a significant philosophical topic, or a topic that relates to philosophy and other discipline. Recommended preparation: PHIL 101. Offered as PHIL 315 and PHIL 415.

PHIL 316. African Political Thought (3)
Introduction to select themes in the work of contemporary African philosophers, with special emphasis on political thought. In this course, students will learn something about factors affecting the creation and flow of knowledge and ideas about Africa and discuss the relative importance of the “nation-state” as an idea in Europe, pre-colonial Africa, and postcolonial Africa. Offered as PHIL 316/416 and ETHS 316/416. Prereq: PHIL 101.

PHIL 320. The Phenomenological Tradition (3)
The background of phenomenology: Descartes, Kant, and Brentano. The epistemological rationale of Husserl’s phenomenology and its ontological implications; the powers and limits of the phenomenological method. Heidegger’s transformation of phenomenology to interpretive ontology of human existence. The development of interpretation theory as the foundation of all human existence. The development of interpretation theory as the foundation of all human sciences in Gadamer and Ricoeur. Recommended preparation: PHIL 101. Offered as PHIL 320 and PHIL 420.

PHIL 325. Philosophy of Feminism (3)
Dimensions of gender difference. Definition of feminism. Critical examination of feminist critiques of culture, including especially politics, ideology, epistemology, ethics, and psychology. Readings from traditional and contemporary sources. Offered as PHIL 325 and PHIL 425 and WGST 325. Prereq: PHIL 101.

PHIL 330. Topics in Ethics (3)
Examination of views in ethics of a major philosopher or philosophical school, a significant philosophical topic in ethics, or a topic that relates ethics to philosophy and another discipline. Recommended preparation: PHIL 101, PHIL 102, or PHIL 205. Offered as PHIL 330 and PHIL 430.

PHIL 332. Classical Jewish Religious Thought (3)
The thought of some major biblical and Rabbinic writings and of the classic age of medieval Jewish philosophy. Offered as JDST 330, PHIL 352, and RLGN 330.

PHIL 333. Philosophy of Religion (3)
Topics include: classical and contemporary arguments for God’s existence; divine foreknowledge and human freedom; the problem of evil and theodicy; nature and significance of religious experience; mysticism; varieties of religious metaphysics; knowledge, belief and faith; nature of religious discourse. Readings from traditional and contemporary sources. Recommended preparation for PHIL 433 and RLGN 433: PHIL 101 or RLGN 102. Offered as PHIL 333, RLGN 333, PHIL 433, and RLGN 433.

PHIL 334. Political and Social Philosophy (3)
Justification of social institutions, primarily political ones. Such distinctions as that between de jure and legitimate authority; analysis of criteria for evaluation, such as social justice and equality; inquiry into theories of justification of the state; theory of democratic government and its alternatives. Readings from classical and contemporary sources. Recommended preparation: PHIL 101. Offered as PHIL 334, POSC 354, PHIL 434, and POSC 454.

PHIL 335. Philosophy of Law (3)
This is an examination of the general nature of law, the broad concerns of jurisprudence, the study of comparative law, and many of the issues raised in the literature of legal philosophy. Students will examine the principles of legal positivism, mitigated natural law, and rights theory. Selected readings and cases will illustrate these theories, which will also be examined in the context of rule selection by new governments in developing or revolutionary societies. The course also looks at the general nature of legal systems: how politics, morality, and individual views of justice and rights affect particular court cases and the course and development of law generally. Topics will include abortion, obscenity and sin, civil disobedience, affirmative action, surrogatehood, and the death penalty. This is unlike any other of the legal theory or jurisprudence courses, and those who have sampled legal theory elsewhere in a different form are welcome and encouraged to enroll. Recommended preparation: PHIL 101. Offered as LAWS 353, PHIL 335, and PHIL 435.

PHIL 345. Epistemology and Metaphysics (3)
Traditional problems of epistemology, such as definition of knowledge, justification of belief, nature of evidence and foundationalism, skepticism, the a

Offered as PHIL 345 and PHIL 445.

PHIL 355. 19th and Early 20th Century Philosophy (3)

History of philosophy after Kant up to and including logical empiricism. Interpretation and comparison of important philosophers and philosophical schools of the period in terms of common methods, problems, themes, doctrines, and ideologies. Emphasis on Schopenhauer, Hegel, Kierkegaard, Marx, and Nietzsche. Recommended preparation: PHIL 101.

Offered as PHIL 355 and PHIL 455.

PHIL 363. Philosophy and Social Neuroscience (3)

A philosophical examination of recent research in human cognition and emotion at the intersection of the social sciences and neurological sciences. The course provides the student with background knowledge of brain processes underlying such social and cultural phenomena as bonding, aggression, imitation, mind-attribute, language, sexual behavior, moral action, and creativity. The approach of this course is at once scientific (comparing methods, findings and questions as they arise in clinical and experimental neuropsychology, brain imaging, neurolinguistics, and behavioral neuroscience) and humanistic, asking critical questions about the nature and methods of a science of cognition, and surveying moral responses from a neurologic and philosophic perspective. Recommended preparation: PHIL 101 or COGS 201.

Offered as COGS 363 and PHIL 363.

PHIL 365. Philosophy of Mind (3)

Traditional problems such as the relation of mind and body, knowledge of other minds, free will and determination, and nature of psychological explanation. Analysis of chief theories of mind. Analysis of mental concepts such as intention, action, decision, emotion, and will. Recommended preparation: PHIL 101.

Offered as PHIL 365 and PHIL 465.

PHIL 367. Topics in Evolutionary Biology (3)

The focus for this course on a special topic of interest in evolutionary biology will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution. Students will participate in discussions and lead class seminars on evolutionary topics and in collaboration with an advisor or advisors, select a topic for a research paper or project. Each student will write a major research report or complete a major project and will make a public presentation of her/his findings.

Offered as ANTH 368, BIOL 369, PHIL 368. SAGES Senior Cap

PHIL 373. Intelligence and Cognition (3)

This course will focus on the notion and meaning of intelligence. What is intelligence? How is it measured, and are these measures adequate to the task? Is there more than one kind of intelligence? What is the relationship between individuals, genetic factors, biological factors, and socio-cultural-economic factors in the development of intelligence? How are language and thought related to intelligence? What is the difference between intelligence and talent? Intelligence seems to be necessary for culture, art, religious belief, the creation of theories and the quest for knowledge, truth and morality; thus intelligence is a necessary condition for the study of itself. To attempt to understand intelligence is an undertaking in which we will ask questions about the self and the common nature of humanity, while simultaneously examining the abilities of animals and machines. What is the mark of intelligence? Recommended preparation: PHIL 101 or COGS 201.

Offered as COGS 373 and PHIL 373.

PHIL 381. Philosophy and Cognitive Neuroscience (3)

This course will focus on the various methodologies used in the cognitive neuroscience, and explore their strengths and weaknesses from scientific and philosophical standpoints. We will begin by examining baseline measures (including IQ tests, tasks of cognitive flexibility, verbal and visual memory, causal/sequential thinking and narrative tasks) and their experimental design. Lesion methods will follow, with an eye toward understanding the strength of inferences that can be drawn from such data. The course will also focus on imaging techniques (CAT, PET, SPECT, fMRI, TMS, etc.) as well as measures of electrical activity such as EGG and single-cell recordings. Students will become familiar with many fundamental assumptions necessary for the implementation of each method, and philosophical questions associated with these endeavors and their potential impact on our knowledge and society. Recommended preparation: PHIL 101 or COGS 201.

Offered as COGS 381 and PHIL 381.

PHIL 383L. Vocalization and Cognition Lab (1)

This is a laboratory section intended to provide hands-on training and experience with sound processing and analysis of animal vocalizations in the context of cognitive science, philosophy, and biology. Students will ask and answer questions surrounding language, meaning, mind, mental states, animal and human cognition. How does a science of content and language sexually proceed? How do we measure behavior for use as an indicator of cognition? What pragmatic constraints are found when we explore the natural world? What causes us to interpret certain symbols as systematic? The laboratory work begins with an understanding of different software for sound analysis with an emphasis on the bioacoustic experimental method. Frog vocalization exercises will familiarize students with the process of data categorization, analysis and comparison, and will be the foundation for understanding hypothesis testing within a Darwinian theoretical backdrop. Cetacean vocalization analysis will press students to move beyond comparison and analysis to consider and evaluate the standard evidence types used in cognitive science to measure the mind. Recommended preparation: PHIL 101 or COGS 201.

Offered as COGS 383L and PHIL 383L.

PHIL 390. Senior Research Seminars in History and Philosophy of Science (3)

Directed independent research seminar for seniors who are majors in the History and Philosophy of Science program. The goal of the course is to develop and demonstrate command of B.A.-level factual content, methodologies, research strategies, historiography, and theory relevant to the field of history of science and/or philosophy of science. The course includes both written and oral components.

Offered as HSTY 380 and PHIL 390. SAGES Senior Cap

PHIL 394. Seminar in Evolutionary Biology (3)

This seminar investigates 20th-century evolutionist theory, especially the Modern Evolutionary synthesis and subsequent expansions of and challenges to that synthesis. The course encompasses the multidisciplinary nature of the science of evolution, demonstrating how disciplinary background influences practitioners’ conceptualizations of pattern and process. This course emphasizes practical writing and research skills, including formulation of testable theses, grant proposal techniques, and the implementation of original research using the facilities on campus and at the Cleveland Museum of Natural History.

Offered as ANTH 394, BIOL 394, GEOl 394, HSTY 394, PHIL 394, ANTH 494, BIOL 494, GEOl 494, HSTY 494, and PHIL 494.

PHIL 396. Undergraduate Research in Evolutionary Biology (3)

Students propose and conduct guided research on an aspect of evolutionary biology. The research will be sponsored and supervised by a member of the CASE faculty or other qualified professional. A written report must be submitted to the Evolutionary Biology Steering Committee before credit is granted.

Offered as ANTH 396, BIOL 396, GEOl 396.
PHIL 399. Directed Study (3)
Open to students in either of the major programs and to minors.

PHIL 403. Topics in Philosophy of Science (3)
In-depth study of selected topics in general philosophy of science or philosophy of physical, biological, or social science. Topics may include: theories of explanation, prediction, and confirmation; semantics of scientific language; reductionism; space, time and relativity; philosophical issues about quantum mechanics; philosophical issues about life sciences (e.g., evolution, teleology, and functional explanation); explanation and understanding in social sciences; value in social science. Recommended preparation: PHIL 101 or PHIL 201 or PHIL 203.
Offered as PHIL 305 and PHIL 304.

PHIL 404. Science and Engineering Ethics (3)
This course prepares students to recognize ethical problems that commonly arise in the scientific and engineering workplace, to understand ethical concepts, to evaluate ethical arguments, and to critically examine responses to problems and their ethical ramifications. It addresses questions such as: What are the criteria of fairness in crediting contributions to research? How safe is safe enough? What are professional responsibilities, and how do they change over time? What is research misconduct? When is ignorance culpable? What is intellectual property and what protections does it deserve? When is biological testing of workers justified? What are responsible ways of raising concerns, and what supports do good organizations give for raising them? What treatment counts as harassment or as an expression of prejudice? What are good means for controlling it? What are scientists’ and engineers’ responsibilities for environmental protection? What is a “conflict of interest” and how is it controlled? What protections for human research subjects are warranted? What, if any, use of animals in research is justified? Recommended preparation: PHIL 101 or PHIL 102 or PHIL 205.
Offered as PHIL 304 and PHIL 404.

PHIL 405. Ethics (3)
Analysis of ethical theories and concepts of goodness, right, and obligation. Discussion of nature of justice, problem of justification of moral principles, and relation between facts and values. Recommended preparation: PHIL 101, PHIL 102 or PHIL 205.
Offered as PHIL 305 and PHIL 405.

PHIL 406. Mathematical Logic and Model Theory (3)
Propositional calculus and quantification theory; consistency and completeness theorems; godel incompleteness results and their philosophical significance; introduction to basic concepts of model theory; problems of formulation of arguments in philosophy and the sciences. Offered as PHIL 306, MATH 406 and PHIL 406.

PHIL 409. Philosophical Issues in Genetics (3)
A philosophical examination of the history and cultural connections of the science of genetics and its precursors. Genetics is a phenomenon of the twentieth century. Thus, it is new. Yet, its implications and dilemmas are enmeshed in old traditions and stereotypes, and the dynamics of cultural change. To explore the breadth of philosophical repercussions of genetics, this course will draw on science, technology, medicine, and their histories, but will also range wider to include aspects of the social history of racism and class relations, changing attitudes toward sexuality, the intricacies of big business and international cooperation, and other such diverse areas. Recommended preparation: PHIL 101 or PHIL 203 or PHIL 204.
Offered as PHIL 309 and PHIL 409.

PHIL 413. Philosophy of Mathematics (3)
Logical paradoxes and their effects on foundations of mathematics. Status of mathematical entities and nature of mathematical truths. Formalist, logicist, and intuitionist positions. Recommended preparation: PHIL 101 or PHIL 201.
Offered as PHIL 313 and PHIL 413.

PHIL 414. Animal Cognition and Consciousness (4)
This course examines the notions of intelligence, cognition, reasoning, consciousness, and mental content as they appear in the philosophical views and empirical studies of animals in individual and social contexts. We will review scientific findings that suggest striking likenesses and intriguing differences in the (apparent) thought processes of humans and animals, and ask whether the research techniques that brought these results are fully adequate to measuring such unobservable entities as conscious experience and thought. Techniques of measurement range from naturalistic observation, to the processing of vocalizations, to memory and problem solving tasks, and the imaging of brain processes through fMRI scans, etc. Students will participate in veterinary or shelter work to provide needed animal care while studying animal behavior using cognitive ethological methods. We will compare methods for measuring consciousness and intelligence in animals to those used for human beings, and ask questions about the possibility of machine consciousness and the emergent property of group consciousness. Offered as BIOL 314, COGS 314, PHIL 314 and PHIL 414.

PHIL 415. Selected Topics in Philosophy (3)
Examination of views of a major philosopher or philosophical school, a significant philosophical topic, or a topic that relates to philosophy and other discipline. Recommended preparation: PHIL 101.

PHIL 416. African Political Thought (3)
Introduction to select themes in the work of contemporary African philosophers, with special emphasis on political thought. In this course, students will learn something about factors affecting the creation and flow of knowledge and ideas about Africa and discuss the relative importance of the “nation-state” as an idea in Europe, pre-colonial Africa, and postcolonial Africa.
Offered as PHIL 316/416 and ETHS 316/416.

PHIL 420. The Phenomenological Tradition (3)
The background of phenomenology: Descartes, Kant, and Brentano. The epistemological rationale of Husserl’s phenomenology and its ontological implications; the powers and limits of the phenomenological method. Heidegger’s transformation of phenomenology to interpretive ontology of human existence. The development of interpretation theory as the foundation of all human existence. The development of interpretation theory as the foundation of all human sciences in Gadamer and Ricoeur. Recommended preparation: PHIL 101. Offered as PHIL 320 and PHIL 420.

PHIL 425. Philosophy of Feminism (3)
Dimensions of gender difference. Definition of feminism. Critical examination of feminist critiques of culture, including especially politics, ideology, epistemology, ethics, and psychology. Readings from traditional and contemporary sources. Offered as PHIL 325 and PHIL 425 and WGST 325.

PHIL 430. Topics in Ethics (3)
Examination of views in ethics of a major philosopher or philosophical school, a significant philosophical topic in ethics, or a topic that relates ethics to philosophy and another discipline. Recommended preparation: PHIL 101, PHIL 102, or PHIL 205.
Offered as PHIL 330 and PHIL 430.

PHIL 433. Philosophy of Religion (3)
Topics include: classical and contemporary arguments for God’s existence; divine foreknowledge and human freedom; the problem of evil and theodicy; nature and significance of religious experience; mysticism; varieties of religious metaphysics; knowledge, belief and faith; nature of religious discourse. Readings from traditional and contemporary sources. Recommended preparation for PHIL 433 and RLGN 433: PHIL 101 or RLGN 102.
Offered as PHIL 333, RLGN 333, PHIL 433, and RLGN 433.

PHIL 434. Political and Social Philosophy (3)
Justification of social institutions, primarily political ones. Such distinctions as that between de facto and legitimate authority; analysis of criteria for evaluation, such as social justice and equality; inquiry into theories of justification of the state; theory of democratic government and its alterna-
PHIL 435. Philosophy of Law (3)  
This is an examination of the general nature of law, the broad concerns of jurisprudence, the study of comparative law, and many of the issues raised in the literature of legal philosophy. Students will examine the principles of legal positivism, mitigated natural law, and rights theory. Selected readings and cases will illustrate these theories, which will also be examined in the context of rule selection by new governments in developing or revolutionary societies. The course also looks at the general nature of legal systems: how politics, morality, and individual views of justice and rights affect particular court cases and the course and development of law generally. Topics will include abortion, obscenity and sin, civil disobedience, affirmative action, surrogatehood, and the death penalty. This is unlike any other of the legal theory or jurisprudence courses, and those who have sampled legal theory elsewhere in a different form are welcome and encouraged to enroll. Recommended preparation: PHIL 101. 
Offered as PHIL 365 and PHIL 435.

PHIL 445. Epistemology and Metaphysics (3)  
Traditional problems of epistemology, such as definition of knowledge, justification of belief, nature of evidence and foundationalism, skepticism, the a priori, and the role of sense perception in knowledge. Metaphysical presuppositions and implications of epistemological views. Forms of realism and anti-realism. Recommended preparation: PHIL 101. 
Offered as PHIL 345 and PHIL 445.

PHIL 455. 19th and Early 20th Century Philosophy (3)  
History of philosophy after Kant up to and including logical empiricism. Interpretation and comparison of important philosophers and philosophical schools of the period in terms of common methods, problems, themes, doctrines, and ideologies. Emphasis on Schopenhauer, Hegel, Kierkegaard, Marx, and Nietzsche. Recommended preparation: PHIL 101. 
Offered as PHIL 355 and PHIL 455.

PHIL 456. Comparative Philosophy (3)  
Comparison of significant philosophers or philosophical schools of non-Western traditions with Western counterparts on metaphysical, epistemological, ethical, aesthetic, and sociopolitical theoretic issues. The non-Western traditions to be considered include the Indian and the Far Eastern, but not exclusively. Discussion, in context, of the problems of comparative hermeneutics. Readings will include original sources in English translation. Recommended preparation: PHIL 101.

PHIL 465. Philosophy of Mind (3)  
Traditional problems such as the relation of mind and body, knowledge of other minds, free will and determination, and nature of psychological explanation. Analysis of chief theories of mind. Analysis of mental concepts such as intention, action, decision, emotion, and will. Recommended preparation: PHIL 101. 
Offered as PHIL 365 and PHIL 465.

PHIL 467. Topics in Evolutionary Biology (3)  
The focus for this course on a special topic of interest in evolutionary biology will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution. ANAT/ANTH/GEOL/PHIL 467/BIOL 468 will require a longer, more sophisticated term paper, and additional class presentation. 
Offered as ANTH 367, BIOL 368, GEOL 367, PHIL 367, ANAT 467, ANTH 467, BIOL 468, GEOL 467, and PHIL 467.

PHIL 470. Philosophy and Literature (3)  
Affinities and tensions between philosophy and literature and issues that arise in their interface. Topics include: philosophical use of literary devices; literary use of philosophical ideas; literary philosophy and philosophical literature; and hermeneutics of literature and philosophy. Readings in philosophy and literature from both traditional and contemporary sources. Team-taught by faculty of the philosophy and literature departments. Recommended preparation: PHIL 101. 

PHIL 494. Seminar in Evolutionary Biology (3)  
This seminar investigates 20th-century evolutionary theory, especially the Modern Evolutionary synthesis and subsequent expansions of and challenges to that synthesis. The course encompasses the multidisciplinary nature of the science of evolution, demonstrating how disciplinary background influences practitioners’ conceptualizations of pattern and process. This course emphasizes practical writing and research skills, including formulation of testable theses, grant proposal techniques, and the implementation of original research using the facilities on campus and at the Cleveland Museum of Natural History. 
Offered as ANTH 394, BIOL 394, GEOL 394, HSTY 394, PHIL 394, ANTH 494, BIOL 494, HSTY 494, and PHIL 494.

PHIL 600. Tutorial (1–18)  
Tutorial.

PHIL 651. Thesis M.A. (1–6)  
For Ph.D. candidates in fields related to philosophy.

DEPARTMENT OF PHYSICS  
Rockefeller Building  
http://phys.case.edu  

The Department of Physics offers programs leading to the following undergraduate degrees: Bachelor of Arts, Bachelor of Science in physics, Bachelor of Science in mathematics and physics, and Bachelor of Science in Engineering with an engineering physics major. Associated with the Bachelor of Science in physics degree are optional concentrations in mathematical physics and in biophysics. The department also offers the graduate degrees Master of Science and Doctor of Philosophy, as well as a unique master’s degree in entrepreneurship.

All of these programs involve the study of the basic laws of nature and the properties of energy and matter in their various forms. The curriculum reflects the varied interests of the faculty and will prepare students for a wide range of future activities. At the undergraduate level, open electives and engineering physics concentration area courses tailor the programs to the student’s interests and career plans. Employment opportunities at the bachelor’s level include research, development, and technical assistance (engineering, computer programming, management) in industrial, government, and university settings.

A similar flexibility exists in the first few years of graduate study. The research leading to the Ph.D. degree normally centers on a specific area of physics. However, even at this stage, the broad background and training characteristic of a physics degree are emphasized.

DEPARTMENT FACULTY  
Daniel S. Akerib, Ph.D.  
(Princeton University)  
Professor and Chair  
Experimental astrophysics

Robert W. Brown, Ph.D.  
(Massachusetts Institute of Technology)  
Institute Professor  
Particle physics theory; cosmology; medical imaging; industrial physics

Gary S. Chottiner, Ph.D.  
(University of Maryland)  
Professor and Director of Undergraduate Studies  
Experimental physics of surfaces and thin films

Corbin E. Covault, Ph.D.  
(Harvard University)
Associate Professor
Experimental high-energy astrophysics
Diana I. Driscoll, Ph.D.
(Case Western Reserve University)
Instructor
Introductory physics
David E. Farrell, Ph.D.
(University of London)
Professor
Experimental condensed matter physics; superconductors; medical physics
Xuan Gao, Ph.D.
(Columbia University)
Assistant Professor
Experimental condensed matter physics; nanomaterials; correlated electrons in low dimensions
Kathleen Kash, Ph.D.
(Massachusetts Institute of Technology)
Professor and Associate Chair
Experimental condensed matter and mesoscopic physics; synthesis of novel semiconductors
Kenneth L. Kowalski, Ph.D.
(Brown University)
Professor
Theoretical and experimental particle physics
Walter R. Lambrecht, Ph.D.
(University of Ghent)
Professor
Theoretical condensed matter physics; electronic structure-based physics of materials
Harsh Mathur, Ph.D.
(Yale University)
Associate Professor
Condensed matter theory, particle-astrophysics theory
Rolfe G. Petschek, Ph.D.
(Harvard University)
Professor
Theoretical condensed matter; optical materials
Charles Rosenblatt, Ph.D.
(Harvard University)
Professor and Director of Graduate Studies
Experimental condensed matter; liquid crystals and complex fluids
John E. Ruhl, Ph.D.
(Princeton University)
Professor
Experimental astrophysics and cosmology
Jie Shan, Ph.D.
(Columbia University)
Associate Professor
Experimental condensed matter physics; ultrastable optics; terahertz spectroscopy
Thomas A. Shutt, Ph.D.
(University of California, Berkeley)
Agnar Pytte Professor; Associate Professor
Experimental astrophysics
Kenneth D. Singer, Ph.D.
(University of Pennsylvania)
Ambrose Swasey Professor of Physics; Director, Engineering Physics
Experimental condensed matter physics; nonlinear optics
Glenn D. Starkman, Ph.D.
(Stanford University)
Professor; Director, Center for Education and Research in Cosmology and Astrophysics (CERCA)
Theoretical cosmology, particle physics, astrophysics
Cyrus C. Taylor, Ph.D.
(Massachusetts Institute of Technology)
Albert A. Michelson Professor in Physics; Dean, College of Arts and Sciences
Theoretical and experimental particle physics; physics entrepreneurship
Philip L. Taylor, Ph.D.
(University of Cambridge)
Perkins Professor of Physics
Theory of solids, polymers and other materials
Norman Tien, Ph.D.
(University of California, Berkeley)
Professor and Ohio Eminent Scholar in Condensed Matter Physics; Dean, Case School of Engineering
MEMS for micro-optical applications in communications and biomedical systems
Tanmay Vachaspati, Ph.D.
(Tufts University)
Professor
Theoretical astrophysics, cosmology, particle physics
Secondary Faculty
J. Iwan Alexander, Ph.D.
(Washington State University)
Professor of Mechanical and Aerospace Engineering, Case School of Engineering
Fluid dynamics, energy research
Michael Dragowsky, Ph.D.
(Oregon State University)
Research Associate Professor
Nuclear and particle astrophysics experiment
Mark A. Griswold, Ph.D.
(University of Wuerzburg)
Associate Professor of Radiology, School of Medicine
Medical imaging, MRI
Eckhard Jankowsky, Ph.D.
(Dresden Institute of Technology)
Associate Professor of Biochemistry, School of Medicine
Proteins and enzymes; structural biology; regulation of gene expression
R. Earle Luck, Ph.D.
(University of Texas at Austin)
Worcester R. and Cornelia B. Warner Professor of Astronomy
Stellar and galactic chemical evolution; stellar spectrophotometry
J. Christopher Mihos, Ph.D.
(Australian National University)
Professor of Astronomy
Galactic structure; stellar populations; dark matter
Idit Zehavi, Ph.D.
(Hebrew University of Jerusalem)
Assistant Professor of Astronomy
Astrophysics
Lecturer
Edward M. Caner, M.S.
(Case Western Reserve University)
Director, Science and Technology Entrepreneurship Program
Science entrepreneurship
Adjunct Faculty
James H. Andrews, Ph.D.
(Case Western Reserve University)
Professor of Physics, Youngstown State University
Optical materials
Pierre Carles, Ph.D., Habilitation
(National Polytechnic Institute, Toulouse)
Associate Professor, Université Pierre et Marie Curie, Paris
Fluid mechanics; critical behavior; stability
Craig J. Copi, Ph.D.
(University of Chicago)
Adjunct Instructor; Senior Research Associate
Theoretical cosmology; particle physics; astro-
Undergraduate Programs

Theoretical condensed matter physics; polymers and biological physics
Volodymyr Duzhko, Ph.D.
(Technical University of Munich)
Visiting Assistant Professor

Experimental condensed matter physics; molecular optoelectronics and photovoltaics

UNDERGRADUATE PROGRAMS

Majors

Course requirements and typical schedules for the majors are summarized in the tables below.

BACHELOR OF ARTS IN PHYSICS

The B.A. physics major includes a large number of elective courses, making it easy for the student to pursue other interests or complete a second major while earning a degree in physics.

Teacher Licensure Option

A program in teacher certification (grades 7-12), based on the B.A. degree, is available for students interested in teaching physics at the secondary level. In addition to content (subject area) requirements, a 36 semester-hour sequence in professional education is required, comprising courses taken at Case Western Reserve University and at John Carroll University, and culminating in student teaching. (For details on education course work, see the program description for Teacher Licensure elsewhere in this bulletin.)

BACHELOR OF SCIENCE IN PHYSICS

The B.S. degree has two alternatives to the standard program: a mathematical physics concentration and a biophysics concentration.

B.S.E. DEGREE IN ENGINEERING PHYSICS

The B.S.E. degree in engineering physics supplies an excellent background for graduate studies in physics, but is also designed for students who value an engineering credential and who are considering a career in engineering, either through employment following the B.S.E. or through engineering graduate studies. This degree is awarded by the Case School of Engineering and includes the Engineering Core Curriculum. The technical electives in this program are concentrated in any of fifteen specific engineering areas.

B.S. IN MATHEMATICS AND PHYSICS

The B.S. in mathematics and physics is a single degree for students interested in both advanced mathematics and theoretical physics and in their relationships. This degree is distinct from the mathematical physics concentration in the B.S. in physics degree. The program is jointly administered by the Departments of Physics and Mathematics, and students may be advised by faculty members from either department.

All B.S., B.A. and B.S.E. candidates complete a year-long senior project in which they work one-on-one with a faculty researcher, write a senior thesis, and present their work in public.

Minor

Course requirements for the minor in physics are as follows:

1. PHYS 121 (or 115 or 123), PHYS 122 (or 116 or 124), and PHYS 221
2. Two or three* of the following courses: PHYS 196, 204 or 208, 309, 310, 313, 315, 316, 326, 331, 332, 324, 328 or 336

*The Case School of Engineering has a policy stating that “no more than two courses taken for the minor may be used simultaneously to satisfy the requirements of the student’s major field, including departmental requirements, technical electives and the Engineering Core.” Thus, engineering students may have to choose between using physics courses as technical electives or counting them as part of a minor in physics.

Graduate Programs

The Department of Physics offers programs of study and research leading to both the Master of Science and the Doctor of Philosophy degrees. Graduate assistantships are available for the full-time support of qualified students. All M.S. programs in physics, with or without a thesis, normally can be completed in less than two years. The requirements for the Ph.D. degree in physics include a flexible program of courses that typically is completed within three years, and a concurrent program of directed research with less course work and more research in each succeeding year.

Master of Science in Entrepreneurship

In addition to a traditional physics program, the department has created a Physics Entrepreneurship master’s degree program, which is part of the university’s larger Science and
Technology Entrepreneurship Program. This two-year program is designed to empower physicists as entrepreneurs. It enables students and graduates to build on their physics skills to start new high-tech businesses or to launch new product lines in existing companies. The program provides top-level academic instruction and real-world entrepreneurial experience while connecting students with the business executives and leaders, experts, and venture capitalists who are crucial to success in startup and growing ventures.

Doctor of Philosophy

For the Ph.D. degree, the student is required to pass a general qualifying examination in physics, which is normally taken after the first year of study, and a topical oral examination within one year of joining a research group. The student must then prepare a dissertation based on the results of independent research. There is no foreign language requirement. Research pursuant to any of the graduate degree programs in physics may be carried out in five areas:

Condemned Matter Physics. An extensive experimental and theoretical program in the electronic properties of solids; quantum liquids; mesoscopic physics; localization and quantum Hall effect; the physics of polymers, liquid crystals and complex fluids; thin films; fluids dynamics; materials synthesis; the physics of surfaces and interfaces; electronic structure of materials and their defects; vibrational properties of solids (phonons); magnetism and magnetic materials; nano- and organic electronics.

Particle Astrophysics and Cosmology. The experimental efforts in this area include the study of the nature of dark matter in the universe, observations of high-energy gamma rays and cosmic rays, and measurements of the cosmic microwave background. Theoretical studies include neutrino astrophysics, stellar evolution, the cosmic microwave background, extra dimensions, gravitational lensing, dark matter, large-scale structure, extra dimensions, topological defects, phase transitions, and early-universe cosmology. Other related work includes activities in general relativity.

The Center for Education and Research in Cosmology and Astrophysics (CERCA) comprises groups from the Departments of Physics and Astronomy and the Cleveland Museum of Natural History. The center organizes international conferences, hosts visitors and lectures, and supports students and faculty in their research. As it grows, it will provide postdoctoral research positions and will also prepare public programs on cosmology and astrophysics.

Elementary Particle Physics. Theoretical studies in the strong, weak, and electromagnetic interactions of the elementary particles, and in all areas of particle theory, gravitation, and cosmology.

Optics and Optical Materials. Both experimental and theoretical programs in nonlinear optics, integrated optics, ultrashot optics, and the optical properties of fluids, liquid crystals, polymers, and crystals, including semiconductors, semiconductor mesoscopic systems, photonic crystals, and nanoscopic systems.

Imaging Physics, Biophysics, and Inverse Problems. An experimental and theoretical program in aspects of non-invasive imaging, including magnetic resonance imaging and ultrasound; medical diagnostic techniques to measure iron in the liver; industrial and medical applications in electromagnetic field modeling.

REQUIREMENTS TABLES FOR PHYSICS PROGRAMS

Bachelor of Arts in Physics

The Bachelor of Arts degree with a physics major requires completion of the Arts and Sciences General Education Requirements (GER) and 120 total credits, of which 60 are specified by the Physics department as shown below. Courses specified for this major satisfy the 6-credit Arts and Sciences GER Sciences and Mathematics.

Choose 2 of the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Semesters</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 310</td>
<td>Clas. Mech</td>
<td>2S</td>
</tr>
<tr>
<td>PHYS 324</td>
<td>E&amp;M I</td>
<td>3S</td>
</tr>
<tr>
<td>PHYS 315</td>
<td>Solid State</td>
<td>4F</td>
</tr>
<tr>
<td>PHYS 316</td>
<td>Nucl. &amp; Par.</td>
<td>4S</td>
</tr>
<tr>
<td>PHYS 326</td>
<td>Optics</td>
<td>S</td>
</tr>
<tr>
<td>PHYS 327</td>
<td>Quan. Elec.</td>
<td>4S</td>
</tr>
<tr>
<td>PHYS 328 or 330</td>
<td>Cosmology</td>
<td></td>
</tr>
<tr>
<td>PHYS 365</td>
<td>Gen. Rel.</td>
<td>4S</td>
</tr>
</tbody>
</table>

Total 37

Requirements Tables for Physics Programs

<table>
<thead>
<tr>
<th>Course</th>
<th>Yr</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 115,121 or 123</td>
<td>Intro Mech</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 116, 122 or 124</td>
<td>Intro E&amp;M</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 221</td>
<td>Modern</td>
<td>2</td>
</tr>
<tr>
<td>PHYS 250</td>
<td>CompMeth</td>
<td>2S</td>
</tr>
<tr>
<td>PHYS 203A</td>
<td>ElecLabBA</td>
<td>3F</td>
</tr>
<tr>
<td>PHYS 301B</td>
<td>AdvLabBA</td>
<td>3F</td>
</tr>
<tr>
<td>PHYS 303</td>
<td>AdvLabSem</td>
<td>3F</td>
</tr>
<tr>
<td>PHYS 313</td>
<td>Thermo</td>
<td>3F</td>
</tr>
<tr>
<td>PHYS 331</td>
<td>QM I</td>
<td>3F</td>
</tr>
<tr>
<td>PHYS 351</td>
<td>Sr. Proj.</td>
<td>4</td>
</tr>
</tbody>
</table>

1Course usually taken in this year; F or S indicates it is offered only in the fall or spring.

2PHYS 303 + PHYS 352 satisfy the SAGES departmental seminar requirement. PHYS 351 is an approved SAGES capstone course.

3Students may choose only one of these two courses to satisfy the requirements of the B.A. degree.

A two-course science sequence chosen from...
Th e Bachelor of Science in Physics requires completion of the courses listed in the table below as well as the Arts and Sciences General Education Requirements, for a total of 127 credits. Many courses may be taken at times other than those shown in the following tables.

**Bachelor of Science in Physics**

<table>
<thead>
<tr>
<th>Course</th>
<th>Year</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 121 or 123</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 122 or 124</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 221</td>
<td>Modern</td>
<td>2</td>
</tr>
<tr>
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**Typical Schedule**

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CHEM 106 or ENGR 145
ENGR 131
MATH 121 or 123
MATH 122 or 124
MATH 223 or 227
MATH 224
PHED 2 semesters
SAGES first/univ. sem.
Breadth requirements
Open electives
Total

1st Year
PHYS 121 or PHYS 123
PHYS 124
MATH 121
CHEM 105 or CHEM 111
ENGR 131
FS** SAGES First Seminar
PHED ***

2nd Year
PHYS 203
PHYS 221
MATH 223
CHEM 106 or ENGR 145
PHYS 124
US** University Seminar
PHED ***

3rd Year
PHYS 204
PHYS 250
PHYS 310
MATH 224
PHYS 303
PHYS 351
PHYS 352

4th Year
PHYS 235
PHYS 351
PHYS 352
PHYS 3**

*Course usually taken in this year; F or S indicates it is offered only in the fall or spring.

2PHYS 303 + PHYS 352 satisfy the SAGES departmental seminar requirement. PHYS 351 is an approved SAGES capstone course.

3Or other approved computational course.

4The breadth requirements include 6 hours of Social Sciences and 6 hours of Arts and Humanities. This may increase by 3 credits if the required Global and Cultural Diversity course is not also one of the breadth requirement courses. Courses required for the B.S. in physics satisfy the 6-credit GER for Natural Sciences and Mathematics as well as the Quantitative Reasoning course requirement.

5The number of open electives may vary, depending on how many credits a student needs to reach the required total of 127.

Typical Schedule

Fall (Class Hours-Lab Hours-Credit Hours)
Spring (Class Hours-Lab Hours-Credit Hours)

* = wildcard, variable choice of letter or number

Bachelor of Science in Physics with Mathematical Physics Concentration

Students who are interested in theoretical physics and who have a strong background in mathematics may consider this concentration. The program is based on the B.S. in physics, but with certain substitutions in the course requirements. Several of the laboratory courses are replaced by advanced mathematics courses, and some of the undergraduate physics courses are replaced by graduate courses.
COLLEGE OF ARTS & SCIENCES

This program is not the same as the separate degree program, the B.S. in mathematics and physics, which is a coherent and parallel education in both mathematics and physics.

The following table shows the requirements for the Bachelor of Science in physics with mathematical physics concentration. Those courses in the standard B.S. program that are replaced are shown in brackets and are followed by their replacements.

<table>
<thead>
<tr>
<th>Course</th>
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<td>Intro E&amp;M</td>
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<td>PHYS 221</td>
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<td>2F</td>
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<tr>
<td>PHYS 204</td>
<td>Instr Lab</td>
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<tr>
<td>PHYS 250</td>
<td>CompMeth</td>
<td>2S</td>
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<td>Clas. Mech.</td>
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<td>[QM 1] QM I grad</td>
<td>[3F]</td>
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<td>[PHYS 324] M-group 4</td>
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<tr>
<td>PHYS 353</td>
<td>SrProjSem</td>
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CHOOSE 1 of the following 3:

| PHYS 315 | Solid State | 4F |
| PHYS 326 | Phys. Optics | S |
| PHYS 327 | Quant. Elec. | 4S |

CHOOSE 1 of the following 4:

| PHYS 316 | Nuc. Particle | 4S |
| PHYS 328 | Cosmo. Univ. | 4 |
| PHYS 336 | Mod. Cosmo. | 4 |
| PHYS 365 | General Rel. | 4F |

Subtotal | 65 |

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<td>CHEM 106 or ENGR 145</td>
<td>Chem 2</td>
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<td>ENGR 131</td>
<td>CompP</td>
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<td>MATH 121 or 123</td>
<td>Calc 1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 122 or 124</td>
<td>Calc 2</td>
<td>4</td>
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<tr>
<td>MATH 223 or 227</td>
<td>Calc 3</td>
<td>3</td>
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<tr>
<td>MATH 224</td>
<td>Diff E</td>
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<tr>
<td>PHED 2 semesters</td>
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</tbody>
</table>

Subtotal | 23 (25) |

| SAGES first/univ. sem. | 1&2 |
| Breadth requirements* | | |
| Open electives* | 38 |

Total | 127 |

*Course usually taken in this year; F or S indicates it is offered only in the fall or spring.

The following table shows the requirements for the Bachelor of Science in physics with mathematical physics concentration. Those courses in the standard B.S. program that are replaced are shown in brackets and are followed by their replacements.

<table>
<thead>
<tr>
<th>Course</th>
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<th>Credits</th>
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<tr>
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<td>Electricity &amp; Magnetism</td>
<td>(4-3-4)</td>
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<td>(4-0-4)</td>
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<tr>
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<tr>
<td>CHEM 106 or ENGR 145</td>
<td>University Seminar (3-0-3)</td>
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<tr>
<td>US** University Seminar</td>
<td>(3-0-3)</td>
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<tr>
<td>Humanities/ Social Science Elective</td>
<td>(3-0-3)</td>
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<tr>
<td>PHED *** Physical Education Activities</td>
<td>(0-3-0)</td>
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Typical Schedule

<table>
<thead>
<tr>
<th>1st Year</th>
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<td>Fall (Class Hours-Lab Hours-Credit Hours)</td>
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<tr>
<td>Humanities/ Social Science Elective</td>
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<tr>
<td>PHED *** Physical Education Activities</td>
</tr>
</tbody>
</table>

6The number of open electives may vary, depending on the number of credits a student needs to reach the required total of 127.

6Course not also one of the breadth requirement courses. Courses required for the B.S. in physics satisfy the 6-credit GER for Natural Sciences and Mathematics as well as the Quantitative Reasoning course requirement.

6The number of open electives may vary, depending on the number of credits a student needs to reach the required total of 127.
Bachelor of Science in Physics with Biophysics Concentration

This concentration is directed towards students interested in the combined study of biology and physics. The degree is a track within the standard B.S. in physics, in which four physics courses and certain open electives are replaced by a "biogroup" of five courses and a technical elective. All substitutions must be approved by a physics faculty committee.

The following table illustrates the requirements for the Bachelor of Science in physics with biophysics concentration. Those courses in the standard B.S. program that are replaced are shown in brackets; their replacements are found either in the same entry or in the biogroup category.

<table>
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<th>Credits</th>
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<td>PHYS 203 Elec Lab</td>
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<td>PHYS 204 Instr Lab</td>
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<td>PHYS 250 CompLab</td>
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<tr>
<td>PHYS 313 Thermo</td>
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</table>

B-group 1

B-group 2

B-group 3

B-group 4

B-group 5

Electives

Subtotal

Total

Credits

Bachelor of Science in Physics with Biophysics Concentration

This concentration is directed towards students interested in the combined study of biology and physics. The degree is a track within the standard B.S. in physics, in which four physics courses and certain open electives are replaced by a "biogroup" of five courses and a technical elective. All substitutions must be approved by a physics faculty committee.

The following table illustrates the requirements for the Bachelor of Science in physics with biophysics concentration. Those courses in the standard B.S. program that are replaced are shown in brackets; their replacements are found either in the same entry or in the biogroup category.

<table>
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<th>Course</th>
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<tr>
<td>PHYS 313 Thermo</td>
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</table>

B-group 1

B-group 2

B-group 3

B-group 4

B-group 5

Electives

Subtotal

Total

Credits

Bachelor of Science in Physics with Biophysics Concentration

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<th>Course</th>
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<tr>
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B-group 1

B-group 2

B-group 3

B-group 4

B-group 5

Electives

Subtotal

Total

Credits
1 Course usually taken in this year; F or S indicates it is offered only in the fall or spring.
2 Suggested technical electives include PHYS 315, 316, 326, 327, 328, 336, 365.
3 PHYS 303 + PHYS 352 satisfy the SAGES departmental seminar requirement. PHYS 351 is an approved SAGES capstone course.
4 Or other approved computational course.
5 B-group 1-5 are to be chosen from among approved biology, biophysics, biochemistry, and biomedical engineering courses, including certain prerequisites as needed (e.g., chemistry). BIOL 214 and BIOL 215 are suggested for B-group 1 and 2. The listing of credits includes numbers for the most likely choices of courses and, in parentheses, possible alternatives.
6 The breadth requirements include 6 hours of Social Sciences and 6 hours of Arts and Humanities. This may increase by 3 credits if the required Global and Cultural Diversity course is not also one of the breadth requirement courses. Courses required for the B.S. in physics satisfy the 6-credit GER for Natural Sciences and Mathematics as well as the Quantitative Reasoning course requirement.

The number of open electives may vary, depending on the number of credits a student needs to reach the required total of 127.

### Typical Schedule

<table>
<thead>
<tr>
<th>Fall</th>
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<td><strong>PHYS 121 or PHYS 123</strong> Mechanics (4-3-4)</td>
<td><strong>PHYS 122 or PHYS 124</strong> Electricity &amp; Magnetism (4-3-4)</td>
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<tr>
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<th>3rd Year</th>
<th>4th Year</th>
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<tr>
<td><strong>PHYS 203</strong> Analog &amp; Digital Electronics (2-4-4)</td>
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<td><strong>PHYS 325</strong> Electricity and Magnetism II (3-0-3)</td>
<td><strong>PHYS 351</strong> Senior Physics Project (0-6-2)</td>
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<td><strong>PHYS 221</strong> General Physics III – Modern Physics (3-0-3)</td>
<td><strong>MATH 223</strong> Calculus for Science &amp; Engineering III (3-0-3)</td>
<td><strong>PHYS 351</strong> Senior Physics Project (0-6-2)</td>
<td><strong>PHYS 352</strong> Senior Physics Project Seminar (1-0-1)</td>
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<td><strong>Humanities/ Social Science Elective (3-0-3)</strong></td>
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<td><strong>PHYS 204</strong> Advanced Instrumentation Lab (2-4-4)</td>
<td><strong>PHYS 250</strong> Mathematics, Physics and Computing (3-0-3)</td>
<td><strong>Open Elective (3-0-3)</strong></td>
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<td><strong>PHYS 204</strong> Advanced Instrumentation Lab (2-4-4)</td>
<td><strong>PHYS 250</strong> Mathematics, Physics and Computing (3-0-3)</td>
<td><strong>PHYS 310</strong> Classical Mechanics (3-0-3)</td>
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<td><strong>Open Elective (3-0-3)</strong></td>
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<tr>
<td><strong>US</strong> University Seminar (3-0-3)</td>
<td><strong>PHYS 301</strong> Advanced Laboratory Physics I (0-8-4)</td>
<td><strong>PHYS 303</strong> Advanced Laboratory Physics Seminar (1-0-1)</td>
<td><strong>PHYS 313</strong> Thermodynamics &amp; Statistical Mech. (3-0-3)</td>
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<tr>
<td><strong>PHYS 301</strong> Advanced Laboratory Physics I (0-8-4)</td>
<td><strong>PHYS 303</strong> Advanced Laboratory Physics Seminar (1-0-1)</td>
<td><strong>PHYS 313</strong> Thermodynamics &amp; Statistical Mech. (3-0-3)</td>
<td><strong>PHYS 331</strong> Introduction to Quantum Mechanics I (3-0-3)</td>
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<tr>
<td><strong>PHYS 313</strong> Thermodynamics &amp; Statistical Mech. (3-0-3)</td>
<td><strong>PHYS 331</strong> Introduction to Quantum Mechanics I (3-0-3)</td>
<td><strong>PHYS 331</strong> Introduction to Quantum Mechanics I (3-0-3)</td>
<td><strong>PHYS 351</strong> Senior Physics Project (0-6-2)</td>
</tr>
<tr>
<td><strong>PHYS 351</strong> Senior Physics Project (0-6-2)</td>
<td><strong>PHYS 352</strong> Senior Physics Project Seminar (1-0-1)</td>
<td><strong>PHYS 352</strong> Senior Physics Project Seminar (1-0-1)</td>
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<td><strong>Open Elective (3-0-3)</strong></td>
<td><strong>Open Elective (3-0-3)</strong></td>
<td><strong>Open Elective (3-0-3)</strong></td>
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</table>

**Bachelor of Science in Engineering with Engineering Physics Major**

The engineering physics major allows students with strong interests in both physics and engineering to concentrate their studies in the common areas of these disciplines. The major...
prepares students to pursue careers in industry, either directly after undergraduate study or continuing graduate study in engineering or physics. Many employers value the unique problem-solving approach of physics, especially in industrial research and development.

Students majoring in engineering physics complete the Engineering Core as well as a rigorous course of study in physics. Students select a concentration area from an engineering discipline, and must complete a sequence of at least four courses in this discipline. In addition, a senior research project under the guidance of a faculty member is required. The project includes a written report and participation in the senior seminar and symposium.

### Typical Schedule

**1st Year**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Spring</th>
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<tbody>
<tr>
<td>PHYS 121</td>
<td>PHYS 122</td>
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<tr>
<td>General Physics I. Mechanics (4-3-4)&lt;sup&gt;#&lt;/sup&gt;</td>
<td>General Physics II. Electricity &amp; Magnetism (4-3-4)&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td>MATH 121</td>
<td>MATH 122</td>
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<tr>
<td>Calculus for Science and Engineering I (4-0-4)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Calculus for Science and Engineering II (4-0-4)&lt;sup&gt;a&lt;/sup&gt;</td>
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<td>ENGR 131</td>
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<tr>
<td>Principles of Chemistry for Engineers (4-0-4)</td>
<td>Elementary Computer Programming (2-2-3)</td>
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<td>FS** SAGES</td>
<td>ENGR 145</td>
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<tr>
<td>First Seminar</td>
<td>Chemistry of Materials (4-0-4)</td>
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<tr>
<td>(4-0-4)</td>
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<td>Thermodynamics &amp; Statistical Mech. (3-0-3)&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>Engineering Physics Lab I(0-3-3)</td>
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<td>PHYS 331</td>
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<td>Introduction to Quantum Mechanics I(3-0-3)&lt;sup&gt;c&lt;/sup&gt;</td>
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**2nd Year**

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<td>PHYS 221</td>
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<tr>
<td>General Physics III – Modern Physics (3-0-3)</td>
<td>Introduction to Solid State Physics (3-0-3)</td>
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<td>MATH 223</td>
<td>PHYS 325</td>
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<tr>
<td>Calculus for Science &amp; Engineering III (3-0-3)</td>
<td>Electricity and Magnetism III(3-0-3)</td>
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<td>ENGR 200</td>
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<td>Statics and Strength of Materials (3-0-3)</td>
<td>Classical Mechanics (3-0-3)</td>
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<td>ENGR 210</td>
<td>MATH 224</td>
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<td>Circuits &amp; Instrumentation (3-2-4)</td>
<td>Differential Equations (3-0-3)</td>
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<td>ENGR 225 Thermodynamics, Fluids, Heat &amp; Mass Transfer (4-0-4)</td>
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**3rd Year**

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<td>Instrumentation and Signal Analysis Lab (2-4-4)</td>
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<td>Total (14-4-16)</td>
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**4th Year**

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<tr>
<td>PHYS 318</td>
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<td>Engineering Physics Lab II(2-4-4)</td>
<td>PHYS 327/427, EEAP 321, EEAP 420, EMSE 314, or EMSE. Students may choose to fulfill this requirement in their third year.</td>
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**Hours required for graduation:** 129

<sup>a</sup>Selected students may be invited to take MATH 123, 124, 227, and 228 in place of MATH 121, 122, 223, and 224.

<sup>b</sup>Selected students may be invited to take PHYS 123, 124 (Physics and Frontiers I, II Honors) in place of PHYS 121, 122.

<sup>c</sup>Engineering physics concentration courses are flexible, but they must be in a specific engineering discipline or study area and approved by an advisor. Possible concentration areas include aerospace engineering, biomedical engineering “hardware,” biomedical engineering “software,” chemical engineering, civil engineering (solid mechanics, structural and geotechnical, environmental), computer science, computer systems hardware, computer systems software, control systems and automation, electrical engineering, macro-molecular science, materials science and engineering, mechanical engineering, mechanical engineering, signal processing, systems analysis and decision making.

<sup>d</sup>PHYS 332, PHYS 327/427, EEAP 321, EEAP 420, EMSE 314, or EMSE. Students may choose to fulfill this requirement in their third year.
### Bachelor of Science in Mathematics and Physics

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>Open electives</td>
<td></td>
<td>16*</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>126</td>
</tr>
</tbody>
</table>

*Course usually taken in this year; F or S indicates it is offered only in the fall or spring.

*Other science sequence courses may be substituted if approved by the mathematics and physics (MP) committee.

*Of other approved computational course

The “MP group” of four courses corresponds to two physics courses and two mathematics courses. The physics courses are chosen from PHYS 250, 349, and 350. The mathematics courses are subject to approval by the MP committee and are hence referred to as “approved electives.” They may be chosen from the general list of mathematics courses at the 300 level or higher. It may also be possible to choose a course outside the Mathematics and Physics departments as a substitute in the MP group, subject to approval by the committee.

*An advanced physics course to be selected from the following list: PHYS 315, 316, 326, 327, 328, 336, 365.

*PHYS 303 + PHYS 352 satisfy the SAGES departmental seminar requirement. PHYS 351 is an approved SAGES capstone course.

*Students may take either the math or physics SAGES departmental seminar. The physics version consists of 1 credit of PHYS 303 plus two credits of PHYS 352.

*The breadth requirements include 6 hours of Social Sciences and 6 hours of Arts and Humanities. This may increase by 3 credits if the required Global and Cultural Diversity course is not also one of the breadth requirement courses. Courses required for the B.S. in Mathematics and Physics satisfy the 6-credit GER for Natural Sciences and Mathematics as well as the Quantitative Reasoning course requirement.

*The number of open electives may vary, depending on how many credits the student needs to reach the required total of 126.
can benefit from simple physical analyses. This discourse, ranging from the believability of ESP to Pseudo-Science (3)

PHYS 101. Distinguishing Science from Pseudo-Science (3)

There are many current issues arising in popular discourse, ranging from the believability of ESP to reincarnation, to “free energy” machines, which can benefit from simple physical analyses. This course will provide an introduction to the use of basic principles of physics to explore the viability of these ideas. A seminar format will be utilized with specific topics presented by students and by the instructor. Recommended preparation: PHYS 100, PHYS 115, PHYS 121, or PHYS 123.

PHYS 115. Introductory Physics I (4)

First part of a two-semester sequence directed primarily towards students working towards a B.A. in science, with an emphasis on the life sciences. Kinematics. Newton’s laws; gravitation; simple harmonic motion; mechanical waves; fluids; ideal gas law; heat and the first and second laws of thermodynamics. This course has a laboratory component.

PHYS 116. Introductory Physics II (4)

Electrostatics, Coulomb’s law, Gauss’s law; capacitance and resistance; DC circuits; magnetic fields; electromagnetic induction; RC and RL circuits; light; geometrical optics; interference and diffraction; special relativity; introduction to quantum mechanics; elements of atomic, nuclear and particle physics. This course has a laboratory component.

PHYS 121. General Physics I - Mechanics (4)

Particle dynamics, Newton’s laws of motion, energy and momentum conservation, rotational motion, and angular momentum conservation. This course has a laboratory component. Recommended preparation: MATH 121 or MATH 123 or MATH 125 or one year of high school calculus.

PHYS 122. General Physics II - Electricity and Magnetism (4)

Electricity and magnetism, emphasizing the basic electromagnetic laws of Gauss, Ampere, and Faraday. Maxwell’s equations and electromagnetic waves, interference, and diffraction. This course has a laboratory component. Recommended preparation: PHYS 121 or PHYS 123, or PHYS Elective MATH 122 or MATH 124 or MATH 126.

PHYS 123. Physics and Frontiers I - Mechanics (4)

The Newtonian dynamics of a particle and of rigid bodies. Energy, momentum, and angular momentum conservation with applications. A selection of special frontier topics as time permits, including fractals and chaos, special relativity, fluid mechanics, cosmology, quantum mechanics. This course has a laboratory component. Admission to this course is by invitation only.

PHYS 124. Physics and Frontiers II - Electricity and Magnetism (4)

Time-independent and time-dependent electric and magnetic fields. The laws of Coulomb, Gauss, Ampere, and Faraday. Microscopic approach to dielectric and magnetic materials. Introduction to the usage of vector calculus; Maxwell’s equations in integral and differential form. The role of special relativity in electromagnetism, Electromagnetic radiation. This course has a laboratory component. Prereq: PHYS 123, or PHYS Elective MATH 122 or MATH 124.

PHYS 137. The Scientific Frontier: Origins, from the Big Bang to Life on Earth (3)

This course will provide undergraduates, both science and non-science majors, with a general perspective of the modern state of our physical understanding of the universe, including outstanding puzzles at the forefront of modern science, focusing on the questions of origins: the origin of the universe, of our galaxy, of matter, of life, etc.

PHYS 166. Physics Today and Tomorrow (1)

This course will provide students with an opportunity to learn about the most exciting and timely research areas in physics, as well as other topics germane to being a professional physicist. These discussions will cover fields such as nanoscience, ultrafast optics, exotic materials, biophysics, cosmology, string theory and the role of physicists in developing new technologies. Each week a member of the faculty will meet with students to discuss a topic of current interest, how a physicist approaches the problem, and how physicists interact with others to find a solution. Other topics germane to being a professional physicist also will be discussed, including the relationship among academic, industrial, and governmental laboratories; ethics, and non-traditional careers for students trained in physics.

PHYS 203. Analog and Digital Electronics (4)

Elements of both analog and digital electronics from the practical viewpoint of the experimental scientist; AC circuits, linear and non-linear operation of op-amps, logic gates, flip-flops, counters, display, memory, transducers, A/D and D/A conversion. Laboratory work involves quantitative investigation of the operation of all these elements, together with projects that explore their combination. Recommended preparation: PHYS 122 or PHYS 124.

PHYS 203A. Analog and Digital Electronics for B.A. (2)

This course is the first half of the laboratory requirement for the B.A. degree in Physics and is the first half of PHYS 203. Elements of both analog and digital electronics from the practical viewpoint of the experimental scientist; AC circuits, linear and non-linear operation of op-amps, digital circuits including logic gates. This course includes weekly lecture and laboratory work in electronics; it may also include an additional weekly lecture, associated with PHYS 301, on topics such as error
PHYS 204. Advanced Instrumentation Laboratory (4)
Principles of experimental design; limits of resolution via band-width, thermal noise, background signals; data acquisition and control by computer; computer simulation; signal processing techniques in frequency and time domains; FFT, correlations, and other transform methods; counting techniques. Applications include lock-in amplifiers, digitizing oscilloscopes and data acquisition systems. Recommended preparation: PHYS 203 and PHYS 221.

PHYS 208. Instrumentation and Signal Analysis Laboratory (4)
AC circuit theory, Fourier series, discrete Fourier analysis; analysis in time and frequency domains, correlation, cross-correlation and other transform techniques; computer control of experiments via IEEE488 interface; advanced instrumentation; DMM, arbitrary waveform generator, multiplexing and digitizing oscilloscopes; experimental design; noise; design, construction, and testing of a lock-in amplifier. Recommended preparation: PHYS 221.

PHYS 221. Introduction to Modern Physics (3)
Concepts in special relativity, statistical mechanics and quantum mechanics. Applications to atomic structure, and selected topics in nuclear, condensed matter physics, particle physics, and cosmology. Prereq: PHYS 116 or PHYS 122 or PHYS 124.

PHYS 250. Computational Methods in Physics (3)

PHYS 301. Advanced Laboratory Physics I (3)
Problem solving approach with a range of available experiments in classical and modern physics. Emphasis on experimental techniques, data and error analysis, and the formal presentation of the work performed. Recommended preparation: PHYS 203 or PHYS 203A and concurrent enrollment in PHYS 303.

PHYS 302. Advanced Laboratory Physics II (4)
Several projects using research-quality equipment in contemporary fields of experimental physics. Each requires reading appropriate literature, choosing appropriate instrumentation, performing data acquisition and analysis, and writing a technical paper. Topics include particle counting techniques, neutron activation, gamma-ray spectroscopy, a range of condensed matter experiments including temperature dependent properties between 10 and 350 K, modern optics, ultrahigh vacuum surface science. Recommended preparation: PHYS 301.

PHYS 303. Advanced Laboratory Physics Seminar (1)
Students will discuss various issues associated with physics research. These include how to judge the quality of an experiment and data (error analysis), how to present your work in written and oral formats, safety and ethical concerns in the laboratory. Recommended preparation: PHYS 250. SAGES Dept Seminar

PHYS 310. Classical Mechanics (3)
Lagrangian formulation of mechanics and its application to central force motion, scattering theory, rigid body motion, and systems of many degrees of freedom. Recommended preparation: PHYS 221 and either MATH 223 or MATH 227.

PHYS 313. Thermodynamics and Statistical Mechanics (3)

PHYS 315. Introduction to Solid State Physics (3)
Characterization and properties of solids; crystal structure, thermal properties of lattices, quantum statistics, electronic structure of metals and semiconductors. PHYS 415 for graduate students in engineering and science. (May not be taken for departmental credit by graduate students in the Department of Physics.) Prerequisite may be waived with consent of department. Recommended preparation for PHYS 415; PHYS 331. Offered as PHYS 315 and PHYS 415. Prereq: PHYS 331 or PHYS 481.

PHYS 316. Introduction to Nuclear and Particle Physics (3)
The physics of nuclei and elementary particles; experimental methods used to determine their properties; models and theories developed to describe their structure.

PHYS 317. Engineering Physics Laboratory I (3)
Laboratory course for engineering physics majors. Emphasis is on experimental techniques, data and error analysis, and written and oral presentation of work. Four experiments drawn from classical and modern physics are carried out. These emphasize condensed matter, material and optical physics. Experiments include electric fields, resistivity of materials, optical interference, chaotic systems, and spectroscopy. Design of data analysis systems and software is required. Prereq: PHYS 208. Coreq: PHYS 303.

PHYS 318. Engineering Physics Laboratory II (4)
Laboratory course for engineering physics majors. Several projects using research-quality equipment in contemporary fields of experimental physics. Open-ended experiments each require reading appropriate literature, designing the experiment, performing data analysis, and writing a technical paper. Topics are drawn from areas of modern physics, and concentrate on condensed matter, material, and optical physics. Prereq: PHYS 317.

PHYS 324. Electricity and Magnetism I (3)
First half of a sequence that constitutes a detailed study of the basics of electromagnetic theory and many of its applications. Electrostatics and magnetostatics of free space, conductors, dielectric and magnetic materials; basic theory illustrated with applications drawn from condensed matter physics, optics, plasma physics, and physical electronics. Prereq: PHYS 116 or PHYS 122 or PHYS 124.

PHYS 325. Electricity and Magnetism II (3)
(Continuation of PHYS 324.) Electrodynamics, Maxwell’s equations, electromagnetic waves, electromagnetic radiation and its interaction with matter, potential formulation of electromagnetism, and relativity. Prereq: PHYS 324.

PHYS 326. Physical Optics (3)
Geometrical optics and ray tracing, wave propagation, interaction of electromagnetic radiation with matter, interference, diffraction, and coherence. Supplementary current topics from modern optics such as nonlinear optics, holography, optical trapping and optical computing. Prerequisite(s) may be waived with consent of department. Offered as PHYS 326 and PHYS 426. Prereq: PHYS 122 or PHYS 124.

PHYS 327. Quantum Electronics (3)
An introduction to theoretical and practical quantum electronics covering topics in quantum optics, laser physics, and nonlinear optics. Topics to be addressed include the physics of two-level quantum systems including the density matrix formalism, rate equations, and semiclassical radiation theory;
Distances to galaxies. The content of the distant universe (3)

PHYS 328. Cosmology and the Structure of the Universe (3)
Prereq: ASTR 222.

PHYS 329. Independent Study (1–4)
An individual reading course in any topic of mutual interest to the student and the faculty supervisor.

PHYS 331. Introduction to Quantum Mechanics I (3)
Quantum nature of energy and angular momentum, wave nature of matter, Schroedinger equation in one and three dimensions; matrix methods; Dirac notation; quantum mechanical scattering. Two particle wave functions.
Prereq: PHYS 221.

PHYS 332. Introduction to Quantum Mechanics II (3)
Continuation of PHYS 331. Spin and fine structure; Dirac equation; symmetries; approximation methods; atomic and molecular spectra; time dependent perturbations; quantum statistics; applications to electrons in metals and liquid helium.
Prereq: PHYS 331.

PHYS 336. Modern Cosmology (3)
An introduction to modern cosmology and an exploration of current topics in the field. The first half of the course will cover the mathematical and physical basis of cosmology, while the second will delve into current questions and the observations that constrain them.
Offered as PHYS 336 and PHYS 436.
Prereq: PHYS 221.

PHYS 339. Seminar (1–3)
Conducted in small sections with presentation of papers by students and informal discussion. Special problem seminars and research seminars offered according to interest and need, often in conjunction with one or more research groups.
Offered as PHYS 339 and PHYS 439.

PHYS 349. Methods of Mathematical Physics I (3)
Analysis of complex functions; singularities, residues, contour integration; evaluation and approximation of sums and integrals; exact and approximate solution of ordinary differential equations; transform calculus; Sturm-Liouville theory; calculus of variations. Additional work required for graduate students.
Offered as PHYS 349 and PHYS 449.
Prereq: MATH 224.

PHYS 350. Methods of Mathematical Physics II (3)
(Continuation of PHYS 349/449). Special functions, orthogonal polynomials, partial differential equations, linear operators, group theory, tensors, selected special topics. Additional work required for graduate students.
Offered as PHYS 350 and PHYS 450.
Prereq: PHYS 349.

PHYS 351. Senior Physics Project (2)
A two semester course required for senior BS and BA physics majors. Students pursue a project based on experimental, theoretical or teaching research under the supervision of a physics faculty member, a faculty member from another Case Western Reserve department or a research scientist or engineer from another institution. A departmental senior project committee must approve all project proposals and this same committee will receive regular oral and written progress reports. Final results are presented at the end of the second semester as a paper in a style suitable for publication in a professional journal as well as an oral report in a professional symposium.
SAGES Senior Cap

PHYS 352. Senior Physics Project Seminar (1)
This two semester seminar is taken concurrently with the student’s two semester senior project. Students meet weekly to discuss their projects and the research experience. The class will include dialogues about professional issues such as ethics, graduate school, jobs, funding, professional organizations, public obligations, writing and speaking. Assignments include proposals, progress reports and posters.
Coreq: PHYS 351 or PHYS 353.
SAGES Dept Seminar

PHYS 353. Senior Engineering Physics Project (2)
A two semester course required for BSE Engineering Physics majors. Students are expected to complete a research project in their concentration area under the supervision of a faculty member in science, engineering, or, with approval, a researcher at another institution or company. The project may be calculational, experimental or theoretical, and will address both the underlying physics and appropriate engineering and design principles. A program senior project committee must approve all project proposals and will receive regular oral and written progress reports. Final results are presented at the end of the second semester as a paper in a style suitable for publication in a professional journal as well as an oral report in a public symposium.
SAGES Senior Cap

PHYS 365. General Relativity (3)
This is an introductory course in general relativity. The techniques of tensor analysis will be developed and used to describe the effects of gravity and Einstein’s theory. Consequences of the theory as well as its experimental tests will be discussed. An introduction to cosmology will be given. Additional work required for graduate students.
Offered as PHYS 365 and PHYS 465.

PHYS 390. Undergraduate Research in Physics (3–6)
Research conducted under the supervision of a faculty member in the Department of Physics. Arrangements must be made with a faculty member and a written description of these arrangements must be submitted to, and approved by, the department before a permit will be issued to register for this course. A final report must be supplied to the department at the end of the semester.

PHYS 413. Classical and Statistical Mechanics I (3)
An integrated approach to classical and statistical mechanics. Lagrangian and Hamiltonian formulations, conservation laws, kinematics and dynamics, Poisson brackets, continuous media, derivation of laws of thermodynamics, the development of the partition function. To be followed by PHYS 414.

PHYS 414. Classical and Statistical Mechanics II (3)
A continuation of PHYS 413. Noninteracting systems, statistical mechanics of solids, liquids, gases, fluctuations, irreversible processes, phase transformations. Recommended preparation: PHYS 413 or consent of department.

PHYS 415. Introduction to Solid State Physics (3)
Characterization and properties of solids; crystal structure, thermal properties of lattices, quantum statistics, electronic structure of metals and semiconductors. PHYS 415 is for graduate students in engineering and science. (May not be taken for departmental credit by graduate students in the Department of Physics without prior approval.) Prerequisite may be waived with consent of department. Recommended preparation for PHYS 415: PHYS 331. Offered as PHYS 315 and PHYS 415.

PHYS 423. Classical Electromagnetism (3)

PHYS 426. Physical Optics (3)
Geometrical optics and ray tracing, wave propagation, interaction of electromagnetic radiation with matter, interference, diffraction, and coherence.
Supplementary current topics from modern optics such as nonlinear optics, holography, optical trapping and optical computing. Prerequisite(s) may be waived with consent of department.

Offered as PHYS 326 and PHYS 426.

**PHYS 427. Quantum Electronics (3)**

An introduction to theoretical and practical quantum electronics covering topics in quantum optics, laser physics, and nonlinear optics. Topics to be addressed include the physics of two-level quantum systems including the density matrix formalism, rate equations, and semiclasical radiation theory; laser operation including oscillation, gain, resonator optics, transverse and longitudinal modes, Q-switching, mode-locking, and coherence; and nonlinear optics including the nonlinear susceptibility, parametric interactions, stimulated processes, and self-action. Recommended preparation for PHYS 427: PHYS 331 or PHYS 481.

Offered as PHYS 327 and PHYS 427.

**PHYS 428. Cosmology and the Structure of the Universe (3)**


**PHYS 431. Physics of Imaging (3)**

Description of physical principles underlying the spin behavior in MR and Fourier imaging in multi-dimensional. Introduction of conventional, fast, and chemical-shift imaging techniques. Spin echo, gradient echo, and variable flip-angle methods. Projection reconstruction and sampling theorems. Bloch equations, T1 and T2 relaxation times, rf penetration, diffusion and perfusion. Flow imaging, MR angiography, and functional brain imaging. Sequence and coil design. Prerequisite may be waived with consent of instructor. Recommended preparation: PHYS 122 or PHYS 124 or EBME 410.

Offered as EBME 431 and PHYS 431.

**PHYS 436. Modern Cosmology (3)**

An introduction to modern cosmology and an exploration of current topics in the field. The first half of the course will cover the mathematical and physical basis of cosmology, while the second will delve into current questions and the observations that constrain the model. Offered as PHYS 336 and PHYS 436.

**PHYS 439. Seminar (1–3)**

Conducted in small sections with presentation of papers by students and informal discussion. Special problem seminars and research seminars offered according to interest and need, often in conjunction with one or more research groups. Offered as PHYS 339 and PHYS 439.

**PHYS 441. Physics of Condensed Matter I (3)**

Crystal structure, x-ray diffraction, band theory and applications. Free electron theory of metals and electrons in magnetic fields.

**PHYS 442. Physics of Condensed Matter II (3)**

Continuation of PHYS 441. Lattice vibrations, thermal properties of solids, semiconductors, magnetic properties of solids, and superconductivity. Prerequisite may be waived with consent of department. Recommended preparation: PHYS 441.

**PHYS 447. Physics of Liquid Crystals (3)**

Molecular interactions; order parameters; electrical, optical, and magnetic properties of the nematic phase; phase transitions; elastic and viscous properties; biaxiality; lyotropic phases; the role of chirality; defects in liquid crystals; interactions at interfaces; smectic order and smectic polymorphism; ferroelectricity, antiferroelectricity, and ferrielectricity; phases associated with complex molecular architectures; free-standing films and quasi 2D behavior; experimental techniques, including nanomanipulation; and liquid crystal devices.

**PHYS 449. Methods of Mathematical Physics (3)**

Analysis of complex functions: singularities, residues, contour integration; evaluation and approximation of sums and integrals; exact and approximate solution of ordinary differential equations; transform calculus; Sturm-Liouville theory; calculus of variations. Additional work required for graduate students.

Offered as PHYS 349 and PHYS 449.

**PHYS 450. Methods of Mathematical Physics II (3)**

(Continuation of PHYS 349/449.) Special functions, orthogonal polynomials, partial differential equations, linear operators, group theory, tensors, selected specials topics. Additional work required for graduate students.

Offered as PHYS 350 and PHYS 450.


The experimental basis for modeling the electroweak and strong interactions in terms of fundamental fermions, quarks and leptons, and gauge bosons, photons, the weak bosons, and gluons; particle accelerators and detection techniques; phenomenology of particle reactions, decays and hadronic structure; space, time and internal symmetries; symmetries; symmetry breaking.

**PHYS 460. Advanced Topics in NMR Imaging (3)**

Frontier issues in understanding the practical aspects of NMR imaging. Theoretical descriptions are accompanied by specific examples of pulse sequences, and basic engineering considerations in MRI system design. Emphasis is placed on implications and trade-offs in MRI pulse sequence design from real-world versus theoretical perspectives. Recommended preparation: EBME 431 or PHYS 431.

Offered as EBME 460 and PHYS 460. Prerequisite: Graduate standing or Undergraduate with Junior or Senior standing and a cumulative GPA of 3.2 or above.

**PHYS 465. General Relativity (3)**

This is an introductory course in general relativity. The techniques of tensor analysis will be developed and used to describe the effects of gravity and Einstein’s theory. Consequences of the theory as well as experimental tests will be discussed. An introduction to cosmology will be given. Additional work required for graduate students.

Offered as PHYS 365 and PHYS 465.

**PHYS 472. Graduate Physics Laboratory (3)**

A series of projects designed to introduce the student to modern research techniques such as automated data acquisition. Students will be assessed as to their individual needs and a sequence of projects will be established for each individual. Topics may include low temperature phenomena, nuclear gamma ray detection and measurement and optics.

**PHYS 481. Quantum Mechanics I (3)**

Quantum mechanics with examples of applications. Schroedinger method; matrix and operator methods. Approximation methods including WKB, variational and various perturbation methods. Applications to atomic, molecular and nuclear physics including both bound states and scattering problems. Applications of group theory to quantum mechanics.

**PHYS 482. Quantum Mechanics II (3)**

Continuation of PHYS 481, including quantum field theory. Prerequisite may be waived with consent of department. Recommended preparation: PHYS 481 or consent of department.

**PHYS 491. Modern Physics for Innovation I (3)**

The first half of a two-semester sequence providing an understanding of physics as a basis for successfully launching new high-tech ventures. The course will examine physical limitations to present technologies, and the use of physics to identify potential opportunities for new venture creation. The course will provide experience in using physics for both identification of incremental improvements, and as the basis for alternative technologies. Case studies will be used to illustrate recent commercially successful (and unsuccessful) physics-based venture creation, and will illustrate characteristics for success.

**PHYS 492. Modern Physics for Innovation II (3)**

Continuation of PHYS 491, with an emphasis on current and prospective opportunities for Physics Entrepreneurship. Longer term opportunities for Physics Entrepreneurship in emerging areas including, but not limited to, nanoscale physics and nanotechnology; biophysics and applications to biotechnology; physics-based opportunities in the context of information technology. Recommended preparation: PHYS 491 or consent of department.

Offered as EE 491/591. Prerequisite: PHYS 491 or consent of department.
PHYS 493. Feasibility and Technology Analysis (3)
This course provides the tools scientists need to determine whether a technology is ready for commercialization. These tools include (but are not limited to): financial analysis, market analysis, industry analysis, technology analysis, intellectual property protection, the entrepreneurial process and culture, an introduction to entrepreneurial strategy and new venture financing. Deliverables will include a technology feasibility analysis on a possible application in the student’s scientific area. Offered as BIOL 493, CHEM 493, and PHYS 493.

PHYS 522. Nonlinear Optics (3)

PHYS 539. Special Topics Seminar (1–3)
Individual or small group instruction on topics of interest to the department. Topics include, but are not limited to, particle physics, astrophysics, optics, condensed matter physics, biophysics, imaging. Several such courses may run concurrently.

PHYS 541. Quantum Theory of Solids I (3)
Elementary excitations in solids, including lattice vibrations, spin waves, helicones, and polarons. Quasi-particles and collective coordinates, BCS theory of superconductivity, Quasicrystals, Transport properties, Conduction electrons in magnetic fields and the quantum Hall effect. Green function methods of many-body systems. Recommended preparation: PHYS 442 or consent of department.

PHYS 544. Advanced Theory of Materials (3)

PHYS 561. Statistical Methods for Scientific Research (3)
This course will introduce students to traditional and novel statistical methods useful for experimental scientists. The emphasis will be on understanding theory and techniques that are used in research. We shall consider problems from astronomy, biology and particle-astro physics. The course will also cover topics of interest to engineers. Current collaborative research problems of the instructor will motivate some of the advanced statistical techniques. Topics to be covered include: Measuring uncertainty and probability distributions (low and high dimensional); point and interval estimation; curve fitting; likelihood and score type tests required for an experiment; posterior probabilities; dealing with small samples (which arise in search experiments); over- and under-coverage using confidence belts; and Monte Carlo simulation methods for planning experiments and evaluating the statistical significance of the results. “GGobi” and “R” open source software will be used for visualization (via dynamic and interactive graphics) and exploring high-dimensional data. Offered as BIOL 561 and PHYS 561.

PHYS 566. Cosmology (3)
Introduction to our current understanding of the origin and evolution of the Universe and connection between our understanding of elementary particle physics and cosmology. Specific topics will include: General Parameters of Cosmology: Expansion, Lifetime, and Density of the Universe, The Early Universe, Constraints on Elementary Particles, Dark Matter and Dark Energy, Nucleosynthesis, Cosmic Microwave Background, Inflation, Stellar Evolution, Gravitational Waves, Baryogenesis. Some background in general relativity and particle physics phenomenology is recommended.

PHYS 579. Special Topics: Frontiers in Research (3)
In-depth examination of a cutting-edge topic of current research. New topic is selected each semester.

PHYS 581. Quantum Mechanics III (3)

PHYS 591. Gauge Field Theory I (3)
Noether’s theorem, symmetries and conserved currents, functional integral techniques, quantization, Feynman rules, anomalies, QED, electroweak interactions, QCD, renormalization, renormalization group, asymptotic freedom and assorted other topics. Prereq: PHYS 581.

PHYS 592. Gauge Field Theory II (3)
(See PHYS 591.) Recommended preparation: PHYS 591.

PHYS 601. Research in Physics (1–9)

PHYS 651. Thesis M.S. (1–9)

PHYS 666. Frontiers in Physics (0)
Weekly colloquia given by eminent physicists from around the world on topics of current interest in physics.

PHYS 701. Dissertation Ph.D. (1–9)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF POLITICAL SCIENCE

The study of political science is primarily concerned with governmental structures and processes in world societies, including who governs, why, and how. Faculty specialties in the department include American politics and governmental institutions; elections and political parties in the United States and abroad; violence and civil disorder; public policy analysis, including economic and welfare state issues; international relations conceived broadly; international political economy; religious and ethnic conflict; state-building; the politics of gender; political strategies; research methods; and comparative politics, with various regional concentrations. In its programs leading to the B.A., M.A., and Ph.D., the department makes a strong effort to relate the study of politics to students’ needs and concerns and to reflect in its courses both the excitement and seriousness of real-world politics.

The study of political science can build a foundation for many types of future employment. Many political science majors are preparing for graduate study or law school. Others intend to pursue careers in journalism, teaching, or public administration, or in private industry and business. Both the public and private sectors hold career possibilities for the political science major.

DEPARTMENT FACULTY

Joseph White, Ph.D.
(University of California, Berkeley)
Luxenberg Family Professor of Public Policy and Chair; Director, Center for Policy Studies and Public Policy Program; Professor of Epidemiology and Biostatistics, School of Medicine
American government; Congress; public policy; health and welfare policy
Karen Beckwith, Ph.D.
American government; public policy; health care and aging

Jonathan L. Entin, J.D.
(Northwestern University)
Professor of Law
American constitutional law; social science and the law

Andrew M. Lucker, Ph.D.
(Case Western Reserve University)
Adjunct Assistant Professor
American government; state politics and government; history of political science

Laura Y. Tartakoff, J.D., M.A.
(Case Western Reserve University; Fletcher School, Tufts University)
Adjunct Associate Professor
Constitutional law; civil liberties; comparative constitutionalism

UNDERGRADUATE PROGRAMS

Major
The major in political science leads to the Bachelor of Arts degree. The degree requires 30 hours of course work, distributed as follows:

1. POSC 109 (3)
2. Two POSC courses at the 200 level (6)
3. Six POSC courses at the 300 level (18)
4. POSC 396 Senior Project SAGES Capstone (3)

Students select courses based on their specific interests, with approval of the faculty advisor. No more than six hours of independent study (i.e., POSC 395 and/or POSC 396) may count toward the major. Independent study completed through the Washington Center program is excluded from this limitation.

Departmental Honors
Majors who maintain a grade point average of at least 3.3 overall and 3.8 in political science courses during the senior year, adhering to the departmental regulations governing the master’s degree program. If completed successfully, these hours will count simultaneously toward both degrees in political science.

The B.A. will be awarded upon completion of all requirements for that degree, including total hours. The M.A. will be awarded upon successful completion of the 30 hours of graduate-level courses and the M.A. examination.

Minor
A minor in political science consists of 15 hours (five courses) in the department, of which 9 hours must be at the 300 level. An elected minor sequence must be approved by a political science faculty advisor.

A minor in public policy is available to undergraduates in the College of Arts and Sciences and to undergraduates in the economics and management programs in the Weatherhead School of Management.

The public policy minor ordinarily includes:

1. ECON 205 or ECON 102
2. POSC 386, POSC 383, or POSC 306
3. One course from the following list of approved courses: HSTY 256, HSTY 358, POSC 308, POSC 310, POSC 323, POSC 385
4. Two courses in a specific policy field (e.g., health care, the environment, business and the economy, science and technology policy, nonprofit and charitable organizations, social policy, etc.), as approved by the public policy minor advisor

GRADUATE PROGRAMS

Master of Arts
Applicants to the Master of Arts program in political science are required to submit their undergraduate transcripts and three letters of recommendation from former instructors. The admission requirements also include a minimum score of 500 on the verbal and quantitative segments of the Graduate Record Examination (GRE) and 4.5 on the analytical section. The department strongly prefers that applicants have a minimum GPA of 3.2 overall and a minimum GPA of 3.4 in political science courses. For students from other
countries, the requirements are a minimum score of 550 on the paper version of the Test of English as a Foreign Language (TOEFL), or at least 215 on the computer version of the TOEFL; the minimum GRE scores indicated above; and transcripts of all undergraduate study, indicating completion of a Bachelor of Arts or Bachelor of Science degree program.

The Master of Arts in political science is a broadly based program in which the student is expected to acquire and exhibit general knowledge and skills. Therefore, within the 30 hours of graduate-level course work (400 level and above) required for the master’s, 12 hours must be distributed as follows:

1. 3 hours in the area of American government and politics
2. 3 hours in the area of comparative politics
3. 3 hours in the area of international relations
4. 3 hours of POSC 449 (Research Methods)

Students who receive permission (due to special circumstances) from the graduate coordinator may take an alternative research methods course outside the department.

Among the remaining 18 hours of electives, the student may take courses oriented toward a general Master of Arts, covering the four broad areas listed above. Alternatively, the student may specialize in one area—one of these four or some other—approved by the graduate coordinator. A maximum of 9 hours may be taken outside the Department of Political Science, with prior approval from the graduate coordinator, for specialized work related to the master’s degree for which no political science course is appropriate. A maximum of nine hours of independent study (POSC 601) may count toward the degree.

A minimum grade point average of 3.0 must be maintained throughout the Master of Arts program. A master’s student who fails to maintain a GPA of 3.0 will be placed on academic probation for one semester. If the GPA is not returned to the 3.0 minimum by the end of the probationary semester, the student will be separated from further study in the department.

Upon completion of no fewer than 30 hours and no more than 42 hours of master’s-level course work, the student must request scheduling of the political science Master of Arts examination. The examination will cover the fields of American government and politics, comparative politics, and international relations.

**Doctor of Philosophy**

Requirements for admission to the Doctor of Philosophy program in political science are the same as for admission to the Master of Arts program, with the following additions. The department strongly prefers that applicants without an M.A. in political science have a minimum GPA of 3.2 overall and a minimum GPA of 3.4 in undergraduate political science courses, and that applicants with an M.A. degree in political science have a minimum GPA of 3.4 overall in their M.A. work. Because the department faculty is small, applicants should determine, prior to applying, whether one or more members of the department faculty are active in the applicant’s field of interest. Ph.D. applications must specify the applicant’s field(s) of interest, as the Graduate Studies Committee will not recommend the admission of an applicant where the department faculty cannot support the applicant’s proposed course of study. Students who are accepted into the department’s M.A. program and then decide they would like to earn the Ph.D. are expected to apply to the Ph.D. program and meet the admission requirements. All Ph.D. students must complete 45 hours of graduate-level courses, plus at least 18 hours of POSC 701 (Dissertation) credit. The required 45 hours of doctoral courses taken before dissertation credits may be distributed as follows:

1. 12 hours in primary subfield (American, comparative, or international relations)
2. 9 hours in secondary subfield (one of the remaining two fields)
3. 6 hours in the remaining subfield
4. 6 hours in Research Methods (including POSC 449 Research Methods)
5. 12 hours of electives

A maximum of 9 hours of independent study (POSC 601) may be undertaken. University regulations require Ph.D. students to spend at least one academic year in full-time residence (two consecutive regular semesters with a minimum of 9 hours’ registration each semester).

Doctoral students whose M.A. in political science has been certified, and doctoral students with an M.A. in political science from Case Western Reserve, need complete only 18 of the 45 hours of doctoral course work. The graduate coordinator will set distribution requirements on an individual basis, reflecting the course work completed for the M.A. Doctoral students without a completed M.A. must pass the M.A. examination. They must take the examination upon completion of no fewer than 30 hours and no more than 36 hours of course work. A student who does not pass this examination may not continue in the Ph.D. program. See the description of the M.A. examination above for further information.

Upon completion of 45 hours of course work, the student must pass the Ph.D. comprehensive examinations in his or her primary and secondary subfields. After passing the examinations, a student must complete a dissertation, typically 150-400 pages in length, that draws on the student’s original research to make a contribution to the field of political science.

**Dual J.D./M.A.**

Students accepted to the School of Law may pursue a Masters of Arts in Political Science in conjunction with their J.D. degree. Completion of the program requires 97 hours of course work, and so would be expected to require seven semesters. Students wishing to enroll in the dual-degree program must be separately admitted to each program, but the department will waive the GRE requirement and accept the LSAT within the admissions process. Students must complete a total of 21 hours of credit within the political science department, including at least three credit hours in American politics, comparative politics, international relations, and research methods. Dual-degree students will normally begin study in the law school and defer enrollment in the M.A. program until their second year. They must pass the M.A. comprehensive examination upon completion of their political science course work.

**COURSE DESCRIPTIONS**

**POSC 109.** The American Political System (3)

Introduction to the study of American politics, addressing the questions “Who rules?” and “Who benefits?” in the American political system. Explores the nature of constitutional limits, the role of public participation, the impact of pressure groups, and the influence of various governmental institutions on American political life.

**POSC 260.** Introduction to Comparative Politics (3)

Comparative politics is the study of processes and institutions within countries. Prompted by real-world puzzles, comparativists investigate broad,
POSC 272. Introduction to International Relations (3)
Survey of the principles of international relations, politics, law and organization; the rise, development and change of the nation-state system; development of international cooperation; methods of studying international relations.

POSC 301. Decision-Making in American Cities (3)
Localities are the primary interface with government and provide the basic psychological place identification for most Americans. The course will explore this assertion in the context of urban America today. How are decisions made in cities? Who shapes these decisions and why? What role is played by shifting demographics, race, and poverty? What can the individual do to influence local decision-making?
Offered as POSC 301 and POSC 401.

POSC 302. State Politics and Policy (3)
State governments may make more decisions that affect the life of an average citizen than does the federal government. The study of state politics and policy includes the different ways states organize the basic political system (such as legislatures, executives, courts and parties); how state cultures, economies, and other factors shape how political institutions work; institutions of state governance that do not exist at the national level (such as the initiative and referendum); and the continual contest between state and federal governments to control policy, shift costs, and avoid blame. Offered as POSC 302 and POSC 402.

POSC 306. Interest Groups in the Policy Process (3)
Introduction to the institutions and processes that make up the political environment of nonprofit and other organizations in the United States, be-
making up the political environment of nonprofi t organizations in the United States, be-

POSC 308. The American Presidency (3)
The sources of, strategies of, and restraints on presidential leadership in the United States. Emphasis on problems of policy formation, presidential relations with Congress and executive agencies, and the electoral process.
Offered as POSC 308 and POSC 408.

POSC 310. The Legislative Process (3)
Legislative, representative, and other functions of Congress and state legislatures; legislative relations with the executive and with private interests; powers and limitations of the legislature as a policy-making institution.
Offered as POSC 310 and POSC 410.

POSC 320B. The U.S. Midterm Elections (3)
Analysis of the midterm elections in the United States. Covers congressional and state elections in all regions, focusing on the issues, personalities, campaign strategies, and voter trends in this key electoral battle held between presidential elections. Offered every four years in conjunction with presidential elections.
Offered as POSC 320B and POSC 420B.

POSC 320C. The Presidential Election (3)
Analysis of the upcoming presidential election in the United States. Focuses on the issues and personalities, polls and public opinion, campaign strategies, and electoral behavior. Offered every four years in conjunction with the United States presidential election cycle.
Offered as POSC 320C and POSC 420C.

POSC 321. News Media and Politics (3)
Analysis of the political role of the news media in American government and politics. Examines the fascinating relationship between reporters and politicians. Covers the overall structure and legal position of the media as well as the media’s impact on the American political system.
Offered as POSC 321 and POSC 421.

POSC 322. Political Movements and Political Participation (3)
Political Movements and Political Participation is concerned with the variety of ways citizens engage in collective activism in the United States and across national boundaries, and with the conditions under which citizens identify common concerns and join together in political movements to bring about change. The course begins with an examination of three general bodies of theory and research on political movements: resource mobilization, political opportunity structures, and cultural framing. We will also investigate frameworks of political participation for understanding the relationships among different expressions of collective activism and representation. In the context of these sometimes competing theories, we will consider 1) the conditions under which political movements are likely to emerge, as well as the circumstances in which collective political action is precluded; 2) how citizens come to recognize collective grievances and shared political identities; 3) the strategies and tactics of organized movements, and their likelihood of political success; and 4) the relationship between political movements, political parties, and the state.
Offered as POSC 322 and POSC 422.

POSC 323. Judicial Politics (3)
Rejecting the view that judges mechanically apply the law, the study of judicial politics seeks to understand the behavior of judges as political actors with policy goals. Topics include judicial selection and socialization, judicial policy change, judicial strategy (especially the strategic interaction of judges on multi-judge panels), the interaction of courts in hierarchical judicial systems, the policy impact of judicial decisions, and the courts’ interactions with coordinate branches of government (the executive, Congress, state governments, state courts). Primary focus will be on the federal judiciary, with some discussion of state judicial systems.
Offered as POSC 323 and POSC 423.

POSC 325. American Constitutional Law (3)
An introductory survey of U.S. constitutional law. Special attention given to the historical, philosophical, and political dimensions of landmark Supreme Court cases. Judicial review, federalism, separation of powers, due process, and equal protection. Supreme Court’s involvement in major political controversies: the New Deal, abortion, physician-assisted suicide, school desegregation, and affirmative action.
Offered as POSC 325 and POSC 425.

POSC 326. Constitutions in Practical Politics (3)
Overview of ancient Greek and Roman constituti-

POSC 327. Civil Liberties in America (3)
An introductory survey of U.S. constitutional law. Special attention given to the historical, philosophi-

POSC 328. Violence and the Political System (3)
Empirical analysis of various theories advanced
in the cross-cultural explanation of factors which cause and mediate the occurrence of violence--revolutions, terrorism, and civil disorder--within the political system.

Offered as POSC 334 and POSC 434.

POSC 341. Elections, Voters, and Political Parties (3)
Examination of American political parties, their activities, organization, characteristics, and functions. Candidate strategies and electoral history viewed within the context of voter orientations and predispositions, stressing linkages between citizen and party and between party and government.
Offered as POSC 341 and POSC 441.

POSC 342. Water (3)
This seminar will explore the history of the meaning of water—that is, the social, cultural, and/or political significance placed on water by individuals and governments in different times and places. It will also examine how humans have acted upon water, and how it has acted upon humans, with great consequences for human life. This seminar will look at the history of water in the context of science, technology and society; public health; political science; and environmental history. Case studies will be drawn from a wide chronological and geographical range; from the ancient world to Renaissance Italy, nineteenth century India, modern Britain, Egypt, and the U.S. The course provides a wide perspective on the themes of the history of human-water interactions, but will also focus closely on some critical cases. Seminar participants will write a research paper on the topic of their choice in the environmental history of water.
Offered as: HSTY 342, HSTY 442, POSC 342, POSC 442.

POSC 343. Public Opinion and American Democracy (3)
Examination of theories, concepts and empirical research related to attitudes and the political behavior of mass publics.
Offered as POSC 343 and POSC 443.

POSC 346. Women and Politics (3)
Women and Politics involves a critical examination of the impact of gender on the forms and distributions of power and politics, with primary reference to the experience of women in the United States. Major concerns of the course include what we mean by “sex,” “gender,” and “politics”; the relationship between women and the state; how women organize collectively to influence state policies; and how the state facilitates and constrains women’s access to and exercise of political power. The course is organized around four foci central to the study of women and politics. The first section of the course focuses on what we mean by “women,” “gender,” and “politics.” In this section, we will consider how these concepts intersect and the ways in which each may be used to deepen our understanding of the workings of governments and political systems, and of women’s relative political powerlessness. The second section of the course employs these concepts to understand the (re)emergence of the U.S. feminist movement, its meanings, practices, and goals, and its transformation across U.S. political history. In the third section, we turn to conventional electoral politics, focusing on women’s candidacies, their campaigns, and women’s voting behavior. In the final section of the course, we consider those general factors that might provide for increased gender equality and improved life status for women, in global, comparative perspective.
Offered as POSC 346 and POSC 446 and WGST 346.
SAGES Dept Seminar

POSC 348. History of Modern Political and Social Thought (3)
This course explores the responses of philosophers, economic theorists, culture critics, and public policy makers to changes in western society wrought by industrialization by focusing on their concerns with technological change.
Offered as HSTY 348 and POSC 348.

POSC 349. Political Science Research Methods (3)
This course examines approaches that political scientists use to understand events and processes. In doing so, the course provides students with skills helpful to completing senior projects, such as the ability to evaluate and conduct research. Through exercises and projects, students will take part in the research process from constructing a question to developing a research design to interpreting results. Students will learn and apply key techniques, including inductive and deductive reasoning, hypothesis construction, operationalization of concepts, measurements, sampling and probability, causal inference, and the logic of controls. They will produce materials common to the discipline, such as research designs. Offered as POSC 349 and POSC 449.
SAGES Dept Seminar

POSC 351. Modern Political Thought (3)
Examination of a limited topic in the study of modern political thought. Topics vary.
Offered as POSC 351 and POSC 451.

POSC 352. American Political Thought (3)
Examination of the unique contribution to the science of government made by American political thinkers.
Offered as POSC 352 and POSC 452.

POSC 354. Political and Social Philosophy (3)
Justification of social institutions, primarily political ones. Such distinctions as that between de facto and legitimate authority; analysis of criteria for evaluation, such as social justice and equality; inquiry into theories of justification of the state; theory of democratic government and its alternatives. Readings from classical and contemporary sources. Recommended preparation: PHIL 101.
Offered as PHIL 334, POSC 354, PHIL 434, and POSC 454.

POSC 355. Modern Political Ideologies (3)
Substance and nature of ideological thinking in the contemporary world via a survey of political "isms"—for example, liberalism, libertarianism, conservatism, fascism, socialism, and even more recent trends such as feminism, environmentalism, etc.
Offered as POSC 355 and POSC 455.

POSC 357. Democratic Politics: Theory and Practice (3)
Study of the theory and application of democracy. The concept of democracy will be examined from the Athenian model to contemporary debates over participatory and deliberative models. Then the concept will be applied to understanding issues of democratic practice and the study of politics in American, comparative, and international arenas. Finally, the course will address the potential effects, both good and ill, of technological innovation on democratic practices, such as "distance" participation, the Internet, and other communication technology.
Offered as POSC 357 and POSC 457.

POSC 358. Political Strategy (3)
This course examines practical applications of prominent political science theories. It is partly a how-to course covering a broad range of political activities, but the primary objective is to link practical issues with theories to help you understand why events happen the way they do. The course focuses on American politics, but the materials will be applicable to a wide range of situations. The course is a seminar requiring regular student presentations that will generate discussion about the readings and current events. Papers consist of analysis of current events, and require students to analyze the strategies used by prominent figures in the context of the theories we discuss in class.
Offered as POSC 358 and POSC 458.
SAGES Dept Seminar

POSC 361. State-Building and State Collapse (3)
Are nation-states the most effective means of organizing society? This course explores this question by examining the historical rationales behind the development of the nation-state, contemporary challenges to the nation-state, and potential alternatives to the nation-state. Possible challenges to the nation-state include multinational corporations, international humanitarian intervention, and regional integration. Alternative providers of state services include charities, companies, and mercenaries.
Offered as POSC 361 and POSC 461.

POSC 362. Politics of Central Asia (3)
Once an unfamiliar region to many people of the world, Central Asia took center stage in the fall of 2001 as a result of the U.S. campaign against terrorism. This course will introduce students to the politics of Central Asia, focusing on the region today composed of Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan, and Kazakhkstan. We will review the nationalism, foreign relations, religion,
Elections involve more than a simple act of voting. The rules under which worldwide elections are held determine who controls the executive and how votes are converted into legislative seats. The mechanics of various electoral arrangements will be examined in detail and the consequences for the political system discussed in terms of strategies and desired outcomes on the part of contestents. Students will research individual countries and analyze recent elections from both qualitative and quantitative perspectives, including introduction to geospatial data for mapping variations in electoral behavior.

Offered as POSC 363 and POSC 463.

POSC 364. Dictatorship and Democracy in Modern Latin America (3)
Examination of political leadership in 20th-century Latin America, exploring the nature, causes, and consequences of dictatorship and democracy in the region, moving from the collapse of oligarchic rule and the emergence of populism in the 1930s and 1940s, to the end of democracy and establishment of military regimes in the 1960s and 1970s, and ultimately to the contemporary processes of democratization and economic liberalization.

Offered as ETHS 364, POSC 364, and POSC 464.

Global & Cultural Diversity

POSC 365. Science, Technology, and Government (3)
Traces the development and influence of federal technology and science policies from colonial times to the present, with emphasis on the 20th century.

Offered as HSTY 366 and POSC 365.

POSC 366. Government and Politics of Africa (3)
Comparative analysis of the political forces and organizations currently functioning in Africa, as well as a survey of the formal government institutions. Special emphasis on single-party rule, military rule, and the political ramifications of African socialism, tribalism, and the problems of national integration.

Offered as ETHS 366, POSC 366, and POSC 466.

Global & Cultural Diversity

POSC 367. Western European Political Systems (3)
Comparative analysis of sociopolitical systems of selected Western European industrial democracies, using North American systems as a point of comparison.

Offered as POSC 367 and POSC 467.

POSC 368. The People's Republic of China (3)
Now more than ever, the Chinese state and society are facing tremendous economic, social, and political challenges. This course presents an overview of the development of Chinese Communist theory and practice from 1949 to the present day. Among the topics covered are the Great Leap Forward, the Cultural Revolution, the economic reforms of the 1980s, the Tiananmen student protests, the Communist party's crisis of legitimacy, the Taiwan problem, ecological challenges, the new socialist market economy, and current social developments from domestic migration to youth culture and new forms of nationalism. The class involves a mixture of lectures and discussion and draws on a combination of primary and secondary sources, including current news reports, films, documentaries, and fiction in translation.

Offered as HSTY 383 and POSC 368.

POSC 369. Current Controversies in Latin American Politics and Society (3)
In addition to questions about race, religion, abortion, the drug industry, immigration, democracy, private property, and free trade, the course will tackle Latin America's apparent shift to the political and ideological left, Chavez's "Imperialism," and Cuba's humanitarian aid.

Offered as ETHS 369, POSC 369 and POSC 469.

Global & Cultural Diversity

POSC 370A. Political Economy (3)
Focus on debates concerning the proper relationship between political and economic systems, including conservative, liberal, and radical perspectives. The politics of international economics and the economics of international politics receive separate attention.

The course concludes with study of "modern" political economy and the application of economic theory to the study of political systems.

Offered as POSC 370A and POSC 470A.

POSC 370C. The United States and Asia (3)
Survey and analysis of U.S.-Asia relations in the post-WWII period. Focus specifically is on the interaction of politics and economics in the United States' relations with Japan, China, and Southeast Asian countries. Topics will include the role of Asia in U.S. Cold War policies, the dynamics of U.S.-Japan alliance politics, post-Cold War issues involving U.S. foreign policy toward Asia, a history and analysis of economic conflict cooperation, and an examination of the move toward Asia-Pacific "regionalism."

Offered as POSC 370C and POSC 470C.

Global & Cultural Diversity

POSC 370G. U.S. Intelligence and National Security (3)
Examination of the impact of the intelligence process on foreign policy making and superpower relations. Covers the life cycle of United States strategic intelligence from the collection of data to formulation of analytic judgments and the policy-level uses of intelligence. Emphasis on contemporary intelligence issues and processes, but includes the formative period of modern American intelligence in the World War II era.

Offered as POSC 370G and POSC 470G.

POSC 370J. International Law and Organizations (3)
Study of international organizations and international law as two means for regulating and coordinating nation-state behavior. History of the two techniques will be traced, covering 19th century efforts at cooperation, the League of Nations and the United Nations, regional and specialized global organization. The functions of international law in global politics will be stressed, with primary focus on the evolving role of law in dealing with global problems, e.g., war, the environment, economic cooperation, and human rights.

Offered as POSC 370J and POSC 470J.

POSC 370K. Nationalism, Ethnicity, and Religion in World Politics (3)
Examination of the post-Cold War surge in conflicts among nationalisms, ethnic groups, and religions with particular attention to the former Yugoslavia, Ireland, India, Africa, and the Middle East.

Offered as ETHS 370K, POSC 370K, and POSC 470K.

Global & Cultural Diversity

POSC 371. Natural Resources and World Politics (3)
Examination of the political causes and ramifications of the uneven distribution of the valuable natural resources for modern industrial societies. Strategic and military issues and the exploitation of the sea bed. Examination in some detail of selected commodity issues, including petroleum, copper and uranium.

Offered as POSC 371 and POSC 471.

POSC 372. The United Nations in the Post-Cold War World (3)
The United Nations has become the focus of a debate over its effectiveness as a global organization dedicated to promoting world peace. Some critics believe it is time for the U.N. to move forward in this regard, while others see the U.N. as an anachronistic, bloated bureaucracy sorely in need of reform. This course will consider the United Nations from the perspective of powerful states such as the United States, as well as from the perspective of weaker ones, and also will consider areas such as peacekeeping, human rights, economic development, political reform, and the U.N.'s involvement with non-state actors such as terrorists.

Offered as POSC 372 and POSC 472.

POSC 373. Politics of the European Union (3)
Study of the origins, operations, and prospects for the European Union. This can include the historical context for the effort to restrict national rivalries (which fueled two world wars) and create common interests; the diplomatic challenges in finding common ground; the tasks and processes of governance within the EU, including its Global & Cultural Diversity
governing institutions, enforcement of terms for European Monetary Union and the operations of its bureaucracies; the social pressures that create policy challenges (such as agriculture policy and immigration); broad tensions within the enterprise (e.g., “broadening” vs. “deepening”), and the EU’s potential place in international politics, especially the efforts to create a common foreign and security policy and the possible implications of the Euro for international political economy.

Offered as POSC 373 and POSC 473.

POSC 374. Politics of Development in the Global South (3)
Exploration of the post-War II emergence of the Global South nations of Africa, Asia, the Middle East, Latin America, and Eastern Europe arena.

Offered as ETHS 374, POSC 374, and POSC 474.

Global & Cultural Diversity

POSC 375. Nuclear Weapons and Arms Control (3)
National and international problems concerning nuclear weapons, and the past and present attempts both to control their spread and to prevent their use. Topics covered include the science and technology of fission and fusion warheads and delivery vehicles; history, domestic policies, and international relations concerning nuclear weapons; and arms control treaties and their verification.

Offered as HSTY 377 and POSC 375.

POSC 376. United States Foreign Policy (3)
Focus on U.S. foreign policy making with a dynamic network of executive and congressional actors and organizations; analysis of traditional and contemporary U.S. foreign policies from nuclear defense to current economic resource issues; future role of the United States in world affairs.

Offered as POSC 376 and POSC 476.

POSC 377. Politics of Russia (3)
Russia faces three problems: the creation of a sovereign state, the development of a new political system, and the restructuring of its economy. In this course we will challenge the assumption that the outcome of these three transitions will be a strong, democratic, capitalist country. We will ask whether civil war, organized crime, an immature party system, poor social services, and nomenklatura privatization bode poorly for these three transformations.

Offered as POSC 377 and POSC 477.

Global & Cultural Diversity

POSC 378. International Relations Theory (3)
This course is a seminar in international relations theory. As such, we will bring a wide range of theoretical perspectives to bear on issues and debates in the area of international relations by systematically studying the evolution of the world system. The seminar is roughly divided into a first half focusing on war and the political system, and a second half focusing on trade, finance and the economic system. Each section devotes particular attention to ethical problems associated with political and economic issues. This course should develop students’ ability to read and critically evaluate academic literature in the field of international relations, and enable students to produce a scholarly paper on one substantive area of the field.

Offered as POSC 378 and POSC 478.

SAGES Dept Seminar

POSC 379. Middle East: Politics, Economics, and American Policy (3)
Examination of continuing conflicts, major trends, and internal political and economic developments affecting U.S. policy in the Middle East region. Discussions include human rights, petroleum economics, and Islamic politics.

Offered as POSC 379 and POSC 479.

Global & Cultural Diversity

POSC 381. City as Classroom (3)
In this course, the city is the classroom. We will engage with the urban terrain. We will meet weekly off-campus, interact with community members, and interface—both literally and figuratively—with the city as a way to examine the linkages between historical, conceptual, and contemporary issues, with particular attention paid to race and class dynamics, inequality, and social justice. This course will have four intersecting components, primarily focusing on American cities since the 1930s: the social and physical construction of urban space, the built environment, life and culture in the city, and social movements and grassroots struggles.

Offered as HSTY 381, POSC 381, SOCI 381, HSTY 481, POSC 481, and SOCI 481.

POSC 383. Health Policy and Politics in the United States (3)
Overview of the principal institutions, processes, social forces, and ideas shaping the U.S. health system. Historical, political, economic, and sociological perspectives on the health system are explored as well as the intellectual context of recent policy changes, challenges, and developments. Students will acquire a sense of how health services are financed and delivered in the U.S. They will also learn how to assess its performance compared to that of other similar countries.

Offered as POSC 383 and POSC 483.

POSC 384. Ethics and Public Policy (3)
Evaluation of ethical arguments in contemporary public policymaking discourse. That is, approaches to evaluating not only the efficiency of policy (Will this policy achieve its end for the least costs?) but also the ethics of policy (Are a policy’s intended ends ethically justified or “good,” and are our means to achieve those ends moral or “just”?).

Overview of political ideologies that supply U.S. political actors with their ethical or moral arguments when proposing and implementing public policy, followed by an application of these differing perspectives to selected policy areas such as welfare, euthanasia, school choice, drug laws, censorship, or others.

Offered as POSC 384 and POSC 484.

POSC 385. U.S. Bureaucratic Politics (3)
Bureaucracy is one of civilization’s most important inventions. It is a way of coordinating very large numbers of people so as to do work, make decisions, and exercise power. Without it, much of modern life would be impossible. Yet “bureaucracy” is normally seen, in public discussion, as a problem, instead of as a solution. This course will consider both the reasons for and pathologies of bureaucratic organization. Its special focus is bureaucracy in American government. The course therefore will provide some introduction to the study of American public administration, but with special emphasis on how the work and performance of public bureaucracies in the United States is shaped by the specific tasks they are given and the distribution of power in the American political arena.

Offered as POSC 385 and POSC 485.

SAGES Dept Seminar

POSC 386. American Public Policy Process (3)
Focus on the concepts and strategies concerned with moving the public policy process to action. Agenda-setting, issue definition, and feedback techniques will be a particular focus. Assessing political change, support, and obstacles also will be covered, as well as how policy systems operate with regard to different types of issues, such as regulatory, distributive, and redistributive policies, and in different configurations ranging from subgovernment to issue networks and advocacy coalitions.

Offered as POSC 386 and POSC 486.

POSC 387. Comparative Public Policy in Advanced Industrial Societies (3)
The study of comparative public policy focuses on three obvious questions: First, how do policies differ among countries? Second, why do policies differ? For example, what explains the differences in policies about health or the environment or energy or pensions? Third, what difference does it make? Is one set of policies better or worse than others? How can we tell? This course will consider each of these questions, focusing especially on the differences between the United States and other advanced industrial countries, and how these questions affect political and social life in those countries.

Offered as POSC 387 and POSC 487.

POSC 389. Special Topics in American Politics and Policy (3)
Specific topic will vary but will consist of an in-depth investigation of a particular policy area or political phenomenon. Topics will involve policy controversies of some current interest.

Offered as POSC 389 and POSC 489.

POSC 395. Special Projects (1–6)
Study of a topic of particular interest, or an approved internship. The student must submit to the departmental office a project prospectus form, approved and signed by the faculty supervisor, no later than the end of the second week of classes. The prospectus must outline the goals of the project and the research methodology to be used and is
part of the basis for grading. The prospectus form is available from the departmental office. Open to juniors and seniors majoring in political science. Open to majors in other departments with consent of faculty. Recommended preparation: Departmental prospectus form.

POSC 396. Senior Project SAGES Capstone (3)
Capstone experience for political science majors or senior POSC minors as part of the SAGES program, providing opportunity to do an in-depth paper on a topic of particular interest to them. Students must obtain approval from a faculty project advisor and list that advisor on the registration form. The advisor must sign and student submit to department a prospectus including goals, schedule, and research methodology. This paper should demonstrate, and ideally even extend, the skills and expertise developed over the course of study in the department. Upon completion of the capstone, students will be expected to present their work in a public forum. Recommended preparation: Junior or Senior political science major or senior political science minor and departmental prospectus form. SAGES Senior Cap

POSC 401. Decision-Making in American Cities (3)
Localities are the primary interface with government and provide the basic psychological place identification for most Americans. The course will explore this assertion in the context of urban America today. How are decisions made in cities? Who shapes these decisions and why? What role is played by shifting demographics, race, and poverty? What can the individual do to influence local decision-making?
Offered as POSC 301 and POSC 401.

POSC 402. State Politics and Policy (3)
State governments may make more decisions that affect the life of an average citizen than does the federal government. The study of state politics and policy includes the different ways states organize the basic parts of American political systems (such as legislatures, executives, courts and parties); how state cultures, economies, and other factors shape how political institutions work; institutions of state governance that do not exist at the national level (such as the initiative and referendum); and the continual context between state and federal governments to control policy, shift costs, and avoid blame. Offered as POSC 302 and POSC 402.

POSC 406. Interest Groups in the Policy Process (3)
Introduction to the institutions and processes that make up the political environment of nonprofit and other organizations in the United States, beginning with an examination of the role of civil society in a democracy and continuing with the framing of issues, role of political entrepreneurs and organized interests, elections, the legislative process and strategies for influencing it, and the roles of executive institutions and the courts. Offered as POSC 306 and POSC 406.

POSC 408. The American Presidency (3)
The sources of, strategies of, and restraints on presi- dential leadership in the United States. Emphasis on problems of policy formation, presidential relations with Congress and executive agencies, and the electoral process. Offered as POSC 308 and POSC 408.

POSC 410. The Legislative Process (3)
Legislative, representative, and other functions of Congress and state legislatures; legislative relations with the executive and with private interests; powers and limitations of the legislature as a policy-making institution.
Offered as POSC 310 and POSC 410.

POSC 420B. The U.S. Midterm Elections (3)
Analysis of the midterm elections in the United States. Covers congressional and state elections in all regions, focusing on the issues, personalities, campaign strategies, and voter trends in this key electoral battle held between presidential elections. Offered every four years in conjunction with the election cycle.
Offered as POSC 320B and POSC 420B.

POSC 420C. The Presidential Election (3)
Analysis of the upcoming presidential election in the United States. Focuses on the issues and personalities, polls and public opinion, campaign strategies, and electoral behavior. Offered every four years in conjunction with the United States presidential election cycle.
Offered as POSC 320C and POSC 420C.

POSC 421. News Media and Politics (3)
Analysis of the political role of the news media in American government and politics. Examines the fascinating relationship between reporters and politicians. Covers the overall structure and legal position of the media as well as the media’s impact on the American political system.
Offered as POSC 321 and POSC 421.

POSC 422. Political Movements and Political Participation (3)
Political Movements and Political Participation is concerned with the variety of ways citizens engage in collective activism in the United States and across national boundaries, and with the conditions under which citizens identify common concerns and join together in political movements to bring about change. The course begins with an examination of three general bodies of theory and research on political movements: resource mobilization, political opportunity structures, and cultural framing. We will also investigate frameworks of political participation for understanding the relationships among different expressions of collective activism and representation. In the context of these sometimes competing theories, we will consider 1) the conditions under which political movements are likely to emerge, as well as the circumstances in which collective political action is precluded; 2) how citizens come to recognize collective grievances and shared political identities; 3) the strategies and tactics of organized movements, and their likelihood of political success; and 4) the relationship between political movements, political parties, and the state.
Offered as POSC 322 and POSC 422.

POSC 423. Judicial Politics (3)
Rejecting the view that judges mechanically apply the law, the study of judicial politics seeks to understand the behavior of judges as political actors with policy goals. Topics include judicial selection and socialization, judicial policy change, judicial strategy (especially the strategic interaction of judges on multi-judge panels), the interaction of courts in hierarchical judicial systems, the policy impact of judicial decisions, and the courts’ interactions with coordinate branches of government (the executive, Congress, state governments, state courts). Primary focus will be on the federal judiciary, with some discussion of state judicial systems.
Offered as POSC 323 and POSC 423.

POSC 425. American Constitutional Law (3)
An introductory survey of U.S. constitutional law. Special attention given to the historical, philosophical, and political dimensions of landmark Supreme Court cases. Judicial review, federalism, separation of powers, due process, and equal protection. Supreme Court’s involvement in major political controversies: the New Deal, abortion, physician-assisted suicide, school desegregation, and affirmative action.
Offered as POSC 325 and POSC 425.

POSC 426. Constitutions in Practical Politics (3)
Overview of ancient Greek and Roman constitutions, medieval principles, emergence of modern constitutionalism, and the constitutionalist vision of the American and French Revolutions. Examination of contemporary constitutional issues and developments in countries such as Canada, France, Germany, Great Britain, Ethiopia, India, and the United States.
Offered as POSC 326 and POSC 426.

POSC 427. Civil Liberties in America (3)
The Supreme Court’s interpretation of the First Amendment: liberty of religion through the establishment and free exercise clauses, freedoms of speech and the press, and the press, of assembly and association. The “pure tolerance” view examined against subversive speech, “fighting words,” libel, and obscenity. Survey of content-neutral regulation, symbolic expression, and current efforts to limit expression (campus speech codes and the feminist anti-pornography movement).
Offered as POSC 327 and POSC 427.

POSC 428. Topics in Civil Liberties (3)
Rights of the accused as outlined in the Fourth, Fifth, Sixth, and Eighth Amendments. Topics covered are (1) arrests, searches, and seizures, (2) the privilege against compelled self-incrimination, (3) the rights to counsel, confrontation, and jury trial, and (4) the prohibition against cruel and unusual
punishments. Case-specific approach but presents interplay of history, philosophy, and politics as background of each topic. Offered as POSC 328 and POSC 428.

POSC 429. Courts, Public Policy, and Social Change (3)
Examines the social impact of law and use of social research in the legal process, assesses efforts to use law to affect social reform, and empirical studies of legal processes and institutions. Recommended preparation: Graduate standing or consent of department. Offered as LAWS 285 and POSC 429.

POSC 434. Violence and the Political System (3)
Empirical analysis of various theories advanced in the cross-cultural explanation of factors which cause and mediate the occurrence of violence—revolutions, terrorism, and civil disorder—within the political system. Offered as POSC 334 and POSC 434.

POSC 441. Elections, Voters, and Political Parties (3)
Examination of American political parties, their activities, organization, characteristics, and functions. Candidate strategies and electoral history viewed within the context of voter orientations and predispositions, stressing linkages between citizen and party and between party and government. Offered as POSC 341 and POSC 441.

POSC 442. Water (3)
This seminar will explore the history of the meaning of water—that is, the social, cultural, and/or political significance placed on water by individuals and governments in different times and places. It will also examine how humans have acted upon water, and how it has acted upon humans, with great consequences for human life. This seminar will look at the history of water in the context of science, technology and society; public health; political science; and environmental history. Case studies will be drawn from a wide chronological and geographical range; from the ancient world to Renaissance Italy, nineteenth century India, modern Britain, Egypt, and the U.S. The course provides a wide perspective on the themes of the history of human-water interactions, but will also focus closely on some critical cases. Seminar participants will write a research paper on the topic of their choice in the environmental history of water. Offered as: HSTY 342, HSTY 442, POSC 342, POSC 442.

POSC 443. Public Opinion and American Democracy (3)
Examination of theories, concepts and empirical research related to attitudes and the political behavior of mass publics. Offered as POSC 343 and POSC 443.

POSC 446. Women and Politics (3)
Women and Politics involves a critical examination of the impact of gender on the forms and distributions of power and politics, with primary reference to the experience of women in the United States. Major concerns of the course include what we mean by “sex,” “gender,” and “politics”; the relationship between women and the state; how women organize collectively to influence state policies; and how the state facilitates and constrains women’s access to and exercise of political power. The course is organized around four core central to the study of women and politics. The first section of the course focuses on what we mean by “women,” “gender,” and “politics.” In this section, we will consider how these concepts intersect and the ways in which each may be used to deepen our understanding of the workings of governments and political systems, and of women’s relative political powerlessness. The second section of the course employs these concepts to understand the (re)emergence of the U.S. feminist movement, its meanings, practices, and goals, and its transformation across U.S. political history. In the third section, we turn to conventional electoral politics, focusing on women’s candidacies, their campaigns, and women’s voting behavior. In the final section of the course, we consider those general factors that might provide for increased gender equality and improved life status for women, in global, comparative perspective. Offered as POSC 346 and POSC 446 and WGST 346.

POSC 449. Political Science Research Methods (3)
This course examines approaches that political scientists use to understand events and processes. In doing so, the course provides students with skills helpful to completing senior projects, such as the ability to evaluate and conduct research. Through exercises and projects, students will take part in the research process from constructing a question to developing a research design to interpreting results. Students will learn and apply key techniques, including inductive and deductive reasoning, hypothesis construction, operationalization of concepts, measurements, sampling and probability, causal inference, and the logic of controls. They will produce materials common to the discipline, such as research designs. Offered as POSC 349 and POSC 449.

POSC 451. Modern Political Thought (3)
Examination of a limited topic in the study of modern political thought. Topics vary. Offered as POSC 351 and POSC 451.

POSC 452. American Political Thought (3)
Examination of the unique contribution to the science of government made by American political thinkers. Offered as POSC 352 and POSC 452.

POSC 454. Political and Social Philosophy (3)
Justification of social institutions, primarily political ones. Such distinctions as that between de facto and legitimate authority; analysis of criteria...
Once an unfamiliar region to many people of the world, Central Asia took center stage in the fall of 2001 as a result of the U.S. campaign against terrorism. This course will introduce students to the politics of Central Asia, focusing on the region today composed of Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan, and Kazakhstan. We will review the nationalism, foreign relations, religion, ethnicity, and economics of the region.

Offered as ETHS 362, POSC 362, and POSC 462.

POSC 463. Comparative Analysis of Elections and Electoral Systems (3)
Elections involve more than a simple act of voting to express individual preferences. The rules under which worldwide elections are held determine who controls the executive and how votes are converted into legislative seats. The mechanics of various electoral arrangements will be examined in detail and the consequences for the political system discussed in terms of strategies and desired outcomes on the part of contestants. Students will research individual countries and analyze recent elections from both qualitative and quantitative perspectives, including introduction to geospatial data for mapping variations in electoral behavior.

Offered as POSC 363 and POSC 463.

POSC 464. Dictatorship and Democracy in Modern Latin America (3)
Examination of political leadership in 20th-century Latin America, exploring the nature, causes, and consequences of dictatorship and democracy in the region, moving from the collapse of oligarchic rule and the emergence of populism in the 1930s and 1940s, to the end of democracy and establishment of military regimes in the 1960s and 1970s, and ultimately to the contemporary processes of democratization and economic liberalization.

Offered as ETHS 364, POSC 364, and POSC 464.

POSC 466. Government and Politics of Africa (3)
Comparative analysis of the political forces and organizations currently functioning in Africa, as well as a survey of the formal government institutions. Special emphasis on single-party rule, military rule, and the political ramifications of African socialism, tribalism and the problems of national integration.

Offered as ETHS 366, POSC 366, and POSC 466.

POSC 467. Western European Political Systems (3)
Comparative analysis of sociopolitical systems of selected Western European industrial democracies, using North American systems as a point of comparison.

Offered as POSC 367 and POSC 467.

POSC 469. Current Controversies in Latin American Politics and Society (3)
In addition to questions about race, religion,abor-
tion, the drug industry, immigration, democracy, private property, and free trade, the course will tackle Latin America’s apparent shift to the political and ideological left, Chavez’s “Imperialism,” and Cuba’s humanitarian aid.

Offered as ETHS 369, POSC 369 and POSC 469.

POSC 470A. Political Economy (3)
Focus on debates concerning the proper relationship between political and economic systems, including conservative, liberal, and radical perspectives. The politics of international economics and the economics of international politics receive separate attention. The course concludes with study of "modern" political economy and the application of economic theory to the study of political systems.

Offered as POSC 370A and POSC 470A.

POSC 470C. The United States and Asia (3)
Survey and analysis of U.S.-Asia relations in the post-World War II period. Focus specifically is on the interaction of politics and economics in the United States’ relations with Japan, China, and Southeast Asian countries. Topics will include the role of Asia in U.S. Cold War policies, the dynamics of U.S.-Japan alliance politics, post-Cold War issues involving U.S. foreign policy toward Asia, a history and analysis of economic conflict cooperation, and an examination of the move toward Asia-Pacific “regionalism.”

Offered as POSC 370C and POSC 470C.

POSC 470G. U.S. Intelligence and National Security (3)
Examination of the impact of the intelligence process on foreign policy making and superpower relations. Covers the life cycle of United States strategic intelligence from the collection of data to formulation of analytic judgments and the policy-level uses of intelligence. Emphasis on contemporary intelligence issues and processes, but includes the formative period of modern American intelligence in the World War II era.

Offered as POSC 370G and POSC 470G.

POSC 470J. International Law and Organizations (3)
Study of international organizations and international law as two means for regulating and coordinating nation-state behavior. History of the two techniques will be traced, covering 19th century efforts at cooperation, the League of Nations and the United Nations, regional and specialized global organization. The functions of international law in global politics will be stressed, with primary focus on the evolving role of law in dealing with global problems, e.g., war, the environment, economic cooperation, and human rights.

Offered as POSC 370J and POSC 470J.

POSC 470K. Nationalism, Ethnicity, and Religion in World Politics (3)
Examination of the post-Cold War surge in conflicts among nationalisms, ethnic groups, and religions with particular attention to the former Yugoslavia, Ireland, India, Africa, and the Middle East.

Offered as ETHS 370K, POSC 370K, and POSC 470K.

POSC 471. Natural Resources and World Politics (3)
Examination of the political causes and ramifications of the uneven distribution of the valuable natural resources for modern industrial societies. Strategic and military issues and the exploitation of the sea bed. Examination in some detail of selected commodity issues, including petroleum, copper and uranium.

Offered as POSC 371 and POSC 471.

POSC 472. The United Nations in the Post-Cold War World (3)
The United Nations has become the focus of a debate over its effectiveness as a global organization dedicated to promoting world peace. Some critics believe it is time for the U.N. to move forward in this regard, while others see the U.N. as an anachronistic, bloated bureaucracy sorely in need of reform. This course will consider the United Nations from the perspective of powerful states such as the United States, as well as from the perspective of weaker ones, and also will consider areas such as peacekeeping, human rights, economic development, political reform, and the U.N.'s involvement with non-state actors such as terrorists.

Offered as POSC 372 and POSC 472.

POSC 473. Politics of the European Union (3)
Study of the origins, operations, and prospects for the European Union. This can include the historical context for the effort to restrict national rivalries (which fueled two world wars) and create common interests; the diplomatic challenges in finding common ground; the tasks and processes of governance within the EU, including its governing institutions, enforcement of terms for European Monetary Union and the operations of its bureaucracies; the social pressures that create policy challenges (such as agriculture policy and immigration); broad tensions within the enterprise (e.g., “broadening” vs. “deepening”), and the EU’s potential place in international politics, especially the efforts to create a common foreign and security policy and the possible implications of the Euro for international political economy.

Offered as POSC 373 and POSC 473.

POSC 474. Politics of Development in the Global South (3)
Exploration of the post-World War II emergence of the Global South nations of Africa, Asia, the Middle East, Latin America, and Eastern Europe arena.

Offered as ETHS 374, POSC 374, and POSC 474.

POSC 476. United States Foreign Policy (3)
Focus on U.S. foreign policy making with a dynamic network of executive and congressional actors and organizations; analysis of traditional and
POS 477. Politics of Russia (3)
Russia faces three problems: the creation of a sovereign state, the development of a new political system, and the restructuring of its economy. In this course we will challenge the assumption that the outcome of these three transitions will be a strong, democratic, capitalist country. We will ask whether civil war, organized crime, an immature party system, poor social services, and nomenklatura privatization bode poorly for these three transformations.
Offered as POSC 377 and POSC 477.

POS 478. International Relations Theory (3)
This course is a seminar in international relations theory. As such, we will bring a wide range of theoretical perspectives to bear on issues and debates in the area of international relations by systematically studying the evolution of the world system. The seminar is roughly divided into a first half focusing on war and the political system, and a second half focusing on trade, finance and the economic system. Each section devotes particular attention to ethical problems associated with political and economic issues. This course should develop students’ ability to read and critically evaluate academic literature in the field of international relations, and enable students to produce a scholarly paper on one substantive area of the field.
Offered as POSC 378 and POSC 478.

POS 479. Middle East: Politics, Economics, and American Policy (3)
Examination of continuing conflicts, major trends, and internal political and economic developments affecting U.S. policy in the Middle East region. Discussions include human rights, petroleum economics, and Islamic politics.
Offered as POSC 379 and POSC 479.

POS 480. Public Policy and Aging (3)
Overview of aging and the aged. Concepts in the study of public policy. Policies on aging and conditions that they address. The politics of policies on aging. Emergent trends and issues. Offered as ANTH 498, BETH 496, EPBI 408, GER0 496, HSTY 480, MPH 408, NURS 479, NURS 579, POSC 480, and SOCI 496.

POS 481. City as Classroom (3)
In this course, the city is the classroom. We will engage with the urban terrain. We will meet weekly off-campus, interact with community members, and interface--both literally and figuratively--with the city as a way to examine the linkages between historical, conceptual, and contemporary issues, with particular attention paid to race and class dynamics, inequality, and social justice. This course will have four intersecting components, primarily focusing on American cities since the 1930s: the social and physical construction of urban space, the built environment, life and culture in the city, and social movements and grassroots struggles.
Offered as HSTY 381, POSC 381, SOCI 381, HSTY 481, POSC 481, and SOCI 481.

POS 483. Health Policy and Politics in the United States (3)
Overview of the principal institutions, processes, social forces, and ideas shaping the U.S. health system. Historical, political, economic, and sociological perspectives on the health system are explored as well as the intellectual context of recent policy changes, challenges, and developments. Students will acquire a sense of how health services are financed and delivered in the U.S. They will also learn how to assess its performance compared to that of other similar countries.
Offered as POSC 383 and POSC 483.

POS 484. Ethics and Public Policy (3)
Evaluation of ethical arguments in contemporary public policymaking discourse. That is, approaches to evaluating not only the efficiency of policy (Will this policy achieve its end for the least cost?) but also the ethics of policy (Are a policy’s intended ends ethically justified or “good,” and are our means to achieve those ends moral or “just”? ). Overview of political ideologies that supply U.S. political actors with their ethical or moral arguments when proposing and implementing public policy, followed by an application of these differing perspectives to selected policy areas such as welfare, euthanasia, school choice, drug laws, censorship, or others.
Offered as POSC 384 and POSC 484.

POS 485. U.S. Bureaucratic Politics (3)
Bureaucracy is one of civilization’s most important inventions. It is a way of coordinating very large numbers of people so as to do work, make decisions, and exercise power. Without it, much of modern life would be impossible. Yet “bureaucracy” is normally seen, in public discussion, as a problem, instead of as a solution. This course will consider both the reasons for and pathologies of bureaucratic organization. Its special focus is bureaucracy in American government. The course therefore will provide some introduction to the study of American public administration, but with special emphasis on how the work and performance of public bureaucracies in the United States is shaped by the specific tasks they are given and the distribution of power in the American political arena.
Offered as POSC 385 and POSC 485.

POS 486. American Public Policy Process (3)
Focus on the concepts and strategies concerned with moving the public policy process to action. Agenda-setting, issue definition, and feedback techniques will be a particular focus. Assessing political change, support, and obstacles also will be covered, as well as how policy systems operate with regard to different types of issues, such as regulatory, distributive, and redistributive policies, and in different configurations ranging from subgovernmental to issue networks and advocacy coalitions.
Offered as POSC 386 and POSC 486.

POS 487. Comparative Public Policy in Advanced Industrial Societies (3)
The study of comparative public policy focuses on three obvious questions: First, how do policies differ among countries? Second, why do policies differ? For example, what explains the differences in policies about health or the environment or energy or pensions? Third, what difference does it make? Is one set of policies better or worse than others? How can we tell? This course will consider each of these questions, focusing especially on the differences between the United States and other advanced industrial countries, and how these questions affect political and social life in those countries.
Offered as POSC 387 and POSC 487.

POS 489. Special Topics in American Politics and Policy (3)
Specific topic will vary but will consist of an in-depth investigation of a particular policy area or political phenomenon. Topics will involve policy controversies of some current interest.
Offered as POSC 389 and POSC 489.

POS 495. Independent Study (3)
Graduate level independent study taken for a grade.

POS 601. Individual Investigation (1–6)
The student must submit to the departmental office a project prospectus form, approved and signed by the faculty project supervisor, no later than the end of the second week of classes. The prospectus must outline the goals of the project and the research methodology to be used and is part of the basis for grading. The prospectus form is available from the departmental office.
Prereq: Predoctoral prospectus form, graduate standing, and consent of department.

POS 701. Dissertation Ph.D. (1–9)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF PSYCHOLOGY
103 Mather Memorial
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Robert L. Greene, Chair
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The Department of Psychology offers programs leading to both undergraduate (Bachelors of Arts) and graduate (Master of Arts and Doctor of Philosophy) degrees. Programs in psychology can be selected in preparation for graduate work in the field, as background for a variety of human service-oriented professions, or to obtain general knowledge and understanding of behavior that is applicable in many different career fields.
DEPARTMENT FACULTY

Robert L. Greene, Ph.D.
(Yale University)
Professor and Chair
Human memory and cognition

Amin M. Connell, Ph.D.
(Emory University)
Jesse Hauk Shera Assistant Professor
Internalizing problems; coping skills during adolescence

Heath A. Demaree, Ph.D.
(Virginia Tech)
Associate Professor
Cerebral and psychophysiological bases of emotion

Douglas K. Detterman, Ph.D.
(University of Alabama, Tuscaloosa)
Louis D. Beaumont University Professor
Human intelligence and mental retardation

Anastasia Dimitropoulos, Ph.D.
(Vanderbilt University)
Assistant Professor
Genetic mental retardation syndromes; compulsive behavior in MR/DD; functional neuroimaging

Julie J. Edline, Ph.D.
(State University of New York, Stony Brook)
Associate Professor
Social relationships; transgression; moral and religious issues

Joseph F. Fagan III, Ph.D.
(University of Connecticut)
Lucy Adams Leffingwell Professor of Psychology
Development of and individual differences in cognition, perception, and intelligence

Norah C. Feeny, Ph.D.
(Bryn Mawr College)
Associate Professor
Evaluation of interventions for anxiety (e.g., post-traumatic stress disorder) and mood disorders

Grover C. Gilmore, Ph.D.
(Johns Hopkins University)
Professor; Dean, Mandel School of Applied Social Sciences
Perceptual development and aging; visual information processing; memory; psychophysics

Bonnie M. Lawrence, Ph.D.
(Washington University)
Assistant Professor
Sensorimotor transformations; response selection; working memory; MRI research

T. J. McCallum, Ph.D.
(University of Southern California)
Associate Professor
Older adults; caregiving; ethnicity; stress and coping

James C. Overholser, Ph.D.
(Ohio State University)
Professor
Adult psychopathology; depression; suicide; personality disorders

Amy Przeworski, Ph.D.
(Pennsylvania State University)
Assistant Professor
Anxiety disorders; emotion regulation; cultural factors in family interactions

Sandra W. Russ, Ph.D.
(University of Pittsburgh)
Professor
Creativity; affective development in children; personality assessment; coping mechanisms in children

Elizabeth J. Short, Ph.D.
(University of Notre Dame)
Professor
Cognitive psychology; applied developmental; learning disabilities

Lee A. Thompson, Ph.D.
(University of Colorado, Boulder)
Professor
Human behavior genetics; child development

Lecturer
Jennifer L. Butler, Ph.D.
(Case Western Reserve University)
Social psychology

Adjunct Faculty
Jane R. Buder-Shapiro, Ph.D.
Adjunct Assistant Professor; Private Practice

Cameron Camp, Ph.D.
Adjunct Professor; Myers Research Institute

Sandra Caramela-Miller, Ph.D.
Adjunct Assistant Professor; Cuyahoga County Coroner’s Office

Dennis Drotar, Ph.D.
Adjunct Professor; Cincinnati Children’s Hospital Medical Center

Robert Goldberg, Ph.D.
Adjunct Assistant Professor; Cleveland Veterans Administration Medical Center

Vanessa Jensen, Ph.D.
Adjunct Assistant Professor; The Cleveland Clinic

Susan M. Knell, Ph.D.
Adjunct Assistant Professor; Spectrum Psychological Associates

Marilyn Malkin, Ph.D.
Adjunct Assistant Professor; Private Practice

Aarti Pyati, Ph.D.
Adjunct Assistant Professor; University Counseling Services

Jeffrey Rosenbaum, Ph.D.
Adjunct Assistant Professor; Children’s Aid Society/Beech Brook

Philip Safford, Ph.D.
Adjunct Professor; Emeritus, Kent State University

Ethan Scharf, Ph.D.
Adjunct Assistant Professor; Spectrum Psychological Associates

Jes-James Sellers, Ph.D.
Adjunct Assistant Professor; University Counseling Center

Jeremy Shapiro, Ph.D.
Adjunct Assistant Professor; Advanced Therapy Center

Harry Sivic, Ph.D.
Adjunct Assistant Professor; Northeast Behavioral Healthcare

Kenneth Weiss, Ph.D.
Adjunct Assistant Professor; Veterans Administration Medical Center at Brecksville

Lucene Wisniewski, Ph.D.
Adjunct Assistant Professor; Cleveland Center for Eating Disorders

Eric Youngstrom, Ph.D.
Adjunct Associate Professor; Associate Professor of Psychology, University of North Carolina Chapel Hill

Secondary Faculty
Richard E. Boyatzis, Ph.D.
Professor of Organizational Behavior, Weatherhead School of Management

Alan Castro, Ph.D.
Senior Instructor; University Hospitals Case Medical Center

Carin L. Cunningham, Ph.D.
Associate Professor of Pediatrics, School of Medicine

Howard Hall, Psy.D., Ph.D.
Associate Professor, School of Medicine/Rainbow Babies and Children’s Hospital

Rebecca Hazen, Ph.D.
Assistant Professor, School of Medicine/Rainbow Babies and Children's Hospital
Leslie L. Heinberg, Ph.D.
Associate Professor, The Cleveland Clinic
Carolyn Landis, Ph.D.
Assistant Professor, School of Medicine/Rainbow Babies and Children's Hospital
Britt A. Nielsen, Ph.D.
Assistant Professor of Psychiatry, School of Medicine
Lynn Singer, Ph.D.
Professor, School of Medicine/University Hospitals
Terry Stancin, Ph.D.
Professor, School of Medicine/MetroHealth Medical Center
Mariann Suarez, Ph.D.
Assistant Professor of Pediatrics, School of Medicine
Thomas P. Swales, Ph.D.
Assistant Professor, School of Medicine/MetroHealth Medical Center
Gerry Taylor, Ph.D.
Professor of Pediatrics, School of Medicine
Kathleen Wells, Ph.D.
Professor, Mandel School of Applied Social Sciences
Carol Sue White, Ph.D.
Associate Professor, School of Medicine/MetroHealth Medical Center
Abraham Wolf, Ph.D.
Associate Professor of Psychiatry, School of Medicine
James M. Yokely, Ph.D.
Assistant Professor of Psychiatry, School of Medicine
Clinical Instructor; Hill House
Lisa Damour, Ph.D.
Clinical Instructor; Private Practice
Matthew A. Fuller, Ph.D.
Clinical Instructor; Veterans Affairs Medical Center
William Hale, Ph.D.
Clinical Instructor; University Counseling Services
Maureen Kreick, Ph.D.
Clinical Instructor; Private Practice
Maryann McGlenn, Ph.D.
Clinical Instructor; University Counseling Services
Pamela Nilsson, Ph.D.
Clinical Instructor; University Counseling Services
Richard Pazol, Ph.D.
Clinical Instructor; University Counseling Services
Joy Pengilly-Wyatt, Ph.D.
Clinical Instructor; University Counseling Services
David Pincus, D.M.H.
Clinical Assistant Professor of Psychiatry, School of Medicine
Robert Smith, Ph.D.
Clinical Assistant Professor; Private Practice
Terry Tobias, Ph.D.
Clinical Assistant Professor; Private Practice
Richard Weisberg, Ph.D.
Clinical Instructor; Access Behavioral Care

UNDERGRADUATE PROGRAMS

Major
Psychology majors must complete 30 hours of course work in the department.

Required courses:
- PSCL 101 General Psychology I (3)
- PSCL 282 Quantitative Methods in Psychology (3)

Three additional courses chosen from:
- PSCL 315 Social Psychology (3)
- PSCL 352 Physiological Psychology (3)
- PSCL 353 Psychology of Learning (3)
- PSCL 355 Sensation and Perception (3)

Elective courses in the department. Psychology majors must complete 30 hours of course work in the department.

Departmental Honors
Junior majors with a 3.0 overall GPA and a 3.25 GPA in psychology are encouraged to apply to the department's honors program. This program consists of one three-credit course, PSCL 395, in which students carry out, under faculty supervision, an independent project in their area of interest. Satisfactory completion of a paper based on this research qualifies students to receive their degree with Honors in Psychology noted on their academic transcript. PSCL 375 (Research Design and Analysis) is a prerequisite to PSCL 395.

Integrated Graduate Studies
The Department of Psychology participates in the Integrated Graduate Studies program. Interested students should note the general requirements and the admission procedures in this bulletin and may consult the department for further information.

Minor
(15 hours)
Required Course:
- PSCL 101 (3 hours)
Electives:
A minimum of four courses (12 hours) are chosen by the student in consultation with his/her advisor. Practica and independent study are available to minors but cannot be used to satisfy the minor requirement.

Graduate Programs
The Department of Psychology offers full-time programs leading to a Ph.D. in clinical or experimental psychology. These programs give students a thorough grounding in basic areas of psychological fact and theory and prepare them for careers as researchers, teachers, and practitioners. The Master of Arts degree can be earned in the department as part of work toward a doctorate.
Clinical Psychology. The department’s program in clinical psychology, which has been approved by the American Psychological Association, emphasizes the scientist-practitioner model. Students participate in an integrated curriculum of basic and applied courses, research activities, and practicum and pre-internship placements. The program’s goal is to prepare students to make meaningful contributions to the science and profession of psychology by instructing them in broad applications of clinical skills and research methods.

Experimental Psychology. Doctoral training in experimental psychology prepares the student for an academic career in teaching and research. It offers concentrations in developmental psychology, adulthood and aging, cognitive psychology, mental retardation research, and social psychology. Faculty members help students develop flexible programs of study, according to individual interests.

Additional information about graduate work in psychology is available at the departmental website: www.case.edu/artsci/pscl.

COURSE DESCRIPTIONS

PSCL 101. General Psychology I (3)
Methods, research, and theories of psychology. Basic research from such areas as psychophysiology, sensation, perception, development, memory, learning, psychopathology, and social psychology.

PSCL 102. General Psychology II (3)
The applications of psychological research in normal problems of adjustment. Topics include: coping with anxiety, romance and marriage, and interpersonal behavior.

PSCL 230. Child Psychology (3)
Basic facts and principles of psychological development from the prenatal period through adolescence. Recommended preparation: PSCL 101.

PSCL 282. Quantitative Methods in Psychology (3)
The theory and application of basic methods used in the analysis of psychological data. Not available for credit to students who have completed STAT 201 or ANTH 319.

PSCL 313. Psychology of Personality (3)
The development and organization of personality; theories of personality and methods for assessing the person; problems of personal adjustment.

PSCL 315. Social Psychology (3)

PSCL 317. Health Psychology (3)
Examines psychological processes that affect physical health. Covers the physiological factors affecting the immune system, chronic physical disorders, pain, compliance with prescribed medical treatments, the effects of stress and coping, the effects of the patient-physician interaction, and the psychological aspects of the hospital and the health care systems. Recommended preparation: PSCL 101.

PSCL 321. Abnormal Psychology (3)

PSCL 325. Psychotherapy and Personality Change (3)
Three methods of psychotherapy (behavioral, psychoanalytic, and client-centered) are discussed. The therapy techniques and the manner by which personality change is effected are examined. Recommended preparation: PSCL 101.

PSCL 329. Adolescence (3)
Psychological perspectives on physical, cognitive, and social development. Recommended preparation: PSCL 101.

PSCL 334C. Seminar and Practicum: Hospitalized Children (3)
Supervised field placement and attendance at staff conferences in various child and adolescent settings. Regular seminar meetings. Prereq: PSCL 230.

PSCL 335C. Seminar and Practicum: Hospitalized Child (3)
Supervised field placement and attendance at staff conferences in various child and adolescent settings. Regular seminar meetings. Prereq: PSCL 230 and Junior or Senior Status.

PSCL 338. Seminar and Practicum in Adolescents (3)
Supervised field placement and attendance in early childhood, child, and adolescent settings including preschools, schools, hospitals, and neighborhood centers. This class is used to fulfill requirements by the Ohio Department of Education teacher licensure program. Recommended preparation: PSCL 101, EDUC 301, EDUC 304, and permission of program director. Offered as EDUC 338, PSCL 338, and SOC 338.

PSCL 344. Developmental Psychopathology (3)
This course will focus on the interplay of biological, psychological, familial, and social determinants of disorders ranging from autism to delinquency and bulimia. Recommended preparation: PSCL 230 or PSCL 321.

PSCL 350. Behavior Genetics (3)
Examines the impact of both nature and nurture on human behavior. Basic quantitative genetic methodology will be covered. Current family, twin, and adoption studies in the areas of personality, intelligence, alcoholism, criminality, and psychopathology will be reviewed. Recommended preparation: PSCL 101.

PSCL 352. Physiological Psychology (3)
The nervous system as it relates to behavior. Recommended preparation: PSCL 101.

PSCL 353. Psychology of Learning (3)
The basic methods in the study of learning. The major theories proposed to account for the learning process. Development of the fundamental concepts and principles governing the learning process in both humans and lower animal. Recommended Preparation: PSCL 101.

PSCL 357. Cognitive Psychology (3)

PSCL 369. Adult Development and Aging (3)
An overview of concepts and research relating to adult development and aging. The lifespan perspective will be used in examining major developmental paradigms. Personality and cognitive lines of development will be traced across the lifespan. Data from both longitudinal and cross-sectional studies will be analyzed. Both normal and pathological aging will be discussed. Special emphasis will be given to areas of cognitive deterioration in aging. Implications for optimal adult development and aging will also be discussed.

PSCL 370. Human Intelligence (3)
Survey of individual differences in human intellect including construction and administration of intelligence tests, theories and models of intelligence, and the role of heredity and environment in intelligence and the development of intelligence. This course will also examine the relationships of cognitive abilities to intelligence and human to artificial intelligence. Recommended preparation: PSCL 101.

PSCL 375. Research Design and Analysis (3)
Conceptual and methodological issues confronted by the behavioral scientist conducting research. Major experimental designs and statistical procedures. Intuitive understanding of the mathemati-
PHYSICAL OPERATIONS. Recommended preparation: PSCL 282.
SAGES DEPT SEMINAR

PSCL 379. Neurodevelopmental Disabilities (3)
Ways in which neurobehavioral development can go awry, the causes of such deviations, and their consequences. The course builds on basic psychological and neuroscience concepts to explore the manner in which developmental disabilities occur, ways of preventing disabilities, and approaches to ameliorating and managing disabling conditions. Recommended preparation: PSCL 101 and PSCL 230.

PSCL 382. Psychological Measurement (3)

PSCL 388. Human Sexual Behavior (3)
Sex is approached as a form of personal and interpersonal behavior. A broad range of theories from social psychology will be used to explain human sexual behavior, and these will be evaluated by using facts and findings from recent research studies. Topics include sexual relationships, gender differences, promiscuity, rape and coercion, finding and choosing sex partners, sexual risk-taking, harassment, sexual identity and orientation, cultural influences and differences, evolution of sexual motivations, prostitution, pornography, and love. Recommended preparation: PSCL 101 and PSCL 315.

PSCL 390. Seminars in Psychology (1–3)
Surveys of special subject areas. Topics vary in response to faculty and student interests. Small group discussion. Prerequisite depends on content.

PSCL 393. Experimental Child Psychology (3)
The development of behavior from birth to adolescence. Growth of basic processes such as perception, learning, memory, intelligence, and language in the light of current theoretical models. Recommended preparation: PSCL 101.

PSCL 394. Psychology Capstone Seminar: Current Problems (3)
This seminar course will revolve around the identification and critical examination of current problems in society. Insights gained from psychological research will be applied to better understand these problems. Successful completion of the course will require critical analysis of published research, integration of information from different areas of psychology and from different disciplines, an oral presentation, and a final written research report including a literature review. Prerequisite: PSCL 375.
SAGES Senior Cap

PSCL 395. Capstone and Honors Program (3)
Supervision in carrying out an independent research study in the student’s area of interest. Prerequisite: PSCL 375.
SAGES Senior Cap

PSCL 397. Independent Study (1–3)
Individual study involving specific programs of reading, research, and special projects. Prerequisite: PSCL 101.

PSCL 398C. Child Policy Externship and Capstone (3)
This course provides students with externships in child policy. These externships give students an opportunity to work directly with professionals who design and implement policies that impact the lives of children and their families. Agencies involved are active in areas such as childcare, education, juvenile justice, and physical and mental health. Students apply for the externship. Selected students are placed in a local child policy agency. An individualized learning plan is developed in consultation with the Childhood Studies Program faculty, the supervisor in the agency, and the student. Offered as ANTH 398C, CHST 398C, PSCL 398C.
SAGES Senior Cap

PSCL 401. Sensation and Perception (3)
Role of sensory and perceptual processes in adjustment. Theories and experimental work dealing with such topics as nativism vs. empiricism, perception without awareness, perception and personality, effects of drugs on personality, effects of drugs on perception, pathology of perception. Limited to graduate students.

PSCL 402. Cognition and Information Processing (3)
Aspects of cognition beyond the area of sensation and perception, involving symbolic processes, especially problems of meaning, conceiving, reasoning, judging, and thinking.

PSCL 403. Physiological Foundations of Behavior (3)
Fundamental neurological processes controlling behavior.

PSCL 404. Learning Theory (3)
The research literature in learning: theoretical formulations of contemporary learning theorists. Limited to graduate students.

PSCL 405. Personality Theory (3)
General problems and systematic points of view in the analysis of personality. Limited to graduate students.

PSCL 407. Research Design and Quantitative Analysis I (3)
Intermediate research design and statistical analysis used in psychological research. Statistical inference from single variables, elementary principles of probability, correlation and regression. Recommended preparation: PSCL 282.

PSCL 408. Research Design and Quantitative Analysis II (3)

PSCL 409. Advanced Social Psychology (3)
Major theories, methods, and problem areas of social psychology. Psychological development of the individual group structures and dynamics.

PSCL 410. Developmental Psychology (3)
The research literature and theoretical formulation in the area of developmental psychology. Limited to graduate students.

PSCL 412. Measurement of Behavior (3)

PSCL 417. Multivariate Data Analysis (3)
Major statistical techniques used in experimental and survey research containing more than one dependent variable. Techniques discussed include multiple regression, canonical correlation, multivariate analysis of variance, discrimination analysis, cluster analysis and factor analysis. Recommended preparation: PSCL 408.

PSCL 418. History and Systems (3)
Historical antecedents of modern psychology.

PSCL 424. Clinical Interviewing (3)
Introduction to diagnostic and therapeutic interviewing.

PSCL 425. Methods of Assessment I (3)
Limited to graduate students in clinical psychology. Required preparation: Graduate standing in psychology with department permission.

PSCL 426. Methods of Assessment II (3)
Methods of psychological assessment, emphasizing personality and family function in childhood and adulthood. Recommended preparation: Limited to Grad students in Clinical Psychology. Requires approval of the director of clinical training.

PSCL 429. Practicum in Assessment I (1)

PSCL 430. Practicum in Assessment II (1)
Recommended preparation: Approval of the director of clinical training or concurrent enrollment in PSCL 426.
PSCl 431. Supervised Field Placement Year 2 (0)
Supervised training in clinical psychology in agency, hospital, or university settings. Required in Fall and Spring terms of all second year students in the clinical psychology training program. Recommended preparation: PSCL 425, PSCL 426.

PSCl 444. Developmental Psychopathology (3)
This course will focus on the interplay of biological, psychological, familial, and social determinants of disorders ranging from autism to delinquency and bulimia. Recommended preparation: PSCL 230 or PSCL 321. Offered as PSCL 344 and PSCL 444.

PSCl 451. Special Topics in Psychology (1)
These 1 credit mini-courses should provide enjoyable opportunities for students to explore interesting material related to clinical psychology that has not been covered in other required courses. A primary goal is to stimulate interest and discussion in the area. Thus, students will not be expected to write term papers or take any exams. In terms of background reading, students should be provided with roughly one journal article per hour of class meeting. The course is graded pass/np pass, and grading will be based on class attendance and class participation.

PSCl 453. Seminars in Psychology (1–3)
A special problem or topic. Content varies with student and faculty interest. Recent offerings: creative thinking in research, community psychological, evaluation of community processes, experimental and computer methods, consultation, and psychoanalytic ego psychology.

PSCl 469. Psychology of Aging (3)
Normal psychological development in later life; psychological development in the oldest old; definitions and assessment of successful aging.

PSCl 497. Graduate Independent Study (1–3)
Independent research and reading programs with individual members of the faculty.

PSCl 501. Seminar: Pediatric Psychology (1–3)
Seminar on current research topics, research design and methodological issues related to pediatric psychology. Introductory lectures provide an overview of research populations, methods, and practical issues appropriate to research with pediatric populations.

PSCl 502. Seminar: Pediatric Psychology (1–3)
Seminar examining specific topics in pediatric psychology. Topics will deal with issues of infant development. Infants at risk for disability, neuropsychology and learning disabilities, and childhood psychopathology. Recommended preparation: Limited to Graduate students in Psychology department.

PSCl 524. Advanced Psychopathology (3)
Theoretical issues and current research data bearing on major patterns of psychological disturbance.

PSCl 525. Ethical and Professional Issues in Psychology (3)
Consideration of legal and ethical principles in research and practice in clinical psychology and contemporary controversies in professional psychology. Recommended preparation: Graduate standing in Psychology.

PSCl 557. Principles of Intervention (3)
Review of principles of psychological change, models of intervention, and process/outcome research related to intervention.

PSCl 529A. Practicum in Intervention I: Behavior Therapy (1)
Recommended Preparation: Graduate standing in clinical psychology.

PSCl 529C. Practicum in Intervention I: Psychodynamic (1)
Recommended preparation: Graduate standing in clinical psychology.

PSCl 530A. Practicum in Intervention II: Behavior Therapy (1)
Recommended preparation: Graduate standing in clinical psychology.

PSCl 530C. Practicum in Intervention II: Psychodynamic (1)
Recommended preparation: Graduate standing in clinical psychology.

PSCl 531A. Seminar in Intervention I: Behavior Therapy (2)
Theoretical issues and research on psychological interventions. Recommended preparation: Graduate standing in clinical psychology.

PSCl 531C. Seminar in Intervention I: Psychodynamic (2)
Theoretical issues and research on psychological interventions. Recommended preparation: Graduate standing in clinical psychology.

PSCl 532A. Seminar in Intervention II: Behavior Therapy (2)
Theoretical issues and research on psychological interventions. Recommended preparation: Graduate standing in clinical psychology.

PSCl 532C. Seminar in Intervention II: Psychodynamic (2)
Theoretical issues and research on psychodynamic intervention. Recommended preparation: PSCL 531C and graduate standing in clinical psychology.

PSCl 535. Child and Family Intervention (2)
A course for advanced clinical graduate students that covers psychodynamic and cognitive behavioral approaches for working with children and adolescents and systems approaches for working with families.

PSCl 536. Advanced Child and Family Intervention (2)
A course for advanced clinical graduate students that covers evidence-based approaches to child and family therapy as well as parent training. Special emphasis on empirically guided treatment planning and outcome evaluation.

PSCl 537. Child and Family Case Seminar I (1)
Clinical graduate students in child and family field placements present and receive group supervision on ongoing cases.

PSCl 538. Child and Family Case Seminar II (1)
Clinical graduate students in child and family field placements present and receive group supervision on ongoing cases.

PSCl 539. Supervised Field Placement Year 3 (0)
Supervised training in clinical psychology in agency, hospital, or university settings. Required in Fall and Spring terms of all third year students in the clinical psychology training program. Recommended preparation: PSCL 531A, PSCL 532A.

PSCl 540. Supervised Field Placement Year 4 (0)
Supervised training in clinical psychology in agency, hospital, or university settings. Required in Fall and Spring terms of all fourth year students in the clinical psychology training program. Recommended preparation: PSCL 531A, PSCL 532A.

PSCl 601. Special Problems (1–18)
(Credit as arranged.)

PSCl 651. Thesis M.A. (1–18)
(Credit as arranged.)

PSCl 700. Internship (0)
Full-time predoctoral internship in clinical psychology. Required of all students in clinical psychology program. Registration requires written consent of director of clinical psychology training and must be for one calendar year.

PSCl 701. Dissertation Ph.D. (1–18)
(Credit as arranged.)

Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

PUBLIC POLICY PROGRAM
113 Mather House
www.case.edu/artsci/public_policy
Phone: 216-368-2424
Joseph White, Director
E-mail: joseph.white@case.edu

CASE WESTERN RESERVE UNIVERSITY
Undergraduate or graduate courses with public policy content are offered through the Departments of Anthropology, Geological Sciences, History, Political Science, and Sociology in the College of Arts and Sciences; through the Department of Economics and other departments in the Weatherhead School of Management; through the School of Law, the School of Medicine, and the Frances Payne Bolton School of Nursing; and through the Mandel School of Applied Social Sciences and the Mandel Center for Nonprofit Organizations. Students can engage with policy issues both through courses and through the extracurricular programming of the Center for Policy Studies and other university bodies.

A minor in public policy is available to undergraduates in the College of Arts and Sciences and in the economics and management programs in the Weatherhead School of Management. The course requirements are in four categories, listed below. Substitutions can be made under exceptional circumstances, at the discretion of the program director.

PROGRAM ADVISORY COMMITTEE
Joseph White, Ph.D.
Luxenberg Family Professor of Public Policy, Department of Political Science; Director, Center for Policy Studies; Director, Public Policy Program

Robert H. Binstock, Ph.D.
Professor of Epidemiology and Biostatistics, School of Medicine

Brian Gran, Ph.D., J.D.
Associate Professor of Sociology

David C. Hammack, Ph.D.
Hiram C. Haydn Professor of History

Susan Helper, Ph.D.
AT&T Professor of Regional Economic Development, Department of Economics, Weatherhead School of Management

UNDERGRADUATE PROGRAMS

Minor
(15 Hours)

Course requirements for the minor are as follows:

1. The policy process: one course from POSC 386, 383, or 306
2. Economic analysis: one course from ECON 205 or 102
3. Policy making institutions: one course selected from HSTY 256, 358, 400; POSC 308, 310, 323, 384, 385
4. Two courses on a particular field of public policy, selected with the approval of the program director. A list of courses that have been approved in the past is available on the Public Policy program’s Web site.

DEPARTMENT OF RELIGIOUS STUDIES

111 Mather House
www.case.edu/artsci/rlgn
Phone: 216-368-2210; Fax: 216-368-4681
Peter J. Haas, Chair
E-mail: peter.haas@case.edu

The academic study of religion at Case Western Reserve University is multicultural, non-sectarian, and both disciplinary and interdisciplinary. Students examine a range of past and present cultures and societies using methods and approaches drawn from the humanities, arts, social sciences, and sciences, all of which sharpen critical and evaluative skills. Religious beliefs, institutions, and practices are studied with emphasis placed on the critical problems and possibilities inherent in current theories, methods, and technologies.

The Department of Religious Studies offers a major and a minor—as well as a departmental honors program—for students pursuing the Bachelor of Arts degree. Both the major and minor programs acquaint the student with the texts and traditions of major religions, as well as cultural and social aspects of these religions. Majors are encouraged to participate in study abroad programs.

Where appropriate, courses are designed to utilize Internet and other technological resources, cultural institutions in University Circle, and the cultural diversity of Greater Cleveland. Several 300-level courses may be taken for graduate credit by fulfilling additional course requirements, and qualified students may pursue the M.A. degree under the Integrated Graduate Studies program. The Department of Religious Studies also contributes courses to and supports a number of the college’s interdisciplinary programs and centers, such as Asian Studies, Environmental Studies, Ethnic Studies, Women’s and Gender Studies, International Studies, and Judaic Studies.

The academic study of religion, combined with appropriate courses in other fields, provides an excellent background for any professional career that involves interaction with diverse populations—including law, engineering, medicine and health care professions, journalism, and social work—and for graduate studies in a number of fields. A major in religious studies provides a well-rounded liberal arts education or can be combined conveniently with a second major. A minor in religious studies complements and broadens any field chosen as a major.

DEPARTMENT FACULTY

Peter J. Haas, Ph.D.
(Brown University)
Abba Hillel Silver Professor of Jewish Studies and Chair; Director, Judaic Studies Program

Alice Bach, Ph.D.
(Union Theological Seminary)
Archbishop Paul J. Hallinan Professor of Catholic Studies

Joy R. Bostic, Ph.D.
(Union Theological Seminary)
Assistant Professor

Timothy K. Beal, Ph.D.
(Emory University)
Florence Harkness Professor of Religion

Deepak Sarma, Ph.D.
(University of Chicago)
Associate Professor

Lecturers

Ramez Islambouli, M.A.
(Case Western Reserve University)
Islam; Islamic thought; Islamic law

Judith Neulander, Ph.D.
A minor in religious studies requires at least 18 credit hours, to include the following:

1. RLGN 102: Introduction to the Study of Religion (3 credit hours)
2. Nine hours of elective credit, chosen in consultation with a departmental advisor. The courses should demonstrate study of diverse religious traditions.
3. RLGN 299-399: Method and Theory in the Study of Religion and Major/Minor Seminar (6 credit hours)

**COURSE DESCRIPTIONS**

**RLGN 102. Introduction to the Study of Religion (3)**
Introduction to the academic study of religion and of the religious dimensions of life. Open to all students but prerequisite for majors and minors in Religion.

**RLGN 105. Aspects of Jewish and Middle Eastern Religions and Cultures (1)**
This mini-course explores a variety of topics in Jewish and Middle Eastern religions and cultures. A one-credit course, repeatable up to three times, taught by distinguished Rosenthal Fellows visiting from Hebrew University in Jerusalem. Intended for students and others interested in an introduction to religion and culture. Participation in lectures and discussions and a final exam are required.

**RLGN 115. Ethical Problems in Local Perspective (3)**
This course examines contemporary ethical problems—including abortion, racism, suicide, capital punishment, bioethics, and just war theory—in light of their impact on the local Cleveland community. Most of us are aware of the national conversation around these issues; this course explores how local communities and institutions address and deal with these ethical problems. Recommended preparation: Priority given to first and second year students.

**RLGN 203. Jewish Religious Heritage (3)**
The beliefs, doctrines and institutions of classical Judaism; their origin and development.

**RLGN 204. Introduction to Asian Religions (3)**
Principal Asian religious traditions based on a study of classical sources. Classical Chinese thought, Hinduism, and Buddhism. Readings include selections from the works of Confucius, Mencius, Mo Tzu, Lao Tzu, Chuang Tzu, the Mahabharata, the Bhagavad Gita, and the early Buddhist canon. Global & Cultural Diversity

**RLGN 206. Religion and Ecology (3)**
Historical and cross-cultural introduction to religious perspectives on nature and ecology, including Jewish, Christian, Hindu, Buddhist, and Native American texts and ritual practices. Themes include: ecology of chaos and complexity, urban ecology, wilderness, and ecological crises.

**RLGN 207. Women and Religion (3)**
Examination of feminist perspectives on religion, such as the status of women in Western and non-Western religions, the nature and purpose of religious beliefs and practices from the standpoints of religious and non-religious feminists, the current status of feminist philosophies of religion, and the efforts of feminists to transform traditional religions and to create new religions. Offered as RLGN 207 and WGST 207.

**RLGN 208. Introduction to Western Religions (3)**
Basic introduction to the three great monotheistic religions of the Western World: Christianity, Judaism, and Islam. All three of these religious traditions trace their roots to the faith of Biblical Israel as revealed by a series of prophets including Noah, Abraham, and Moses. Each absorbed the philosophy and science of the Greco-Roman world and went on both to influence and struggle with each other. Many of the religious problems of the contemporary world, from Afghanistan to the Middle East to Yugoslavia, can be traced to tension within and between these religious groups.

Global & Cultural Diversity

**RLGN 209. Introduction to Biblical Literature (3)**
This course is an introduction to the academic study of biblical literature, including Hebrew Scriptures ("Old Testament") and the New Testament. The literature will be studied in light of both ancient and contemporary historical contexts, with a particular emphasis on the roles it plays in American culture and politics today. Class sessions will be discussion oriented and will involve close, careful analysis and interpretation of texts. No background in religion is necessary. Evaluation will be based on class preparation and participation, regular short writing assignments, two exams, and a major paper.

**RLGN 210. Introduction to the Philosophy of Religion (3)**
An introduction to the central questions in the philosophy of religion, such as “Can there be more than one true religion?” These questions will be examined from a number of perspectives, including those presented by modern theologians and philosophers of religion.

**RLGN 212. Introduction to Christianity (3)**
An introduction to the history, thought and culture of Christianity and its diverse traditions. Course will include field research with local Christian religious institutions.

**RLGN 215. Religion In America (3)**
Survey of religious histories in North America, from the trans-Bering migrations to the present. Drawing from a variety of approaches such as social history, ritual studies, and institutional and
doctrinal histories, this course charts the religious development of various groups including Native Americans, African Americans, Euro-Americans, and others.

Global & Cultural Diversity

RLGN 216. Hinduism I: The Vedic, Epic and Puranic Periods (3)
This course will provide an introduction to the Vedic, Epic and Puranic periods in the development of Hinduism. We will read a range of primary sources produced during these times. These texts were composed between 1500 BCE and the 5th century CE. The course has an emphasis on research and writing. We will not be examining contemporary issues or practice. The goal of the class is to gain detailed understanding of the kind of world(s) that were envisioned in these forms of early “Hinduism.”

Global & Cultural Diversity

RLGN 217. Buddhism (3)
The development of Buddhism. The life and teaching of the Buddha, the formation of the early Buddhist church, the schools of Hinayana Buddhism and Abhidharma philosophy, Nagarguna and the emergence of Mahayana Buddhism, the spread of Buddhism to China, the transformation of Buddhist thought in China, Zen Buddhism, the spread of Buddhism to the West.

Global & Cultural Diversity

RLGN 218. Islam: Faith and Politics (3)
An overview of the relationship between Islam as a religion and Islam as a political system and the effect of this relationship on Islamic society from its origin to the present time.

Global & Cultural Diversity

RLGN 219. Islam in America (3)
An examination of the experience of Islam in America and its various religious, educational, and social manifestations. Beginning with a history of Islam in America, the course will address topics such as Islam’s relationship with slavery in America, American Islamic law and theology, ritual practice, Sufism, and the Islamic community in Cleveland.

Global & Cultural Diversity

RLGN 221. Indian Philosophy (3)
A survey of Indian philosophical thought with emphasis on the Vedas, early Hindu, and Jain literature.

Offered as PHIL 221 and RLGN 221.

Global & Cultural Diversity

RLGN 222. African-American Religions (3)
This course is an exploration of the rich diversity of African American religions from the colonial period to the present. Attention will be given to key figures, institutional expressions, and significant movements in African American religious history. Major themes include African traditions in American religions, slavery and religion, sacred music, social protest, Black Nationalism in religion, Islam, African American women and religion, and black and womanist theologies. Course requirements will include field trips to local religious sites. Offered as ETHS 222 and RLGN 222.

RLGN 223. Religious Roots of Conflict in the Middle East (3)
The course is about the rhetoric and symbols used by various voices in the Middle East in the ongoing debate about the future shape of the region. For historical and cultural reasons, much of the discourse draws on religious symbolism, especially (although not exclusively) Islamic, Jewish, and Christian. Because of the long and complex history of the region and the religious communities in it, virtually every act and every place is fraught with meaning. The course examines the diverse symbols and rhetorical strategies used by the various sides in the conflict and how they are understood both by various audiences within each community and among the different communities.

Global & Cultural Diversity

RLGN 226. Hinduism II: The Medieval and Modern Periods (3)
This course will provide an introduction to the medieval and modern periods in the development of Hinduism. We will read a range of primary sources produced during these times in addition to examining rituals and other practices that were developed concurrently. We will also focus on Diaspora Hinduism. The course has an emphasis on research and writing. Prereq: RLGN 216.

RLGN 231. Jews in the Modern World (3)
Investigation of the impact of modernity on the Jewish community. In particular the course will examine the influence of the Emanicipation and Enlightenment on the social situation of the Jews in Europe and America and the corresponding changes in Judaic religion, philosophy, social structure, and culture. Attention will be paid to the creation of a modern Jewish identity in the secular culture of the post-Modern world.

Offered as HSTY 238, JSTD 231, and RLGN 231.

RLGN 233. Introduction to Jewish Folklore (3)
Exploration of a variety of genres, research methods and interpretations of Jewish folklore, from antiquity to the present. Emphasis on how Jewish folk traditions and culture give us access to the spirit and mentality of the many different generations of the Jewish ethnic group, illuminating its past and informing the direction of its future development. Offered as ANTH 233 and JSTD 233.

Global & Cultural Diversity

RLGN 235. Religion and Visual Culture (3)
Cross-cultural introduction to complex relations between religion and seeing. Study of visual culture, sacred iconography, calligraphy, film, mass media, and avant-garde fashion. Extensive use of cultural resources in University Circle.

RLGN 238. Alternative Altars: Folk Religion in America (3)
Taking a multidisciplinary approach, students will become familiar with the distinction between conventional and unconventional religions, with the history and personalities associated with new belief systems in America, and with the means, motivations and methods of generating faith communities. Students will come to understand the role of cultural anxieties, new technologies, changing roles, globalization and other social tensions in the formation and duration of alternative altars.

RLGN 240. The Heavens in Religion and Science (3)
Review of the relationships between scientific descriptions of the natural world and the religious and ethical implications drawn from those in Western civilizations. Introduction to the close cooperation between religion and science in the West until the modern period and review of the breakdown of that relationship in the past 200 years.

RLGN 251. Perspectives in Ethnicity, Race, Religion and Gender (3)
This course is designed to introduce students to the study of ethnicity. Basic concepts such as race, gender, class, and identity construction will be examined. Students are encouraged to use the tools and perspectives of several disciplines to address the experiences of ethnic groups in the United States. Offered as ETHS 251 and RLGN 251.

Global & Cultural Diversity

RLGN 254. The Holocaust (3)
History of racism in European society from 18th to 20th century; investigation, from perspectives of history, psychology, literature, philosophy, and religion, of how bureaucracy could exterminate six million Jews; responses of individuals, groups, institutions, and nations to deliberate extermination of nearly a whole people.

Offered as HSTY 254 and RLGN 254.

Global & Cultural Diversity

RLGN 259. Tricksters, Conjurors, and Gods: Religion in West Africa and Diaspora (3)
This course will present a portrait of West African religious history framed in the religious themes common to the rest of the world. We will focus upon the traditional religions that provided the philosophical, religious, and the ethical basis of the African cultures. Focusing primarily on traditional West African religions and their related myths, rituals, divinities, and religious art, the course will consider African indigenous religions as well as those beliefs, traditions, and ritualism that have become part of the religious life in the diaspora in the Americas.

Offered as ETHS 259 and RLGN 259.

Global & Cultural Diversity

RLGN 260. Introduction to the Qur’an (3)
This course explains the complexities of the Qur’an
and provides an entree into a text that has shaped the lives of millions for centuries. In addition to a comprehensive introduction to the Qur'an, the course will examine problems of translation and the major subjects addressed in the Qur'an: Muhammed and revelation, God and the Last Judgment, prophets in general, and the Qur'an as a law book. Also discussed will be the relations of Muslims to the other Peoples of the Book, namely Jews and Christians.

Global & Cultural Diversity

RLGN 266. Bible in Fiction - Fiction in the Bible (3) Examination of use of biblical themes, tropes, and characters in modern fiction and popular culture, e.g., films, librettos, songs. Readings include Genesis, Exodus, Numbers, Judges, 1-2 Samuel, haggadic Midrashim, Jewish folktales, and modern fiction.

RLGN 268. Women in the Bible: Ethnographic Approaches to Rite and Ritual, Story, Song, and Art. (3) Examination of women in Jewish and Christian Biblical texts, along with their Jewish, Christian (and occasionally Muslim) interpretations. Discussion of how these traditions have shaped images of, and attitudes toward, women in western civilization. Offered as RLGN 268 and WGST 268.

RLGN 270. Introduction to Gender Studies (3) This course introduces women and men students to the methods and concepts of gender studies, women's studies, and feminist theory. An interdisciplinary course, it covers approaches used in literary criticism, history, philosophy, political science, sociology, anthropology, psychology, film studies, cultural studies, art history, and religion. It is the required introductory course for students taking the women's studies major. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 270, HSTY 270, PHIL 270, RLGN 270, and WGST 201.

Global & Cultural Diversity

RLGN 272. Morality and Mind (3) Recent research in cognitive science challenges ethical perspectives founded on the assumption that rationality is key to moral knowledge or that morality is the product of divine revelation. Bedrock moral concepts like free will, rights, and moral agency also have been questioned. In light of such critiques, how can we best understand moral ethics, cognitive science, and evolutionary biology? Offered as COGS 272, RLGN 272.

RLGN 280. Religion and Politics in the Middle East (3) An in-depth look at the relationship between politics and religion in the Middle East. Students will spend the first week on the Case Western Reserve campus and the last three weeks in Israel, where time will be divided between classroom teaching, guest lectures, and "field trips" to important sites. Students will have the opportunity to interact directly with members of the region's diverse religious groups within the political, social, and cultural contexts in which they live. A final research paper will be required. Knowledge of Hebrew is not necessary. Offered as JDST 280 and RLGN 280.

Global & Cultural Diversity

RLGN 283. Muhammad: The Man and the Prophet (3) The life of the Prophet Muhammad (c.470-632 CE) was as crucial to the unfolding Islamic ideal as it is today. An examination of how he attempted to bring peace to war-torn Arabia by evolving an entirely new perspective of the human situation, guidance for human lives, and humans' relationship with God. The course will include Western perceptions of Islam, especially in light of September 11, 2001.

Global & Cultural Diversity

RLGN 299. Method and Theory in the Study of Religion (3) This is an advanced course in method and theory in the study of religion and is designed for majors in Religious Studies. The goal is to strengthen the foundation in religious studies first obtained in RLGN 102 and to prepare students for projects to be completed and presented during the second semester in RLGN 399. (or RLGN 395 for honors). Class time will be devoted to lectures and discussions of a variety of authors, methods and topics. Particular readings will be assigned by the designated instructor. Students are expected to attend class regularly, complete assigned reading and participate in class discussions. Prereq: RLGN 102 and 9 credits in other RLGN courses.

RLGN 301. Ritual in Religion (3) Drawing from a broad range of approaches and academic fields, this seminar offers an introduction to the study of ritual. The course has three main goals: (1) to help students become familiar with important theories of and approaches to ritual studies; (2) to explore a number of ritual practices from different cultures, from ancient priestly rites in the Bible to contemporary cockfights in Bali; and (3) to study and discuss several representations of ritual in contemporary literature and film.


Global & Cultural Diversity

RLGN 305. Sanskrit Religious Texts (3) Introduction to the Sanskrit language and culture through the reading of selected texts taken from the ancient religions of South Asia. Offered as CLSC 305 and RLGN 305.

RLGN 306. Interpreting, Buddhist Texts (3) Readings in translation of major texts from the Buddhist tradition. Special emphasis on problems of textual interpretation, historical context, Buddhist conceptions of the sacred, and Buddhist ethics. Prereq: RLGN 102 or RLGN 204 or RLGN 217 or RLGN 303 or RLGN 341.

RLGN 309. Advanced Sanskrit Religious Texts (3) This class is a continuation of RLGN 305/CLSC 305, the introduction to the Sanskrit language and culture. In RLGN 309/CLSC 309 students will learn advanced Sanskrit grammar and syntax. Previous knowledge of Sanskrit is required. We will finish the lessons from Devavanipravesika that we began in the introductory course. We will then translate sections for the Bhagavad Gita. Offered as CLSC 309 and RLGN 309. Prereq: RLGN 305 or CLSC 305.

RLGN 310. Folklore and Myth in Japanese Film (3) Representations of folklore, myth and the uncanny in Japanese film primarily in the post-war era.

RLGN 312. The Mythical Trickster (3) Few literary figures have as wide a distribution, and as long a history, as the mythical Trickster. He is at once sacred and profane, creator and destroyer; and incorrigible duper who is always duped. Free of social and moral restraints he is ruled instead by passions and appetites, yet it is through his unprincipled behavior that morals and values come into being. How are we to interpret this amazing creature? Using folkloristic theories and ethnographic methods, we will come to understand the social functions and symbolic meanings of the cross-cultural Trickster, over time and across space.

RLGN 315. Heresy and Dissidence in the Middle Ages (3) Survey of heretical individuals and groups in Western Europe from 500 - 1500 A.D., focusing on popular rather than academic heresies. The development of intolerance in medieval society and the problems of doing history from hostile sources will also be explored. Offered as HSTY 315 and RLGN 315.

RLGN 316. Modern Religious Thought: 1800 to the Present (3) A survey of some major religious thinkers of Eu-
rope and North America from roughly 1800 to the present. A chronological examination of classical texts of theology and philosophy of religion of this period, with consideration of significant themes: Given the advance in modern rational thought, how can we understand traditional religion? What is the relationship between religion and reason? Religion and history? Religion and culture? Religion and experience? Is the attempt to modernize faith misguided or necessary to prevent faith from being captive to outmoded cultural assumptions?

RLGN 319. The Crusades (3)
This course is a survey of the history of the idea of “crusade,” the expeditions of Western Europeans to the East known as crusades, the Muslim and Eastern Christian cultures against which these movements were directed, as well as the culture of the Latin East and other consequences of these crusades. Offered as HSTY 319 and RLGN 319.

The major focus of this seminar will range from the ongoing questions of peace and justice in Israel and occupied Palestine to the land and border questions; Green line, crossing points, the wall; to interpretations from biblical to contemporary texts, reflecting a multiplicity of agendas. Our primary focus will be the analysis of recent research and scholarship on issues of mass violence, contested space and land, gender, race and ethnicity, religious sectarianism, colonialism/imperialism. Through our readings we will identify the bias and concerns of various interpretive communities involved in the ongoing struggles in this very small area. With two peoples claiming the same land for different reasons, can this conflict ever be resolved? Recommended preparation: One course about the Middle East. Offered as ETHS 359 and RLGN 320.

RLGN 325. Justice, Religion, and Society (3)
The ways in which several 20th-century American religious figures, both North and South American, have interpreted their religion as requiring them to struggle for a better society by using direct action to deal with issues of poverty, peace, and social justice. Introduction to writings of prominent social justice activists such as Dorothy Day, Daniel Berrigan, Thomas Merton, and others. Course includes service learning within the Cleveland area via association with structured institutions and programs engaged in social justice and urban poverty issues in order to investigate these from the inside.

RLGN 330. Classical Jewish Religious Thought (3)
The thought of some major biblical and Rabbinic writings and of the classic age of medieval Jewish philosophy. Offered as JDST 330, PHIL 332, and RLGN 330.

RLGN 333. Philosophy of Religion (3)
Topics include: classical and contemporary arguments for God’s existence; divine foreknowledge and human freedom; the problem of evil and theodicy; nature and significance of religious experience; mysticism; varieties of religious metaphysics; knowledge, belief and faith; nature of religious discourse. Readings from traditional and contemporary sources. Recommended preparation for PHIL 433 and RLGN 433: PHIL 101 or RLGN 102. Offered as PHIL 333, RLGN 333, PHIL 433, and RLGN 433. Prereq: PHIL 101 or RLGN 102.

RLGN 341. Religion and Postmodernism (3)
Consideration of the impact of postmodern thought on the study of religion. Examination of how recent critical theory informs our understanding of religious texts and religious themes in contemporary literature, arts and film. Utilizing the theories of Foucault, Derrida, Kristeva, and others, the class will explore such postmodern concerns as narrative, textuality, the author, ideology, gender, and rhetoric. Offered as RLGN 341 and RLGN 441.

RLGN 343. Mysticism (3)
A mystical experience can be broadly defined as a direct experience of the sacred. The course will begin with an exploration of the language of mystical experience and assess how mystical experiences can be studied “objectively.” Then we will examine mysticism in major religious traditions through primary texts with some commentary for guidance. In the final classes we will compare the significance of mystical phenomena, as well as common themes and divergent views, across the traditions.

RLGN 345. Religion and Horror (3)
This seminar explores relations among religion, horror, and the monstrous in ancient scripture and contemporary horror. Course readings, discussions, and research projects approach the subject from two distinct but related directions: first, a focus on elements of horror and the monstrous in biblical and related ancient mythic and ritual texts; second, an examination of religious dimensions in the modern horror, especially as found in representations of monsters in literature and film. Offered as RLGN 345 and RLGN 445. Prereq: RLGN 102.

RLGN 350. Jewish Ethics (3)
An exploration of Jewish moral and ethical discourse. The first half of the course will be devoted to studying the structure and content of classical Jewish ethics on issues including marriage, abortion, euthanasia and social justice. Students will read and react to primary Jewish religious texts. The second half of the course will focus on various modern forms of Judaism and the diversity of moral rhetoric in the Jewish community today. Readings will include such modern thinkers as Martin Buber and Abraham Joshua Heschel. Offered as JDST 350, RLGN 350, and RLGN 450. SAGES Dept Seminar

RLGN 352. Language, Cognition, and Religion (3)
This course utilizes theoretical approaches found in cognitive semantics—a branch of cognitive linguistics—to study the conceptual structures and meanings of religious language. Cognitive semantics, guided by the notion that conceptual structures are embodied, examines the relationship between conceptual systems and the construction of meaning. We consider such ideas as conceptual metaphor theory, conceptual blending, image schemas, cross-domain mappings, metonymy, mental spaces, and idealized cognitive models. We apply these ideas to selected Christian, Buddhist, and Chinese religious texts in order to understand ways in which religious language categorizes and conceptualizes the world. We examine both the universality of cognitive linguistic processes and the culturally specific metaphors, conceptual blends, image schemas, and other cognitive operations that particular texts and traditions utilize. Course Offered as RLGN 352/RLGN 452 and COGS 352/452.

RLGN 366. Religion and Film (3)
Study of the cultural use of biblical figures, especially in film: movies as myth; place of myths in American culture; how cinematic images continue the polarization of biblical images and intertwine them with the American myth. Offered as RLGN 366 and RLGN 466.

RLGN 372. Anthropological Approaches to Religion (3)
The development of, and current approaches to, comparative religion from an anthropological perspective. Topics include witchcraft, ritual, myth, healing, religious language and symbolism, religion and gender, religious experience, the nature of the sacred, religion and social change, altered states of consciousness, and evil. Using material from a wide range of world cultures, critical assessment is made of conventional distinctions such as those between rational/irrational, natural/supernatural, magic-religion, and primitive/ civilized. Recommended preparation: ANTH 102. Offered as ANTH 372, RLGN 372 and ANTH 472.

RLGN 373. History of the Early Church: First Through Fourth Centuries (3)
Explores the development of the diverse traditions of Christianity in the Roman Empire from the first through the fourth centuries C.E. A variety of New Testament and extra-Biblical sources are examined in translation. Emphasis is placed on the place of Christianity in the larger Roman society, and the variety of early Christian ideals of salvation, the Church, and Church leadership. Offered as HSTY 303 and RLGN 373.

RLGN 374. Reformation Europe, 1500-1650 (3)
Origins and development of Protestantism, the Catholic Counter-Reformation, and the interaction between secular power and religious identity in Christian Europe.
Offered as HSTY 309 and RLGN 374.

RLGN 388. Topics in Religion (3) Critical assessment of selected topics of historical or current interest. Project must be accepted by a member of the department faculty prior to registration. Offered as RLGN 388 and RLGN 488.

RLGN 392. Independent Study (1–3) Up to three semester hours of independent study may be taken in a single semester. Must have prior approval of faculty member directing the project.

RLGN 395. Honors Research (3) Intensive study of a topic or problem leading to the writing of an honors thesis. By department approval only. Maximum six credits.

RLGN 399. Major/Minor Seminar (3) Capstone course primarily for majors and minors in Religion. Allows students to interact with peers and faculty, reflect critically, and integrate their learning experiences. Prepares students to continue their learning in the discipline and in the liberal arts. Subject matter varies according to student and faculty needs and perspectives. May be repeated once for up to six credit-hours. Recommended preparation: RLGN 102 and one other RLGN course. SAGES Senior Cap

RLGN 433. Philosophy of Religion (3) Topics include: classical and contemporary arguments for God’s existence; divine foreknowledge and human freedom; the problem of evil and theodicy; nature and significance of religious experience; mysticism; varieties of religious metaphysics; knowledge, belief and faith; nature of religious discourse. Readings from traditional and contemporary sources. Recommended preparation for PHIL 433 and RLGN 433: PHIL 101 or RLGN 102. Offered as PHIL 333, RLGN 333, PHIL 433, and RLGN 433.

RLGN 441. Religion and Postmodernism (3) Consideration of the impact of postmodern thought on the study of religion. Examination of how recent critical theory informs our understanding of religious texts and religious themes in contemporary literature, arts and film. Utilizing the theories of Focault, Derrida, Kristeva, and others, the class will explore such postmodern concerns as narrative, textuality, the author, ideology, gender, and rhetoric. Offered as RLGN 341 and RLGN 441.

RLGN 445. Religion and Horror (3) This seminar explores relations among religion, horror, and the monstrous in ancient scripture and contemporary horror. Course readings, discussions, and research projects approach the subject from two distinct but related directions: first, a focus on elements of horror and the monstrous in biblical and related ancient mythic and ritual texts; second, an examination of religious dimensions in the modern horror, especially as found in representations of monstrosity in literature and film. Offered as RLGN 345 and RLGN 445.

RLGN 450. Jewish Ethics (3) An exploration of Jewish moral and ethical discourse. The first half of the course will be devoted to studying the structure and content of classical Jewish ethics on issues including marriage, abortion, euthanasia and social justice. Students will read and react to primary Jewish religious texts. The second half of the course will focus on various modern forms of Judaism and the diversity of moral rhetoric in the Jewish community today. Readings will include such modern thinkers as Martin Buber and Abraham Joshua Heschel. Offered as JDST 350, RLGN 350, and RLGN 450. SAGES Dept Seminar

RLGN 452. Language, Cognition, and Religion (3) This course utilizes theoretical approaches found in cognitive semantics—a branch of cognitive linguistics—to study the conceptual structures and meanings of religious language. Cognitive semantics, guided by the notion that conceptual structures are embodied, examines the relationship between conceptual systems and the construction of meaning. We consider such ideas as conceptual metaphor theory, conceptual blending, image schemas, cross-domain mappings, metonymy, mental spaces, and idealized cognitive models. We apply these ideas to selected Christian, Buddhist, and Chinese religious texts in order to understand ways in which religious language categorizes and conceptualizes the world. We examine both the universality of cognitive linguistic processes and the culturally specific metaphors, conceptual blends, image schemas, and other cognitive operations that particular texts and traditions utilize.

Offered as RLGN 352/RLGN 452 and COGS 352/452.

RLGN 466. Religion and Film (3) Study of the cultural use of biblical figures, especially in film: movies as myth; place of myths in American culture; how cinematic images continue the polarization of biblical images and intertwine them with the American myth. Offered as RLGN 366 and RLGN 466.

RLGN 488. Topics in Religion (3) Critical assessment of selected topics of historical or current interest. Project must be accepted by a member of the department faculty prior to registration. Offered as RLGN 388 and RLGN 488.

RLGN 601. Special Research (1–6) Project must be accepted by a member of the department faculty prior to registration. Prereq: Graduate standing.

RLGN 651. Thesis M.A. (1–9) Project must be accepted by a member of the department faculty prior to registration.

DEPARTMENT OF SOCIOLOGY

Sociology offers an essential perspective for understanding the dynamics of the social world, including interpersonal relationships, individual lives, and the broader social forces that affect them. Sociology courses explore social change and conflict, crime and deviant behavior, and social-psychological topics such as family relationships, values and health, as well as innovations in social practices and policies that are designed to respond to social problems and challenges. Sociologists explore how economic and cultural forces interact with factors such as gender, race, ethnicity, and age to shape social practices and customs and individual experience. Sociologists conduct research using a broad array of quantitative and qualitative methods in order to illuminate the nature of the social world.

The Department of Sociology places special emphasis on the ways that health and human development and aging are shaped by social forces, and on health policies and health disparities throughout the life course. Study in sociology also offers a variety of practical and hands-on experiences, including courses that involve field research or service learning in medical, educational, geriatric, and other settings. The creative and rigorous thinking skills that one develops in learning to do sociological analysis provide excellent preparation for advanced work in almost any field.

A major in sociology provides a strong background for students considering careers in a broad array of fields, including the health and social service professions, criminal justice, social research, public administration and program development, market research, communications, and business careers. A sociology major also provides excellent preparation for law school, medical school, social work, and other fields of graduate study. Surveys show sociology majors to be among those with the highest rates of acceptance to professional schools. A minor or a second major in sociology also provides excellent preparation to students majoring in other social and behavioral sciences, natural sciences, or humanities.

The Department of Sociology offers programs leading to the Bachelor of Arts, Master of
DEPARTMENT FACULTY

Dale Dannefer, Ph.D.
(Rutgers University)
Selah Chamberlain Professor of Sociology and Department Chair
Aging and the life course; theory; work and family; research methods

Gary Deimling, Ph.D.
(Bowling Green State University)
Professor
Family sociology; sociology of aging; medical sociology; research methods

Brian Gran, Ph.D., J.D.
(Northernwestern University; Indiana University-Bloomington)
Associate Professor
Sociology of law; political sociology; comparative sociology; health care policy

Susan W. Hinz, Ph.D.
(Vanderbilt University)
Associate Professor
Medical sociology; social inequality; sex and gender; work and family

Eva Kahana, Ph.D.
(University of Chicago)
Pierce T. and Elizabeth D. Robson Professor of the Humanities
Sociology of aging; medical sociology; social factors in stress and coping

Jessica Kelley-Moore, Ph.D.
(Purdue University)
Associate Professor
Health disparities; sociology of disability; sociology of the life course; race/ethnicity

Emilia McGucken, Ph.D.
(University of Akron)
Senior Instructor
Criminology; juvenile delinquency; deviance; theory; urban sociology

David Warner, Ph.D.
(Pennsylvania State University)
Assistant Professor
Demography of work and retirement; health inequalities; gender and the life course; marriage and marital quality; event history and multistate life table methods

Secondary Faculty

David E. Biegel, Ph.D.
(University of Maryland, Baltimore)
Henry Zucker Professor, Mandel School of Applied Social Sciences
Family; social networks; caregiving; mental health

Robert H. Binstock, Ph.D.
(Harvard University)
Henry R. Luce Professor of Health, Aging and Society, School of Medicine
Public policy and aging; health care policy

Kathleen Smyth, Ph.D.
(Case Western Reserve University)
Associate Professor of Epidemiology and Biostatistics, School of Medicine
Medical sociology; research methods; sociology of aging

Kurt Stange, M.D., Ph.D.
(University of North Carolina)
Professor of Epidemiology and Biostatistics, School of Medicine
Epidemiology; preventive health care; biostatistics; disability prevention in the elderly

Aloen Townsend, Ph.D.
(University of Michigan)
Associate Professor, Mandel School of Applied Social Sciences
Adult development and aging; research methods and statistics; mental health; families and formal service systems

Adjunct Faculty

Sandra L. Barnes, Ph.D.
(Georgia State University)
Professor of Sociology, Vanderbilt University
Urban sociology; race/ethnicity; sociology of religion; statistics; methodology; African American studies; inequality

Gunhild Hagestad, Ph.D.
(University of Minnesota)
Professor of Sociology, Agder University College
Senior Researcher, NOVA
Life course; gender; social policy

Linda Noelker, Ph.D.
(Case Western Reserve University)
Associate Director of Research, Benjamin Rose Institute
Sociology of aging; family sociology; sex and gender

UNDERGRADUATE PROGRAMS

Major
The major in sociology has been designed to serve the different educational goals of undergraduates: general education, pre-professional training, postgraduate employment, and preparation for graduate school. The major requires a minimum of 30 hours of course work. All majors complete the common core requirements (12 hours):

- SOCI 101 Introduction to Sociology: Human Interaction
- SOCI 300 Modern Sociological Thought
- SOCI 305 Social Research Methods
- STAT 201 or PSCL 282 Statistics

Majors also complete 18 hours of electives, consisting of any six courses in sociology. SOCI 375 (Independent Study) is available to selected majors in their junior or senior year.

Majors have the option of choosing a general sociology curriculum or one of four concentrations: 1) Crime and Delinquency, 2) Health and Aging, 3) Social Inequality, and 4) Gender, Work and Family. Students may choose four courses within any of the following specializations for a concentration in that area:

CRIME AND DELINQUENCY CONCENTRATION

- SOCI 204 Criminology
- SOCI 320 Delinquency and Juvenile Justice
- SOCI 328 Urban Sociology
- SOCI 333 Deviance
- SOCI 349 Social Inequality
- SOCI 360 Sociology of Law

HEALTH AND AGING CONCENTRATION

- SOCI 203 Human Development—Medical and Social
- SOCI 311 Health, Illness and Social Behavior
- SOCI 313 Sociology of Stress and Coping
- SOCI 319 Sociology of Institutional Care
- SOCI 361 The Life Course
- SOCI 365 Health Care Delivery
- SOCI 369 Aging in American Society

SOCIAL INEQUALITY CONCENTRATION

- SOCI 203 Human Development—Medical and Social
Minor
The minor consists of 15 credit hours in sociology, including:

1. SOCI 101 Introduction to Sociology: Human Interaction
2. SOCI 300 Modern Sociological

GRADUATE PROGRAMS
The Department of Sociology offers graduate training leading to the Doctor of Philosophy degree. Students may petition for a Master of Arts degree once they fulfill the requirements outlined below. Sociology of Aging and Medical Sociology are the major areas of emphasis in the department.

Master of Arts
To receive the Masters of Arts degree, a student must successfully complete 27 credit hours of course work. Required courses for the degree are SOCI 400 and 406 and either 401 or 407 plus 469 and 443 and four general electives in sociology. In addition, the student must pass one written comprehensive examination in Sociology of Aging, Medical Sociology, or Research Methods.

Doctor of Philosophy
The Doctor of Philosophy degree is awarded upon the completion of all requirements of the School of Graduate Studies and the following departmental requirements: Completion of 63 credit hours past the Bachelor of Arts degree, including 18 credits of 701 (dissertation hours). Required courses are SOCI 400, 401, 406, 407, 443, 469, two additional electives in research methods, two additional electives in medical sociology, two additional electives in aging, and three general electives in sociology. In addition, students must pass two comprehensive examinations—aging and medical sociology—and successfully defend the dissertation.

A predoctoral training program in Health Research and Aging, sponsored by the National Institute of Aging, has been offered in conjunction with the Elderly Care Research Center of the Department of Sociology.

COURSE DESCRIPTIONS
SOCI 101. Introduction to Sociology (3)
This course examines the basic principles that underlie how sociologists look at the world: “The Sociological Imagination.” It addresses the basic questions: How is social order possible and how does change occur? The course is designed as a foundation for further study in the field of sociology and related disciplines. It introduces the student to the role that culture and social institutions play in modern society and examines important concepts such as socialization, deviance, social control, patterned inequalities and social change. These concepts are discussed in the context of both contemporary and historical social theories. Additionally, the student will be introduced to the methods of inquiry used by practicing sociologists.

SOCI 113. Critical Problems in Modern Society (3)
Focus is on major social problems present in large, complex, industrial societies. Topics include environmental problems, poverty, drug addiction, social deviance, and alienation.

SOCI 203. Human Development: Medical and Social (3)

for a long-term study of very old residents of a retirement community. This research seeks to understand health promotion, proactive adaptation, and maintenance of wellness in late life. Major research projects focusing on medical sociology deal with life-threatening illness, caregiver burden, and physician-patient interactions. The center serves as a laboratory for student research. Collaborative and cross-national research involves colleagues from other disciplines at universities in Israel, Hungary, Britain, and Germany.

Cancer Survivors Research Program
The Cancer Survivors Research Program (CSRP) investigates important research issues in psychological oncology. Formally started in September 1998, the CSRP had been funded for ten years by the National Cancer Institute. Dr. Gary Deimling serves as program director and principal investigator and is assisted by colleagues in the Department of Sociology and the Case School of Medicine. As with many other research programs within the department and the university at large, the CSRP also serves as a teaching facility by training graduate students in the many methodological and theoretical aspects of sociomedical research. The program allows students in the sociology Ph.D. program to gain hands-on experience in a formal research setting while putting their course work into practice.
Social influences on health and illness across the lifespan. Social determinants of health and behavior, and delivery of health care. Guest lecturers from the medical school and other health care providers address professional practice issues across the lifespan. Issues include: new approaches to childbirth; adolescent substance abuse: myths and realities of AIDS; risk factors of diseases in middle age; menopause, cognition and aging-Alzheimer’s disease; problems in care of elderly; medical ethic of death and dying.

SOCI 204. Criminology (3)
What is crime and to what extent does crime affect you? This course will investigate the nature and extent of crime, theories on the causes of crime, types of crime and criminals, and the efforts society makes to cope with and prevent criminal behavior.

SOCI 208. Dating, Marriage, and Family (3)
What is the family today? How has it changed over the last century? How will it change in the future? This course aims to answer these questions as it explores the influences of work, education, government, health and religion on today’s changing families. The course considers the factors that affect mate selection. It also examines parenting, roles of husbands and wives, and family dysfunction and divorce.

SOCI 222. Gender in U.S. Society (3)
The focus of this course is on unique and convergent experiences of men and women in U.S. society. Different social expectations and opportunities encountered by men and women in the context of marriage and the family, work settings, and in informal organizations will be addressed. Legislation and social policy dealing with gender issues will be considered.

Offered as SOCI 222 and WGST 222.

SOCI 228. Sociology of Sexuality (3)
This course analyzes the issues of sex and sexuality from a sociological point of view. It is centered on the notion that what we consider to be ‘normal’ or ‘natural’ about sex and sexuality is, in reality, socially constructed. One’s viewpoint on the issues surrounding sexuality are influenced by the social context in which they live, as opposed to the purely biological viewpoint that presupposes some sense of normalcy or naturalness regarding sexual relations. A range of topics will be covered, including readings that discuss the variations of sexuality and the notions of sexual “deviance” in order to explore the cultural and societal variation that exists along the lines of gender, race, ethnicity, sexual orientation, age and disability.

Offered as SOCI 228 and WGST 228.

SOCI 255. Special Topics (1–3)
Courses taught as special topics seminars focus on selected areas of study in sociology. They tend to be more specialized and emphasis is placed upon a sociological examination of one social institution (such as the media) or on one historical period (such as the ‘60s).

SOCI 262. Disability and Society (3)
This course considers and examines the relationship between disability and society. The course covers how we define, represent, and react to disability in modern society. This includes and analysis of stigma and discrimination. We also explore the timing and experience of disability from a life-course perspective. Finally, we examine the political, social, and economic influences on disability, including the Disability Rights movement.

SOCI 269. Young and Old Face the 21st Century (3)
Examines prospects and problems of the young and old as a window into the 21st century. An intergenerational perspective is used to highlight opportunities for cooperation and conflict between young and old who face the future together. This approach represents a shift in thinking about aging as relevant only to the old, to a view that aging is relevant to the future of all individuals, families, and societies.

SOCI 275. Lives in Medicine: Becoming and Being a Physician (3)
This course applies a sociological approach to medical profession. Medical sociology emerged as a distinct field of study in the 1950s in part due to prominent studies of medical education such as The Student Physician by Robert K. Merton and Howard Becker’s Boys in White. Since then, sociologists and other social scientists have written extensively about how issues of race, gender, aging and ethnicity are tied to issues of medical education, medical training, medical socialization and physician decision-making. Using a life course perspective, this course will examine how lives in medicine change over time; in particular, we’ll study changing workforce patterns, physician satisfaction, and burnout. Other topics to be covered include contemporary ethical issues and alternative professional health careers. The course provides an overview of how medicine and medical practice have a profound influence on—and are influenced by—social, cultural, political and economic forces. In short, you’ll become familiar with how scholars outside of medicine cast a sociological gaze on the profession.

SOCI 300. Modern Sociological Thought (3)
The most profound commentary of industrial society began in the middle of the nineteenth century with thinkers such as Durkheim, Marx, and Max Weber. Students will read the work of these scholars as it appeared in the original sources. They thoughtfully address concepts such as social integration and alienation, crime and punishment, and the social impact of modernization. The course is of special relevance to students in the social sciences, but is also recommended for students in other fields who wish to understand the social context in which professional lives will be conducted. Prereq: SOCI 101 and Sophomore standing.
This course will focus attention on human stress throughout the lifespan and its role in personal health and well-being. There have been exciting advances in recent years in understanding the nature of stress in everyday life as well as elements of extreme stress. Trauma is experienced by many people due to normative events such as illness and bereavement or natural and man-made disasters such as crime or war. Coping strategies and social supports which ameliorate negative impact of stress will be considered.

Offered as SOCI 313 and SOCI 413. Prereq: SOCI 101 and Sophomore standing.

SOCI 314. Qualitative Methods/Field Research (3)

Students explore the theoretical foundations of qualitative social research. The course is designed to introduce and provide experience with a range of data generation strategies and analytic skills. The ethnographic techniques of semi-structured interviewing and participant-observation receive particular attention.

Offered as SOCI 314 and SOCI 414. Prereq: SOCI 101 and Sophomore standing.

SOCI 319. Sociology of Institutional Care (3)

This course focuses on converging issues of theory, research, and practice in general hospitals, mental hospitals, nursing homes, hospices, and correctional institutions. The ecology of institutions and the adaptation of individuals within institutions will also be considered. There will be field trips to institutional facilities.

Offered as SOCI 319 and SOCI 419. Prereq: SOCI 101 and Sophomore standing.

SOCI 320. Delinquency and Juvenile Justice (3)

The primary focus of this course is on acquainting the student with the nature and the extent of juvenile delinquency. Accordingly, theoretical approaches to delinquency causation and the prevention, control, and treatment of delinquent behavior in society are addressed. Important aspects of juvenile justice procedures, policy, and practice are examined, and the early history of the juvenile justice system and the many changes occurring over the years are discussed.

Prereq: SOCI 101.

SOCI 325. Departmental Seminar in Sociology: Great Books (3)

This course fulfills the SAGES requirement of a Departmental Seminar. It focuses on close readings of contemporary classics in sociology, analytical writing and intensive seminar-type discussion. The course examines theoretical perspectives and methodological issues in sociology such that students are able to investigate, analyze and present research findings in written form. Research is always an inherently collaborative process, and thus the course will utilize seminar-style discussions to formulate and examine ideas. The seminar will focus on topics generated by critical reading of books that inform our understanding of large and small group processes as well as individual experiences. Students will be introduced to the sociological imagination as an overarching frame work to examine groundbreaking classical and contemporary books on topics such as health and aging, gender, work and family, social inequality and crime and delinquency, guided by the instructor of record. Readings will provide a sociological perspective for understanding and assessing macro- and micro-level interactions as well as encourage and stimulate critical thinking.

SAGES Dept Seminar
Prereq: SOCI 101 or permission of program director.

Global & Cultural Diversity

SOCI 326. Gender, Inequality, and Globalization (3)

Using a sociological perspective, this course examines how major societal institutions, including the economy, polity, medicine, religion, education and family, are structured to reproduce gendered inequalities across the globe. Attention is given to the intersections of race/ethnicity, social class, gender and sexuality in social systems of power and privilege. Of critical importance is how gender figures in the relationship between Economic North and Economic South countries. We will elucidate how gender norms vary by culture and exert profound influence on the daily, lived experiences of women and men. The course will be informed by recent scholarship on feminism, women's movements, and globalization.

Offered as SOCI 326 and WGST 326. Prereq: SOCI 101 or permission of program director.

Global & Cultural Diversity

SOCI 328. Urban Sociology (3)

The goal of this course is to acquaint the student with the realities and the possibilities of our urban society. Theories and applications of urban sociology interpreting city life and structure are reviewed. The transformation of the urban landscape, the emergence of cities, urban life, urban problems, and urban planning are explored. Issues related to finances, schooling, transportation, the infrastructure of the city, growth and decline, urban poverty, the homeless, crime, pollution, as well as the policy issues and questions such concerns provoke are studied. Key aspects of social science theories and research findings about the nature of spatial, economic and social relationships in cities in developed and developing countries will be analyzed, illuminating some of the processes of urban growth, social transition, and change.

Prereq: SOCI 101.

SOCI 333. Sociology of Deviant Behavior (3)

Sociological approaches to causes of deviant behavior, and social psychology of deviance are studied. Illustrations range from juvenile delinquency to scientific misconduct and cover both criminal and noncriminal forms of deviance.

Prereq: SOCI 101.

SOCI 336. Institutional Care: Research and Reform (3)

This course is designed to provide an introduction to the nature of long term care in the U.S. and to contemporary issues of reform and culture change. It also provides an introduction to techniques for studying nursing home culture, and for assessing culture changes. The issues and problems of long term care are well documented and the need for changing practices of long-term care is so widely recognized and deeply felt that several initiatives for “changing the culture” of long term care have gained national notoriety and rapid momentum. While laudatory, such efforts are inevitable criticized on numerous grounds, including cost, philosophy and vision, and lack of research evidence to support claims of success. The course is designed to provide an introduction to these debates in the scientific literature and in popular culture, and will provide an opportunity to develop skills in structured observation and action research.

Offered as SOCI 336 and SOCI 436.

SOCI 338. Seminar and Practicum in Adolescents (3)

Supervised field placement and attendance in early childhood, child, and adolescent settings including preschools, schools, hospitals, and neighborhood centers. This class is used to fulfill requirements by the Ohio Department of Education teacher licensure program. Recommended preparation: PSCL 101, EDUC 301, EDUC 304, and permission of program director.

Offered as EDUC 338, PSCL 338, and SOCI 338.

SOCI 345. Sociology of Mental Illness (3)

Focus is on social construction of mental health and illness and sociology of emotions. Social determinants of psychological distress will be discussed along with social stigma associated with mental illness. Institutional and community options for care of the mentally ill will be considered along with the impact of recent social movements of deinstitutionalization and independent living.

Offered as SOCI 345 and SOCI 445. Prereq: SOCI 101 and junior/senior standing.

SOCI 347. Sociology of Education (3)

This course provides an introduction to the field of sociology of education, which might be more properly called sociology of schooling. We will examine the development of schools historically and competing paradigms for understanding the place of school in society. Major theoretical perspectives concerning the nature and consequences of schools for individuals and for societies will be reviewed. Issues of individual opportunity - including how it is organized by race, class, and gender - will be covered, as well as issues institutional dynamics - including tracking, testing and so-called crisis and reform.

Offered as SOCI 347 and SOCI 447. Prereq: SOCI 101 and junior or senior standing.

SOCI 349. Social Inequality (3)

Theory and research on contemporary inequality is considered in terms of income, wealth, education, occupational standing, occupational prestige,
status categories, racial, ethnic, religious, age, and gender groupings. Offered as SOCI 349 and SOCI 449. Prereq: SOCI 101 and Sophomore standing.

SOCI 355. Special Topics (3)
One or more sections each semester focusing on selected areas of study in sociology. Offered as SOCI 335 and SOCI 455.

SOCI 360. The Sociology of Law (3)
This course will focus on the role of rights in the U.S. legal system and society. In particular, we will consider three questions. The first is how do rights fit in the legal system and society? Second, how have different social groups used and thought about rights? Third, how do legal actors like judges and lawyers think about rights compared to non-lawyers? Offered as SOCI 360 and SOCI 460. Prereq: SOCI 101 and Sophomore standing.

SOCI 361. The Life Course (3)
Individual experiences and transitions over the life course are considered as the result of societal, cultural, psychological, biological, and historical influences. Developmental issues of childhood, adolescence, young adulthood, middle years and late life are discussed in the context of social expectations, challenges, and opportunities. Emphasis is placed on theoretical readings. Offered as SOCI 361 and SOCI 461. Prereq: SOCI 101 and Sophomore standing.

SOCI 365. Health Care Delivery (3)
Health care in the U.S. may be approaching a critical crossroad. Limiting care to older persons and the chronically ill has been proposed as a means to combat rising costs and limited access to health care. What are the alternatives to health care rationing? Socialized medicine? National health insurance? This course deals with issues of cost, quality, and access to health care in the United States and other societies. It considers how solutions by other societies can provide directions for the organization of health care in the U.S. Offered as SOCI 355 and SOCI 455. Prereq: SOCI 101 and Sophomore standing.

SOCI 369. Aging in American Society (3)
Considers the position and participation of aged adults in American society. Sociological perspectives through which to interpret the aging process and old age: social policies; intergenerational relations; lifestyles and how they affect participation of the aged in American society; dying and death serve as major themes. Offered as SOCI 369 and SOCI 469. Prereq: SOCI 101 and Sophomore standing.

SOCI 370. Sociology of the Family (3)
This course provides the theoretical and methodological foundation for conducting family research. It also reviews the most current research in the sociology of the family arena such as intergenerational issues, ethnicity and gender, and family transitions. Offered as SOCI 370 and SOCI 470. Prereq: SOCI 101 and Sophomore standing.

SOCI 372. Work and Family: U.S. and Abroad (3)
Covers the impact on human lives of the interface between work and family; the different ways gender structures the experience of work and family depending upon racial and ethnic background, social class, age, and partner preference; the impact of historical context on work-family experiences; work-family policies in the United States and other countries. Offered as SOCI 372, WGST 372, and SOCI 472. Prereq: SOCI 101 and Sophomore standing.

SOCI 374. Using Law to Designate Public/Private Boundaries for Social Policies (3)
This course studies law and the public-private dichotomy. With a basis in important research on the sociology of law, it considers three questions: 1) What is the impact of "law" on the boundary separating the public and private sectors? 2) How does "law" designate which actors and institutions belong to the public and private sectors? 3) Is the public-private dichotomy adequate for sociological analyses of law and its influence? If not, what alternatives to the public-private dichotomy can we offer? Offered as SOCI 374 and SOCI 474. Prereq: SOCI 101.

SOCI 375. Independent Study (1–3)
Prereq: SOCI 101 and SOCI 300.

SOCI 377. Population Dynamics and Changing Societies (3)
Population and social structure are inextricably linked, as changes in one elicit changes in the other. Social demography, as a discipline, examines these linkages through the systematic study of the size, composition and distribution of populations and their relationship to the social, political and economic organization of societies. This course will pay particular attention to mortality, morbidity and health, fertility, family and household organization, and migration as the major processes of population change. The population dynamics of the United States will be emphasized, with select comparisons to developing and developed countries. Offered as SOCI 377 and SOCI 477.

SOCI 381. City as Classroom (3)
In this course, the city is the classroom. We will engage with the urban terrain. We will meet weekly off-campus, interact with community members, and interface—both literally and figuratively—with the city as a way to examine the linkages between historical, conceptual, and contemporary issues, with particular attention paid to race and class dynamics, inequality, and social justice. This course will have four intersecting components, primarily focusing on American cities since the 1930s: the social and physical construction of urban space, the built environment, life and culture in the city, and social movements and grassroots struggles. Offered as HSTY 381, POSC 381, SOCI 381, HSTY 481, POSC 481, and SOCI 481.

SOCI 392. Senior Capstone Experience (3)
SOCI 392 represents the completion of an independent study paper involving exploration of a sociology topic to be chosen in consultation with the student's capstone advisor. The student will interact regularly with the faculty advisor who will review their progress on the project. This project allows for original thought and for the tailoring of the research to the student's interests. The student will integrate theory, methods and social issues as he/she applies critical thinking skills and insights to the analysis of some aspects of a subject chosen from any of the following subfields and concentrations: Gerontology, Social Inequality, Medical Sociology, Crime and Delinquency, The Life Course, Education, Work and Family, Sociology of Law, and Deviance. The Capstone Project has both a written and an oral component. Following the submission of the Capstone paper, the student will give a presentation of the project at the Senior Capstone fair, or another forum chosen by the department. Prereq: SOCI 101, SOCI 300, SOCI 303, and Stat 201, or PSCL 282. SAGES Senior Cap

SOCI 397. Honors Studies (3)
Intensive investigation of research or conceptual problem; original work under supervision of faculty member. Limited to senior majors. Prereq: Senior status.

SOCI 398. Honors Studies (3)
Intensive investigation of research on conceptual problem; original work under supervision of faculty member. Limited to senior majors.

SOCI 400. Development of Sociological Theory (3)
This course examines in detail the works of major sociological theorists of the 19th and 20th centuries. It is intended to integrate their ideas with the social and historical milieu from which they were born. Questions of intergroup conflict vs. cooperation, interactions between economic, familial, religious, and political institutions, and the development of the self as a function of larger social processes are addressed. Such celebrated figures as Marx, Weber, and Durkheim, as well as modern thinkers will be presented and discussed. Prereq: Graduate standing.

SOCI 401. Contemporary Sociological Theory (3)
Current viewpoints in sociological theory are explored using contrasting theoretical perspectives.

SOCI 406. Sociological Research Methods I (3)
The first of a two-semester series in social research
methodology. Students will learn how to interpret and conduct social science research. The two-semester course covers problem formulation, the logic of causal inference, measurement models, research designs, sampling, data collection, and data analysis.

SOCI 407. Sociological Research Methods II (3)
The second of a two-semester series in social research methodology. (See SOCI 406.)
Prereq: SOCI 406.

SOCI 410. The Individual in Society (3)
This course focuses on the relationships between individuals and the societies in which they live. Influences of values and culture on individuals’ selves and identities are discussed as well as how individuals attach meaning to personal life experiences and histories in the context of society at large.
Offered as SOCI 310 and SOCI 410.

SOCI 411. Health, Illness, and Social Behavior (3)
This course considers the role of social factors (e.g., poverty, occupational and family structure) on health and illness. Discussion will concentrate on the role of health promotion (e.g., anti-smoking campaigns), social behavior and lifestyle in health and health care use. Considerable attention is given to understanding health careers and professions and their role in the health of societies and individuals.
Offered as SOCI 311 and SOCI 411.

SOCI 413. Sociology of Stress and Coping (3)
This course will focus attention on human stress throughout the lifespan and its role in personal health and well-being. There have been exciting advances in recent years in understanding the nature of stress in everyday life as well as elements of extreme stress. Trauma is experienced by many people due to normative events such as illness and bereavement or natural and man-made disasters such as crime or war. Coping strategies and social supports which ameliorate negative impact of stress will be considered.
Offered as SOCI 313 and SOCI 413.

SOCI 414. Qualitative Methods/Field Research (3)
Students explore the theoretical foundations of qualitative social research. The course is designed to introduce and provide experience with a range of data generation strategies and analytic skills. The ethnographic techniques of semi-structured interviewing and participant-observation receive particular attention.
Offered as SOCI 314 and SOCI 414.

SOCI 419. Sociology of Institutional Care (3)
This course focuses on converging issues of theory, research, and practice in general hospitals, mental hospitals, nursing homes, hospices, and correctional institutions. The ecology of institutions and the adaptation of individuals within institutions will also be considered. There will be field trips to institutional facilities.
Offered as SOCI 319 and SOCI 419.

SOCI 436. Institutional Care: Research and Reform (3)
This course is designed to provide an introduction to the nature of long term care in the U.S. and to contemporary issues of reform and culture change. It also provides an introduction to techniques for studying nursing home culture, and for assessing culture changes. The issues and problems of long term care are well documented and the need for changing practices of long-term care is so widely recognized and deeply felt that several initiatives for “changing the culture” of long term care have gained national notoriety and rapid momentum. While laudatory, such efforts are inevitable criticized on numerous grounds, including cost, philosophy and vision, and lack of research evidence to support claims of success. The course is designed to provide an introduction to these debates in the scientific literature and in popular culture, and will provide an opportunity to develop skills in structured observation and action research.
Offered as SOCI 336 and SOCI 436.

SOCI 443. Medical Sociology (3)
Course covers theories, research methods, and problems in sociology of medicine. Topics include social epidemiology, health and illness behavior, and sick role. Structures and functions of delivery systems and their interrelationships with other social institutions are discussed.

SOCI 445. Sociology of Mental Illness (3)
Focus is on social construction of mental health and illness and sociology of emotions. Social determinants of psychological distress will be discussed along with social stigma associated with mental illness. Institutional and community options for care of the mentally ill will be considered along with the impact of recent social movements of deinstitutionalization and independent living.
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This course provides the theoretical and methodological foundation for conducting family research. It also reviews the most current research in the sociology of the family arena such as intergenerational issues, ethnicity and gender, and family transitions.
Offered as SOCI 370 and SOCI 470.

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Offered as HSTY 381, POSC 381, SOCI 381, HSTY 481, POSC 481, and SOCI 481.

SOCI 496. Public Policy and Aging (3)
Offered as ANTH 498, BETH 496, EPBI 408, GERO 496, HSTY 480, MPH 408, NURS 479, NURS 579, POSC 480, and SOCI 496.

SOCI 500. Advanced Social Theory (3)
This course focuses on problems and issues relevant to contemporary social theorizing. As such, it deals with the rational roots of mainstream sociological thought and its relation to practice. Attention will also be paid to critical theory, hermeneutics, and current feminist thinking.
Prereq: SOCI 400 and SOCI 401.

SOCI 509. Problems of Data Analysis (3)
Research in social epidemiology, health service research and other applied fields increasingly demands an understanding of social research methodology. This seminar exposes students to state of the art analyses of social science data including: data preparation, factor analysis, regression and structural equation modeling. Students are provided the opportunity to interpret and critically evaluate the methodology used in journal articles, with an emphasis on data analytical techniques. Students will analyze data sets using SPSS and EQS.
Prereq: STAT 401 or SOCI 406, and SOCI 407.

SOCI 600. Reading and Research (1–9)
Individual study and/or project work.

SOCI 701. Dissertation Ph.D. (1–18)
Individual study.

GENERAL BULLETIN 2009-2011

DEPARTMENT FACULTY

Jill E. Korbin, Ph.D.
(University of California-Los Angeles)
Interim Chair; Professor of Anthropology

Jiayang Sun, Ph.D.
(Stanford University)
Professor

General statistics and applications; methodologies in statistical computing and data mining; semi- and nonparametrics; biased sampling; bump hunting and mixtures; statistics in astronomy, neuroscience, imaging, and information technology research

Patricia Williamson, Ph.D.
(Bowling Green University)
Instructor
Bayesian analysis; estimation; hypothesis testing

Wojbor Woyczynski, Ph.D.
(Wroclaw University, Poland)
Professor
Stochastic models; probability; random fields; nonlinear diffusion; turbulence

Associate Faculty

J. Sunil Rao, Ph.D.
(University of Toronto)
Associate Professor; Professor of Epidemiology and Biostatistics, School of Medicine
Statistical aspects of data mining; statistical methods for analysis of DNA microarrays

Lecturers

Paula FitzGibbon, M.S.
(Miami University)
General statistics and applications; program evaluation for nonprofit organizations; survey questionnaire design

Danhong Song, Ph.D.
(Bowling Green University)
Statistical genetics; linkage analysis and association study
Adjunct Faculty
Manfred Denker, Ph.D.
(University of Erlangen)
Adjunct Professor
Nonparametric statistics; probability theory; complex dynamics
Harold S. Haller, Ph.D
(Case Western Reserve University)
Adjunct Professor
Statistical quality control; experimental design
Bo Hu, Ph.D.
(University of Wisconsin-Madison)
Adjunct Assistant Professor
Model selection; longitudinal analysis
Hemant Ishwaran, Ph.D.
(Yale University)
Adjunct Associate Professor
Data mining; mixture models; nonparametric Bayes; genomic data
Mary Rieger, Ph.D.
(University of California, Berkeley)
Adjunct Professor
Statistical education
Yaomin Xu, Ph.D.
(Case Western Reserve University)
Adjunct Assistant Professor
Statistical Genetics and Bioinformatics

UNDERGRADUATE PROGRAMS
Students in statistics begin with a foundation in mathematics. Then they add statistical theory, plus intensive modern data analysis and a concentration in a field of their choice. The goal is to develop an appreciation of each facet of the discipline and a mastery of technical skills. This prepares students to enter a research setting or to work in an interdisciplinary collaboration.

For the undergraduate student looking toward graduate school, the course of study within these guidelines easily incorporates additional mathematics in preparation for the more abstract mathematical level of graduate courses. The more specialized option in actuarial science expands the basic program in statistics to incorporate topics from operations research and numerical analysis which are fundamental to actuarial theory and computation. This actuarial option includes the course work necessary to prepare for Courses 1-3 of the Society of Actuaries Exams.

All undergraduate majors begin with a foundation in mathematics and a core of courses in mathematical statistics, courses in statistical methodology and courses in modern data analysis. Each student’s program is individualized by: (1) the choice of an applied field of concentration according to the student’s own talents and interests, and (2) the choice of appropriate statistics electives, drawn from offerings by the Statistics department and from suitable offerings by other departments at the university. The senior project option allows students to work in a research setting or to participate either in interdisciplinary collaboration or in industrial consulting along with a statistics faculty member.

MAJORS

BACHELOR OF ARTS

The B.A. degree offers flexibility and the chance to pursue a wider range of interests. It also offers the possibility of expanding the interdisciplinary aspect of the program to complete the requirements for majors in two fields. For example, students may combine statistics with computer science, biology (molecular, organismal, or ecology), psychology, economics, accounting, or management science.

The B.A. degree in statistics requires a minimum of 56 hours of approved course work, including 27 hours in statistics and the remainder in related disciplines and a substantive field of application. The specific requirements are as follows:

1. MATH 121, 122, 223, 224, and 201 or equivalent
2. ENGR 131 or EECS 251 or approved alternate, plus an additional higher-numbered course in computation from EECS offerings or EPBI 414
3. STAT 325 and 326, STAT 345 and 346
4. At least 15 hours of courses in statistical methodology, to be chosen from courses numbered 300 and higher offered by the statistics department, or approved courses in statistical methodology or probability taught in Biostatistics, Electrical Engineering and Computer Science, Economics, Mathematics, Operations Research, Systems Engineering, etc. At least 6 hours must be in STAT.
5. Two approved courses (or more) numbered 300 or above in an approved discipline outside statistics
6. A combined total of 12 hours (or more) in ASTR, BIOL, CHEM, GEOL, or PHYS which may be counted toward a major in that field, including at least one of PHYS 121 and 122, CHEM 105 and 106 plus 113, CHEM 107 and 108 plus 113, BIOL 110 and 210 plus 211, or BIOL 110 and 220 plus 221. Students are strongly encouraged to include advanced expository or technical writing courses in their programs.

BACHELOR OF SCIENCE

The B.S. degree adds a laboratory science requirement. For students seriously interested in basic science, a natural science is the logical choice as a focus for the application, and the B.S. degree is the logical choice of program.

The B.S. degree in statistics requires a minimum of 68 hours of approved course work, including 27 hours in statistics and the remainder in related disciplines and a substantive field of application.

COMBINED B.S.-M.S. PROGRAM

The combined bachelor’s-master’s degrees in statistics require a minimum of 21 hours beyond the bachelor’s degree requirements. In total, 42 hours must be in statistics, including an M.S. thesis or M.S. research project, with the remainder (either 41 or 26 hours for the B.S. or B.A., respectively) in approved course work in related disciplines and a field of application.

In addition to the B.S. or B.A. requirements, a combined degree program must include:

1. STAT 455 and three semesters of STAT 491
2. One semester of STAT 495
3. M.S. research project (STAT 621) or M.S. thesis (STAT 651)
4. At least 6 additional hours of courses in statistical theory and methodology (making a total of 21 hours, including at least 4 STAT courses numbered 400 or higher), to be chosen from Statistics Department offerings numbered 300 and higher, or approved courses in statistical methodology or probability taught in Biostatistics, Computer Science, Economics, Mathematics, Operations Research, Systems Engineering, etc.
5. Two approved courses (or more) numbered 300 or above in an approved discipline outside statistics. Students are strongly encouraged to include advanced courses.
expository or technical writing courses in their programs. Students may pursue a B.A. with a double major in statistics and a related field from within the College of Arts and Sciences. In this case, the substantive field requirement (No. 5 of the B.A. requirements above) is waived.

**BACHELOR’S DEGREE OPTION IN ACTUARIAL SCIENCE**

The actuarial program leading to either a B.A. or a B.S. in statistics requires 30 hours in statistics and actuarial studies and must satisfy the requirements for the appropriate degree program, with the following modifications of requirements 4 and 5 of the B.A. or B.S. program:

4. At least 12 hours in statistical methodology, to be chosen from courses numbered 300 and higher offered by the statistics department, or approved courses taught in biostatistics, electrical engineering, computer science, economics, mathematics, operations research, etc. At least 6 hours must be in STAT courses; STAT 243 and 244 may be counted.

5. STAT 317 and STAT 318. Students ordinarily can expect to be prepared to take Courses 1-3 of the Society of Actuaries Exams upon graduation.

**Minor**

A minor in statistics requires a minimum of 15 hours of approved course work. The minor must satisfy the requirements below and must include a minimum of 9 credits in courses from statistics department offerings.

1. STAT 243 and 244 or STAT 345 and 346 or other approved sequence
2. One of the following: STAT 208, 312, 313, 332, 333, or 325
3. Two approved elective courses numbered 300 or above

**GRADUATE PROGRAMS**

The department offers programs leading to the Master of Science and to the Doctor of Philosophy degrees. Graduate assistantships both with teaching responsibilities and with research duties are available to qualified applicants. The dual core of the M.S. program is mathematical statistics and modern data analysis, with the option of a special Entrepreneurial Track. Expanding from this core, students develop technical facility in a variety of statistical methodologies. This breadth of competence is designed to equip graduates to go beyond the appropriate choice of method for implementation and to be able to adapt these techniques and to construct new methods to meet the specific objectives and constraints of new situations.

**Master of Science**

The M.S. degree in statistics requires a minimum of 27 hours of approved course work in statistics and related disciplines and an M.S. research project or a thesis. Each student’s program is developed in consultation with the director of graduate studies or a senior faculty mentor and must satisfy the following requirements:

1. STAT 425 and 426
2. STAT 445 and 446
3. STAT 455
4. STAT 495 or STAT 491 (3 credits)
5. M.S. research project (STAT 621) or M.S. thesis (STAT 651)
6. A minimum of 6 hours of approved graduate-level statistics electives

The goals of this program are: (1) to give each student a balanced view of statistical theory and the application of statistics in practice or in substantive research, and (2) to have the student develop a broad competence in statistical methodology. The required core course work reflects this balance. The first two requirements are for full-year sequences in data analysis and theory; the third develops the theory underlying linear modeling. The requirement for applications of statistics will be satisfied through intensive participation in the consulting forum; the selection of an M.S. research project provides additional exposure. Graduate students are also required to participate in a forum or seminar to gain experience in written and oral presentation.

The remainder of each student’s program is individualized to address the more specialized statistical demands of the selected field of concentration or the focus of multidisciplinary work. Each student may choose either the applied research project or the thesis option, depending on individual interests. In either case, the student can expect to work with a faculty mentor in undertaking a significant task, the results of which will be suitable for publication or for presentation at professional society meetings.

A student coming to school from a position as a professional statistician might choose a statistical problem arising in the workplace as the basis for an M.S. research project. A student intending to continue graduate work toward a Ph.D. might choose an M.S. research project to explore the intimate relationship of statistics to substantive fields. Alternatively, either student might choose the thesis option to tailor a methodology to a new setting or to make a first essay at mathematical statistical research.

**ENTREPRENEURIAL TRACK**

The Master of Science in Statistics-Entrepreneurial Track (MSS-ET) is a professional degree designed to provide training in statistics focused on developing data analysis and decision-making skills in industrial/government/consulting environments where uncertainties and related risks are present. It expands our basic Master of Statistics program by creating a professional track that includes some business training. The Entrepreneurial Track provides instruction and real-world business experience to students who have a background in statistics and a vision for new and growing ventures. The MSS-ET program requires a minimum of 27 hours.

The required New Venture Creation and Technology Entrepreneurship courses will be offered by the Weatherhead School of Management. Students on internships will sign up for the consulting forum sequence. In addition, students are required to participate in an intensive (up to 30 hours) one-week annual workshop on the industrial use of statistics from the management perspective. This non-credit workshop will take place during the fall or spring undergraduate breaks.

**Doctor of Philosophy**

The focus of the doctoral program is on research, and the plan of study emphasizes the theory of statistics. Graduates will be able both to extend the theoretical basis for statistics and to bring statistical thought to scientific research in other fields. The objective of preparing students to collaborate in interdisciplinary work demands breadth as well, so advanced knowledge of a substantive field and participation in the collaborative experience are also integral to the program.

Students planning to enter the doctoral program in statistics should obtain information from the departmental office. Plans of study are prepared individually by the graduate student and a faculty advisor to develop the talents and interests of each student.
STAT 201. Basic Statistics for Social and Life Sciences (3)
Designed for undergraduates in the social sciences and life sciences who need to use statistical techniques in their fields. Descriptive statistics, probability models, sampling distributions. Point and confidence interval estimation, hypothesis testing. Elementary regression and analysis of variance. Not for credit toward major or minor in Statistics.

STAT 207. Statistics for Business and Management Science I (3)
Organizing and summarizing data. Mean, variance, moments. Elementary probability, conditional probability. Commonly encountered distributions including binomial, Poisson, uniform, exponential, normal distributions. Central limit theorem. Sample quantities, empirical distributions. Reference distributions (chi-square, z-, t-, F-distributions). Point and interval estimation; hypothesis tests. Recommended preparation: MATH 122 or MATH 126 or equivalent.

STAT 208. Statistics for Business and Management Science II (3)

STAT 243. Statistical Theory with Application I (3)

STAT 244. Statistical Theory with Application II (3)

STAT 312. Basic Statistics for Engineering and Science (3)
For advanced undergraduate students in engineering, physical sciences, life sciences. Comprehensive introduction to probability models and statistical methods of analyzing data with the object of formulating statistical models and choosing appropriate methods for inference from experimental and observational data and for testing the model’s validity. Balanced approach with equal emphasis on probability, fundamental concepts of statistics, point and interval estimation, hypothesis testing, analysis of variance, design of experiments, and regression modeling. Note: Credit given for only one (1) of STAT 312, 313, 333, 433. Prereq: MATH 122 or equivalent.

STAT 313. Statistics for Experimenters (3)
For advanced undergraduates in engineering, physical sciences, life sciences. Comprehensive introduction to modeling data and statistical methods of analyzing data. General objective is to train students in formulating statistical models, in choosing appropriate methods for inference from experimental and observational data and to test the validity of these models. Focus on practicalities of inference from experimental data. Inference for curve and surface fitting to real data sets. Designs for experiments and simulations. Student generation of experimental data and application of statistical methods for analysis. Critique of model; use of regression diagnostics to analyze errors. Note: Credit given for only one (1) of STAT 312, 313, 333, 433. Prereq: MATH 122 or equivalent.

STAT 317. Actuarial Science I (3)
Practical knowledge of the theory of interest in both finite and continuous time. That knowledge should include how these concepts are used in the various annuity functions, and apply the concepts of present and accumulated value for various streams of cash flows as a basis for future use in: reserving, valuation, pricing, duration, asset/liability management, investment income, capital budgeting, and contingencies. Valuation of discrete and continuous streams of payments, including the case in which the interest conversion period differs from the payment period will be considered. Application of interest theory to amortization of lump sums, fixed income securities, depreciation, mortgages, etc., as well as annuity functions in a broad finance context will be covered. Topics covered include areas examined in the American Society of Actuaries Exam 2. Recommended preparation: MATH 122 or MATH 126 or equivalent. Offered as STAT 317 and STAT 417.

STAT 318. Actuarial Science II (3)
Theory of life contingencies. Life table analysis for simple and multiple decrement functions. Life and special annuities. Life insurance and reserves for life insurance. Statistical issues for prediction from actuarial models. Topics covered include areas examined in the American Society of Actuaries Exam 3. Recommended preparation: STAT 317 and one of the following: STAT 207, 312, 345, or equivalent. Statistical data and testing using S-plus computing language. Linear and multiple regression. Emphasis on model selection criteria, on diagnostics to assess goodness of fit and interpretation. Techniques include transformation, smoothing, median polish, robust/resistant methods. Case studies and analysis of individual data sets. Notes of caution and some methods for handling bad data. Knowledge of regression is helpful. Offered as STAT 325 and STAT 425. Prereq: STAT 207 or STAT 243 or STAT 312 or EPBI 431 or EPBI 441 or EPBI 458.

STAT 326. Multivariate Analysis and Data Mining (3)
Extensions of exploratory data analysis and modeling to multivariate response observations and to non-Gaussian data. Singular value decomposition and projection, principal components, factor analysis and latent structure analysis, discriminant analysis and clustering techniques, cross-validation, EM algorithm, CART. Introduction to generalized linear modeling. Case studies of complex data sets with multiple objectives for analysis. Recommended preparation: STAT 325/425. Offered as STAT 326 and STAT 426.

STAT 332. Statistics for Signal Processing (3)
For advanced undergraduate students or beginning graduate students in engineering, physical sciences, life sciences. Introduction to probability models and statistical methods. Emphasis on probability as relative frequencies. Derivation of conditional probabilities and memoryless channels. Joint distribution of random variables, transformations, autocorrelation, series of irregular observations, stationarity. Random harmonic signals with noise, random phase and/or random amplitude. Gaussian and Poisson signals. Modulation and averaging properties. Transmission through linear filters. Power spectra, bandwidth, white and colored noise. ARMA processes and forecasting. Optimal linear systems, signal-to-noise ratio, Wiener filter. Completion of additional assignments required from graduate students registered in this course. Offered as STAT 332 and STAT 432. Prereq: MATH 122.

STAT 333. Uncertainty in Engineering and Science (3)
Phenomena of uncertainty appear in engineering and science for various reasons and can be modeled in different ways. The course integrates the mainstream ideas in statistical data analysis with models of uncertain phenomena stemming from three distinct viewpoints: algorithmic/computational complexity; classical probability theory; and chaotic behavior of nonlinear systems. Descriptive statistics, estimation procedures and hypothesis testing (including design of experiments). Random number generators and their testing. Monte Carlo Methods. Mathematica notebooks and simulations will be used. Note: Credit given for only one (1) of STAT 312, 313, 333, 433. Graduate students
are required to do an extra project.
Offered as STAT 333 and STAT 433.
Prereq: MATH 122 or MATH 223.

STAT 345. Theoretical Statistics I (3)
Topics provide the background for statistical inference. Random variables; distribution and density functions; transformations, expectation. Common univariate distributions. Multiple random variables; joint, marginal and conditional distributions; hierarchical models, covariance. Distributions of sample quantities, distributions of sums of random variables, distributions of order statistics. Methods of statistical inference. Recommended preparation: MATH 122 or MATH 223.

STAT 346. Theoretical Statistics II (3)

STAT 395. Senior Project in Statistics (3)
An individual project done under faculty supervision involving the investigation and statistical analysis of a real problem encountered in university research or an industrial setting. Written report.

STAT 401. Statistics for Social and Life Sciences (3)
Principles and practice of data presentation and basic models including analysis of variance and multiple linear regression. Content includes analysis of discrete data in contingency tables, sensitivity and specificity, odds ratios, tests of goodness of fit, display and summarization of data, hypothesis testing, and interval estimation. Taught in case-based format with individual and/or collaborative student projects. Primarily for graduate students in nursing and health sciences. Not for credit toward undergraduate major or minor in Statistics or for credit toward any graduate degree in Statistics. Recommended preparation: STAT 201.

STAT 412. Statistics for Design and Analysis in Engineering and Science (3)
For graduate students (primarily) and advanced undergraduates in engineering, physical sciences, and life sciences. After basic statistical concepts are reviewed, the remainder of the course consists of a comprehensive introduction to statistical methods of designing experiments and analyzing data. The general objective is to train students in statistical modeling and in the choice of experimental designs to use in scientific investigations. A variety of experimental designs are covered, and regression analysis is presented as the primary technique for analyzing data from designed experiments, and in discriminating between various possible statistical models. The course is oriented toward graduate students engaged in or embarking on research.
Prereq: MATH 122.

STAT 417. Actuarial Science I (3)
Practical knowledge of the theory of interest in both finite and continuous time. That knowledge should include how these concepts are used in the various annuity functions, and apply the concepts of present and accumulated value for various streams of cash flows as a basis for future use in: reserving, valuation, pricing, duration, asset/liability management, investment income, capital budgeting, and contingencies. Valuation of discrete and continuous streams of payments, including the case in which the interest conversion period differs from the payment period will be considered. Application of interest theory to amortization of lump sums, fixed income securities, depreciation, mortgages, etc., as well as annuity functions in a broad finance context will be covered. Topics covered include areas examined in the American Society of Actuaries Exam 2. Recommended preparation: MATH 122 or MATH 126 or equivalent. Offered as STAT 317 and STAT 417.

STAT 418. Actuarial Science II (3)
Theory of life contingencies. Life table analysis for simple and multiple decrement functions. Life and special annuities. Life insurance and reserves for life insurance. Statistical issues for prediction from actuarial models. Topics covered include areas examined in the American Society of Actuaries Exam 3. Recommended preparation: STAT 317 and one of the following: STAT 207, 312, 345, or equivalent.
Offered as STAT 318 and STAT 418.

STAT 425. Data Analysis and Linear Models (3)
Basic exploratory data analysis for univariate response with single or multiple covariates. Graphical methods and data summarization, model-fitting using S-plus computing language. Linear and multiple regression. Emphasis on model selection criteria, on diagnostics to assess goodness of fit and interpretation. Techniques include transformation, smoothing, median polish, robust/resistant methods. Case studies and analysis of individual data sets. Notes of caution and some methods for handling bad data. Knowledge of regression is helpful.
Offered as STAT 325 and STAT 425.

STAT 426. Multivariate Analysis and Data Mining (3)
Offered as STAT 326 and STAT 426.

STAT 427. Statistical Computing (3)
Basic topics in statistical computing; floating point arithmetic; seminumerical computation including generation and test of random numbers, Monte Carlo methods, variance reduction methods, stochastic models and simulation studies; numerical computation including numerical linear algebra, optimization and root-finding, numerical integration; some graphical and symbolic computations, special topics in statistical computing: resampling methods, EM algorithms, Gibbs sampling and projection pursuit.
Prereq: STAT 345 or STAT 425 or permission of department.

STAT 432. Statistics for Signal Processing (3)
For advanced undergraduate students or beginning graduate students in engineering, physical sciences, life sciences. Introduction to probability models and statistical methods. Emphasis on probability as relative frequencies. Derivation of conditional probabilities and memoryless channels. Joint distribution of random variables, transformations, autocorrelation, series of irregular observations, stationarity. Random harmonic signals with noise, random phase and/or random amplitude. Gaussian and Poisson signals. Modulation and averaging properties. Transmission through linear filters. Power spectra, bandwidth, white and colored noise. ARMA processes and forecasting. Optimal linear systems, signal-to-noise ratio, Wiener filter. Completion of additional assignments required from graduate students registered in this course. Offered as STAT 332 and STAT 432.
Prereq: MATH 122.

STAT 433. Uncertainty in Engineering and Science (3)
Phenomena of uncertainty appear in engineering and science for various reasons and can be modeled in different ways. The course integrates the mainstream ideas in statistical data analysis with models of uncertain phenomena stemming from three distinct viewpoints: algorithmic/computational complexity; classical probability theory; and chaotic behavior of nonlinear systems. Descriptive statistics, estimation procedures and hypothesis testing (including design of experiments). Random number generators and their testing. Monte Carlo Methods. Mathematica notebooks and simulations will be used. Note: Credit given for only one (1) of STAT 312, 313, 333, 433. Graduate students are required to do an extra project. Offered as STAT 333 and STAT 433. Prereq: MATH 122 or MATH 223.

STAT 437. Stochastic Models: Time Series and Markov Chains (3)
Introduction to stochastic modeling of data. Emphasis on models and statistical analysis of data with a significant temporal and/or spatial structure. This course will analyze time and space dependent random phenomena from two perspectives: Stationary Time Series: Spectral representation of deterministic signals, autocorrelation. Power spectra. Transmission of stationary signals through linear filters. Optimal filter design, signal-to-noise ratio.

Prereq: STAT 312 or equivalent.

STAT 439. Integrated Numerical and Statistical Computations (3)
This course will embed numerical methods into a Bayesian framework. The statistical framework will make it possible to integrate a priori information about the unknowns and the error in the data directly into the most efficient numerical methods. A lot of emphasis will be put on understanding the role of the priors, their encoding into fast numerical solvers, and how to translate qualitative or sample-based information—-or lack thereof—-into a numerical scheme. Confidence on computed results will also be discussed from a Bayesian perspective, at the light of the given data and a priori information. The course should be of interest to anyone working on signal and image processing statistics, numerical analysis and modeling. Recommended Preparation: Math 431. Offered as MATH 439 and STAT 439.

STAT 445. Theoretical Statistics I (3)
Topics provide the background for statistical inference. Random variables; distribution and density functions; transformations, expectation. Common univariate distributions. Multiple random variables; joint, marginal and conditional distributions; hierarchical models, covariance. Distributions of sample quantities: distributions of sums of random variables, distributions of order statistics. Methods of statistical inference. Graduate students are responsible for mathematical derivations, and full proofs of principal theorems. Recommended preparation: MATH 122 or MATH 223, or concurrent registration in EPBI 431. Offered as EPBI 481 and STAT 445.

STAT 446. Theoretical Statistics II (3)
Point estimation: maximum likelihood, moment estimators. Methods of evaluating estimators including mean squared error, consistency, “best” unbiased and sufficiency. Hypothesis testing; likelihood ratio and union-intersection tests. Properties of tests including power function, bias. Interval estimation by inversion of test statistics, use of pivotal quantities. Application to regression. Graduate students are responsible for mathematical derivations, and full proofs of principal theorems. Recommended preparation: MATH 223 or STAT 445. Offered as EPBI 482 and STAT 446.

STAT 448. Bayesian Theory with Applications (3)
Principles of Bayesian theory, methodology and applications. Methods for forming prior distributions using conjugate families, reference priors and empirically-based priors. Derivation of posterior and predictive distributions and their moments. Properties when common distributions such as binomial, normal or other exponential family distributions are used. Hierarchical models. Computational techniques including Markov chain, Monte Carlo and importance sampling. Extensive use of applications to illustrate concepts and methodology. Recommended preparation: STAT 445.

STAT 453. Time Series and Wavelets (3)
Stationary discrete-time and continuous-time models. Search for hidden periodicities in data. Fast Fourier transform; smoothing and filtering; spectra and periodograms. Multiple series; cross spectra and cross periodograms. Prediction problems. Time-frequency localization and the uncertainty principle, windowed Fourier transforms. Introduction to wavelet and multiresolution analysis. Prereq: STAT 353 or STAT 346 or STAT 433 or STAT 446 or permission of department.

STAT 455. Linear Models (3)

STAT 491. Graduate Student Seminar (1–2)
Seminar run collaboratively by graduate students to investigate an area of current research, the topic chosen each semester. All graduate students participate in presentation of material each semester. Satisfies requirement for every full-time graduate student to enroll in a participatory seminar every semester while registered in any graduate degree program. Recommended preparation: Graduate standing.

STAT 495A. Consulting Forum (1–3)
This course unifies what students have learned in their course work to apply their knowledge in consulting. It recognizes the fact that the essence of the statistical profession is continuing interaction with practitioners in the sciences, engineering, medicine, economics, etc. The course presents the views of prominent experts in the field as obtained from the literature and other sources. The responsibilities of the consultant and the client are discussed. Sample consulting problems are presented and strategies for solving them are provided. Prereq: STAT 325 or STAT 425.

STAT 495B. Consulting Forum With Practicum (3)
This course is designed to provide a hands-on experience with statistical consulting under the guidance of the instructor. It will include discussion of practical aspects of consulting such as the entrepreneurial nature of this activity. The students will become involved in actual consulting projects generated in a collaborative environment. Statistical problems, together with their substantive background, will be presented by individuals from the private sector (e.g., from industry) and/or Case Western Reserve faculty and students. Selected problems will be addressed in a collaborative fashion; i.e., by a team involving graduate students from the Statistics Department, the course instructor, and scientists. Some of these problems may lead to collaborative research or entrepreneurial ventures. Prereq: STAT 495A, STAT 325, or STAT 425 or consent of department.

STAT 525. Advanced Data Analysis (3)
Topics drawn from resampling methods (including bootstrapping), MCMC (Gibbs sampling), nonparametric curve and surface fitting, kernel density estimation, projection pursuit, mixture models, time series (time permitting), approaches to model uncertainty, models for repeated measures and structural-functional models, statistical inference for large systems, modern data analysis techniques. Recommended preparation: STAT 426 or permission of department.

STAT 538. Stochastic Models: Diffusive Phenomena and Stochastic Differential Equations (3)

STAT 545. Advanced Theory of Statistics I (3)

STAT 546. Advanced Theory of Statistics II (3)
STAT 555. Generalized Linear Models (3)

STAT 571. Advanced Topics in Statistics (1–3)
For advanced graduate students. Topics in specialized areas of statistical theory and methodology, with emphasis on recent advances in theory, developments of new methodology and definition of new research questions. Topics may change from year to year. Number of credit hours for the class will be predetermined each semester based on the material to be presented.

STAT 576. Advanced Topics in Modeling (1–3)
Advanced topics in specialized areas of statistics and stochastic modeling designed to define new research directions drawing on recent advances in theory and model formulation. Focus on statistical issues arising in the application of statistical or stochastic models to new substantive research efforts. Topics may change from year to year. Number of credit hours for the class will be predetermined each semester based on the material to be presented.

STAT 601. Reading and Research (1–9)
Individual study and/or project work.

STAT 621. M.S. Research Project (1–9)
Completion of statistical design and/or analysis of a research project in a substantive field which requires substantial and/or nonstandard statistical techniques and which leads to results suitable for publication. Written project report must present the context of the research, justify the statistical methodology used, draw appropriate inferences and interpret these inferences in both statistical and substantive scientific terms. Oral presentation of research project may be given in either graduate student seminar or consulting forum.

STAT 651. Thesis M.S. (1–18)
(Credit as arranged.) May be used as alternative to STAT 621 (M.S. Research Project) in fulfillment of requirements for M.S. degree in Statistics.

STAT 701. Dissertation Ph.D. (1–18)
(Credit as arranged.) Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

PROGRAM FACULTY
Edward Bernetich, M.Ed.
Director of Teacher Education
E-mail: edward.bernetich@case.edu

STAT 655. Generalized Linear Models (3)

Ohio Teacher Licensure Programs
Teacher education may be chosen as a second major by students whose primary major is in a field in which Case Western Reserve has teacher licensure agreements with John Carroll University and programs approved by the Ohio Department of Education. The teacher education major requires 35 credit hours in professional education, 15 hours taken at Case Western Reserve and 20 hours taken at John Carroll University.

Adolescence/Young Adult teacher licensure is available in integrated language arts, integrated social studies, mathematics, integrated life sciences, chemistry, and physics. In addition, the program offers dual-field licensure in physical science, which includes both chemistry and physics, to students pursuing the B.A. in either discipline. Multi-age licensure is available in French, Spanish, or Latin. For information concerning specific subject area requirements, turn to the departmental descriptions for Biology, Chemistry, Classics (Latin), English, History, Mathematics, Modern Languages and Literatures (French, Spanish), and Physics.

The education course requirements are as follows:

1. Courses at Case Western Reserve University (15 hours):
   - PSCL 101 General Psychology (pre-requisite for EDUC 304) (3)
   - EDUC 301 Introduction to Education (3)
   - EDUC 304 Educational Psychology (3)
   - EDUC 338 Seminar and Practicum in Adolescents (3)
   - EDUC 255 Literacy Across the Curriculum (3)

2. Courses at John Carroll University (20 hours)
   - EDUC 186 Instructional Technology (2)
   - EDJC 337 Adolescent Education Special Methods (3)
   - EDJC 427 Adolescent Education Special Topics (3)
   - EDJC 405C Adolescent Education Seminar (3)
   - EDJC 444C Adolescent Student Teach-
Students seeking licensure in French, Spanish, or Latin will register for the following instead of EDJC 405 and 444C:

EDJC 405D Multi-Age Education Seminar (3)
EDJC 444D Multi-Age Student Teaching (9)

Students must maintain a 3.0 GPA in all professional education courses, a 2.7 GPA in the specific content area, and a cumulative overall GPA of 2.5 to be recommended for Ohio teacher licensure.

As noted above, Case Western Reserve University also offers teacher licensure programs in art education and music education at the undergraduate (Bachelor of Science) and graduate (Master of Arts) levels. For further information on Art Education, see the Department of Art History and Art description in this bulletin; for Music Education, see the Department of Music description.

DEPARTMENT OF THEATER AND DANCE
Eldred Hall
www.case.edu/artsci/thtr
Phone: 216-368-4868; Fax: 216-368-5184
Ron Wilson, Chair
E-mail: ron.wilson@case.edu

Mather Dance Center
http://dance.case.edu
Phone: 216-368-2854; Fax: 216-368-6936
Karen Potter, Director
E-mail: karen.potter@case.edu

The Department of Theater and Dance offers education and participation in all aspects of drama and dance, with course offerings in acting, dance technique, choreography, stagecraft, costume, scene design, directing, and playwriting. Students have the opportunity to perform on stage as well as to serve on the technical crews in dance concerts and mainstage theatrical productions each year. The high ratio of faculty to students ensures that students will be able to work closely with highly skilled professionals. The department treats all performances as educational experiences and welcomes the participation of all students regardless of their academic majors and career goals.

Actor education in the theater arts program prepares majors for acting career opportunities in the American theater. Graduates are currently employed nationally and regionally. The MFA Acting Program, a collaboration between the University and The Cleveland Play House, represents a unique alliance between one of the oldest theater programs in the United States and the nation’s first regional theater.

Graduates of the dance program are currently employed as modern dance company members (regionally and nationally), company directors/choreographers, dance production managers, and dance educators in state and private universities. Others have pursued specialized advanced training and work as dance therapists.

The department is affiliated with the National Theater Institute (NTI) in Waterford, Connecticut. This prestigious program offers our students the best in concentrated theater training, and its Moscow semester provides a unique cultural perspective as well. Students may participate in NTI programs during the fall or spring semester; full credit is available with no loss of scholarship aid.

Many of our students go abroad for either one semester at the British American Drama Academy (BADA) or for a full year in other programs. BADA offers a conservatory-based intensive program in all aspects of actor training, with full credit transfer and no loss of financial aid. For more information on this and other opportunities, consult Catherine Albers, director of undergraduate theater studies.

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DEPARTMENT OF THEATER AND DANCE
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DEPARTMENT FACULTY
Ron Wilson, B.G.S.
(University of Nebraska)
Professor; Director, Undergraduate Theater Studies
Acting; audition laboratory; business of the business; acting for the camera

Russ Borski, M.F.A.
(University of Minnesota)
Associate Professor
Stage and lighting design; portfolio; production

Catherine Albers, M.F.A.
(Case Western Reserve University)
Associate Professor; Artistic Director, Mather Dance Ensemble
Contemporary dance technique; choreography; dance wellness; production and technology

Shanna Beth McGee, M.F.A.
(University of Georgia)
Associate Professor
Voice

Karen Potter, M.F.A.
(Case Western Reserve University)
Associate Professor; Director, Dance Program
Contemporary dance technique; choreography; pedagogy

Adjunct Faculty
Michael Bloom, Ph.D.
(Stanford University)
Adjunct Associate Professor; Artistic Director, The Cleveland Play House

Mark Alan Gordon, M.F.A.
(Ohio University)
Adjunct Associate Professor; Associate Director, MFA Acting Program
Acting; script analysis

Visiting Faculty
Jeffrey Ullom, Ph.D.
(University of Illinois, Champaign-Urbana)
Visiting Assistant Professor
Dramatic literature, history

UNDERGRADUATE PROGRAMS
THEATER ARTS
Major
The Bachelor of Arts program in theater offers concentrations in general theater, acting, design/technical theater, dramatic writing, and directing.

The basic course requirements for all theater majors are as follows:
1. THTR 101, 102, 103, and 201 (12 hours)
2. At least 4 but not more than 8 hours of THTR 385/386 and 6 hours of English above the 300 level. The department strongly recommends ENG 324 and 325.
Additional course requirements for each concentration are as follows:

**GENERAL THEATER (27 HOURS)**
THTR 223, 224, 228, 229 (SAGES Seminar), 330, 352, 380, 327, 329, 312 or 424 or 440
Total hours, not including THTR 385/386: 42

**ACTING (31 HOURS)**
THTR 228, 229 (SAGES Seminar), 231, 232, 306, 311 (1 hour), 330, 375, 376, 327 or 329, and 382 (Senior Capstone)
Total hours, not including THTR 385/386: 43

**DESIGN/TECHNICAL THEATER (30 HOURS)**
THTR 105, 223, 224, 228, 229 (SAGES Seminar), 330, 352, 380, 327 or 329, 424 or 440
Total hours, not including THTR 385/386: 42

**DIRECTING (30 HOURS)**
THTR 223, 224, 228, 229 (SAGES Seminar), 327 or 329, 330, 331, 380, ARTH 272, MUSC 221
Total hours, not including THTR 385/386: 42

**Departmental Honors in Theater**
Majors wishing to take a Bachelor of Arts degree with honors in theater must make written application to the director of undergraduate theater studies no later than May 1 of the junior year. Students must have a minimum 3.25 overall grade point average and a minimum 3.75 grade point average in theater. Acceptance into the honors program is contingent upon faculty support and recommendation by the director of undergraduate theater studies and the department chair.

Those accepted register for THTR 397 and 398 (Honors Studies) during their senior year, for a total of 6 hours. The honors project is defined as a production project in acting, design, playwriting, directing, or management/ outreach. A supporting paper discussing the concept, execution, and performance of the project must be filed with the director of undergraduate theater studies no later than one week following the project presentation. Preparation of the project will be supervised by a department faculty member.

This project may be accepted for Honors only if it receives a grade of A from both the project advisor and the director of undergraduate theater studies. The grade of A must be received both semesters. Students who qualify will receive the notation “Departmental Honors in Theater” on their diplomas. Information about the structure and specific requirements of the honors project is available from the director of undergraduate theater studies.

**Minor**
A minor in theater requires 18 hours. The requirements for each concentration are as follows:
1. General Theater: THTR 101, 103, 223 or 224 or 352, 228, 229 (SAGES Seminar), and 327 or 329
2. Acting: THTR 101, 102, 231, 228, 229 (SAGES Seminar), and 375
3. Design/Tech: THTR: 105, 228, 229 (SAGES Seminar), 312, 316, 330
4. Dramatic Writing: THTR: 101, 228, 229 (SAGES Seminar), 312, 316, 330
5. Directing: THTR 228, 229 (SAGES Seminar), 223 or 224, 327, 330, 331
6. Dance

**DANCE Major**
The basic course requirements for all department majors with a concentration in dance are as follows:
1. DANC 121 or 122, 203, 204 and THTR 101 (12 hours)
2. At least 4 but not more than 8 hours of DANC 385/386 and 6 hours from Anatomy, Art, English, Music, or Philosophy, at or above the 300 level are recommended
Additional course requirements for the dance concentration (28-31 hours) are as follows:
1. DANC 303, 304, 355 (SAGES Seminar), 403, 404, 414, 423, 451, 460 or 461, and one of the following: 413, 415, 416, 445 or 446. A department senior capstone course must also be taken. Recommended is DANC 396.
2. (Students may elect to substitute THTR 224 or 352 for DANC 423 and 451, with their advisor’s approval.)
3. Total hours, not including DANC 385/386: 40-43

**Departmental Honors in Dance**
All majors are encouraged to apply for Honors Studies, DANC 397 and 398, in their final year. This adds 6 hours to the total.

**Minor**
The minor in dance requires 19 hours. The course requirements are as follows:
DANC: 103, 104, 203, 204 (460 or 461), 303, 304

**GRADUATE PROGRAMS**

**Master of Arts (Dance)**
Although the graduate dance program is geared toward the Master of Fine Arts degree, appropriate candidates may select or be encouraged to pursue the Master of Arts degree. The course work for the M.A. may be similar to that for the Master of Fine Arts, enhanced by related studies in the theater arts program and in other departments. The candidate’s program of study will be designed by the primary dance faculty. As required by the School of Graduate Studies, students must maintain a minimum grade point average of 2.75.

M.A. candidates must complete a minimum of 30 hours, following a program similar to that suggested below. The principal faculty advisor may suggest modifications.
1. 9-12 hours of technique classes, from DANC 417/18, 403, and 460/461
2. 6-9 hours of choreography, from DANC 413, 414, 415, and 416
3. 12 hours of eurythmics, from MUSC 501
4. 2-6 hours of kinesiology and topics in dance medicine, science, and wellness, from DANC 445/446
5. 3 hours of suggested advanced electives: i.e., DANC 535 (Pedagogy) or 455 (History)
6. 3 hours of Music Resources: DANC 505
7. 2-4 hours of project-oriented seminars, from DANC tr. 601, 423 or 451

The program recommends Plan B, with re-
requirements including a non-performance, non-production thesis on a topic approved by the primary program faculty. The thesis must be a substantial and contributive work with potential for publication or presentation. The M.A. thesis must be completed no later than one academic year beyond the completion of the course requirements.

Master of Fine Arts (Acting or Contemporary Dance)

The Master of Fine Arts degree, available with concentrations in acting and contemporary dance, is a terminal pre-professional degree. Candidacy for the Master of Fine Arts program requires an undergraduate degree with (ideally) a major in theater or dance, equivalent training and experience, or demonstrable potential for work at the M.F.A. level. In addition, each candidate must provide evidence of technical skill and creative ability in his or her area of concentration.

At the end of each semester in residence, the student’s skill and creative ability are evaluated in light of his or her work in the department. Only students who have clearly demonstrated growth and excellence are permitted to remain in the program. The award of the M.F.A. degree is contingent upon the student’s academic progress and upon the assessment on the part of the faculty that the candidate possesses the potential to work in the field of theater or dance on a professional level.

Requirements for the M.F.A. degree include:

1. A minimum of 60 semester hours of graduate work beyond the bachelor’s degree
2. A cumulative grade point average of 3.0 for all course work on the graduate level
3. Completion of the course requirements for the M.F.A. Thesis Portfolio
4. Successful completion of the Third Year Internship at The Cleveland Play House, or performance in the Mather Dance Center mainstage season

Specific requirements for the MFA degrees in acting and in dance appear below.

M.F.A. IN ACTING

In 1996, The Cleveland Play House and Case Western Reserve University joined forces to create a new program in professional actor training. The students begin their involvement with the Play House in their first semester, and their level of involvement steadily increases until, in the third year, they become professional apprentices in the Play House company.

Course requirements for the M.F.A. in acting are as follows:

1. 18 semester hours of acting, including script analysis, implementation of acting theory, characterization, Modernist playwrights, and Shakespeare
2. 12 semester hours of movement, chosen from mask work, period styles, stage combat, and commedia
3. 9 semester hours of voice, chosen from voice production, articulation, and interpretation
4. 6 hours of speech, using Edith Skinner techniques, dialects, verse and lyric drama, and Shakespeare
5. 6-9 semester hours of performance theory, projects, and professional seminars
6. 6 semester hours of creative thesis

M.F.A. IN CONTEMPORARY DANCE

1. The M.F.A. degree requires 60 hours. Specific course requirements are as follows:
2. 18-24 semester hours of dance technique
3. 11-12 semester hours of choreography
4. 4 semester hours (two each) of light and costume design
5. 2 semester hours of eurythmics, MUSC 501
6. 3 semester hours of contemporary dance history
7. 3 semester hours of music resources
8. 12-15 semester hours of kinesiology, pedagogy, or allied fields, chosen in consultation with advisor
9. 6 semester hours of creative thesis

COURSE DESCRIPTIONS

DANC 103. First-Year Modern Dance Techniques I (3)
Comprehensive perspective of theory established, through active participation, to serve individual development of normative movement principles in a broad spectrum of applications including theater movement dance, and sports. Content is directly and fundamentally serviceable to subsequent specialized training applications of the actor, dancer, musician, athlete, physiotherapist, and educator.

DANC 104. First-Year Modern Dance Techniques II (3)
Continuation of DANC 103.

DANC 121. Dance in Culture - Ethnic Forms (3)
A lecture class designed to introduce dance as an art form and the many roles it plays in a variety of cultures. Focus will be on ethnic forms and primal cultures.

DANC 122. Dance in Culture - Theatrical Forms (3)
Introduction to an historical and cultural overview of many different forms of dance from various cultural backgrounds, historically selected to demonstrate diversity and represent different periods in history. Basic craft elements of the structures of dance will be introduced to provide a foundation for viewing dance and developing a personal aesthetic.

DANC 160. Introduction to Ballet Technique I (3)
This introductory-level course offers the beginning ballet student the basic tenets and principles of ballet technique. Classwork will involve strong emphasis on proper alignment of the body, dynamic timings, and a command of ballet terminology.

DANC 161. Introduction to Ballet Technique II (3)
Continuation of DANC 160. Prereq: DANC 160 or consent of department.

DANC 189. Improvisation I (1)
Continuation of DANC 160. Prereq: DANC 160 or consent of department.

DANC 203. Second-Year Modern Dance Techniques I (3)
For the performing arts student, normative movement principles are formally extended in both theory and application to include individual correction, modification of adaptation as foundational training needs of the actor, dancer, and singer. Prereq: DANC 103 and DANC 104.

DANC 204. Second-Year Modern Dance Techniques II (3)
Continuation of DANC 203. Prereq: DANC 103 and DANC 104.

DANC 260. Second-Year Ballet Technique I (3)
In-depth exploration of principles and foundations of ballet technique as preparation for the specialized training needs of dancers.

DANC 261. Second-Year Ballet Technique
II (3)
Continuation of DANC 260.
Prereq: DANC 260 or consent of department.

DANC 303. Third-Year Modern Dance Techniques I (3)
For the dance major and advanced non-major. Durational formalities of dance technique as a contemporary American art form structure the aesthetic and technical challenges of development.
Prereq: DANC 204.

DANC 304. Third-Year Modern Dance Techniques II (3)
Continuation of DANC 303. Recommended preparation: DANC 303 or consent of department.

DANC 355. History of Modern Dance (3)
Origins and development of contemporary dance in its historical context.
Prereq: 100 level first year seminar in USFS, FSCC, FSNA, FSSO, FSSY, or FSCS. Prereq or Coreq: FSTS 100.
SAGES Dept Seminar

DANC 385. Rehearsal and Production (1-3)
Practicum for students participating in production work in the Department of Theater and Dance. Supervised laboratory experience in technical theater, construction techniques, scenery, costumes, lighting, and props; production; ticket office operations; promotion, publicity and public relations; house management; wardrobe responsibilities; stage management; assistant directing; and other production positions relating to the mainstage performances in Mather Dance Center. Students are recommended to take one credit hour per production, with a maximum of 8 credit hours allowed during their undergraduate career.

DANC 386. Rehearsal and Performance (1)
Practicum for students participating in performance in the Department of Theater and Dance, relating to the mainstage productions at Mather Dance Center. This course may be repeated, for a maximum total of 2 credits.

DANC 397. Honors Studies I (3)
Individual projects in dance.

DANC 398. Honors Studies II (3)
Individual projects in dance.

DANC 399. Independent Study in Theater Arts (1-3)
Independent research and project work in areas of dance and pedagogy.

DANC 403. Fourth-Year Contemporary Dance Technique I (1-3)
A logical progression of advanced technique. Performing skills assessed and developmentally stressed. Sections from repertory works learned.
Prereq: DANC 303.

DANC 404. Fourth-Year Contemporary Dance Technique II (1-3)
Continuation of DANC 403.
Prereq: DANC 403.

DANC 405. Improvisation I (1)
Movement and dance structures designed to engage responsivity in group dynamics applied to challenge specific technical components which include time and effort, shape, and kinetic awareness.

DANC 406. Improvisation II (1)
Continuation of DANC 405.

DANC 408. Fourth-Year Modern Dance Techniques II (1-3)
Continuation of DANC 407.

DANC 413. Space and Choreography (1-3)
Principles governing the dynamics of concrete and imagistic space applicable to stage values defined, differentiated, and tested through applied studies. Exercising the dual role of choreographer/performer, the sequencing is designed to enlarge active perception of space values, spatial dynamics, and relationships with spatial determinants. Introduced are the psychological principles involved in the development of one’s own creative process; involvement of these principles integrates the subsequent work in the choreography and production sequences.

DANC 414. The Craft of Choreography (3)
An in depth investigation of choreographic craft elements is presented through lecture, practical involvement and specified studies. Emphasized are tools to discover primary movement vocabulary, development of vocabulary through per-mutative investigations and the co-ordering of movement vocabulary into phrases, structural units and larger sections.

DANC 415. Choreography and Music (3)
Combining craft resources with emphasis on use of music. Music selections, historically categorized, are chosen for the purpose of analyzing metric and structural characteristics in accord with which choreography will be created.
Prereq: DANC 414.

DANC 416. Choreography and Theatrical Elements (3)
Use of properties, costumes, and scenic elements in both “first-and-second-function” (Northrop) or “literal” and “abstract” applications challenge the functional and aesthetic appropriateness of conjoined choices. Dance structures fully developed under supervision. Successful results may be programmed for performance and tested for applicability to the Production sequence.
Prereq: DANC 414.

DANC 417. Advanced Contemporary Dance Technique I (1-3)
Performing skills enlarged to include rehearsal and performance of full repertory works. Adaptability, versatility, and fidelity to choreographic intention stressed.
Prereq: DANC 404.

DANC 418. Advanced Contemporary Dance Technique II (1-3)
Continuation of DANC 417.
Prereq: DANC 417.

DANC 423. Light Design for Theatrical Dance (2)
Elements of stage light design and technology for theatrical dance. Lectures and laboratory experience on color, instruments, and computerized design.

DANC 445. Kinesiology for Dance (1-3)
Seminar and laboratory for assessment of kinesiological and biomechanical principles as related to dance. Assessment will be implemented to affect cross-training protocols.

DANC 446. Topics in Dance Medicine, Science, and Wellness (1-3)
Review and application of continually emerging information from the fields of Dance Medicine and Wellness Program is encouraged to facilitate continued application of principles developed in DANC 445.

DANC 451. Costume Design and Construction for Dance (2)
Lecture and studio course in selecting fabrics, draping techniques, construction, and design for concert dance.

DANC 455. History of Modern Dance (3)
Origin and development of modern dance in its historical context.

DANC 460. Ballet Technique for Modern Dance Students I (1-3)
Ballet Technique for Dancers will focus on developing the ballet skills required of the Modern Dance major. The technical level of the class will range from intermediate to advanced where applicable in barre work as well as center. Consent of department is required.

DANC 461. Ballet Technique for Modern Dance Students II (1-3)
Ballet Technique for Dancers will focus on developing the ballet skills required of the Modern Dance major. The technical level of the class will range from intermediate to advanced where applicable in barre work as well as center. Consent of department is required.

DANC 485. Rehearsal, Performance and Production (1-3)
(See DANC 385.)
DANC 505. Music Resources for Contemporary Dance (3)
Resources in the various periods and styles of music for the dancer/choreographer. Study of the choreographic use of music.

DANC 509. Seminar: Introduction to Performance Theory (3)
Research seminar designed to acquaint the dance student with the major theoretical writings of performance theory. Readings on the creative process and archetypal mythology. Exploration of anthropological, psychological, and cultural sources of art and the theatrical impulse.

DANC 535. Contemporary Dance Pedagogy (3)
The study and investigation of the approaches and methods of teaching contemporary dance. Detailed study is made of kinesthetic, oral, and creative factors in teaching of dance. Opportunity to assist and teach under supervision.

DANC 601. Special Projects (1-3)
Credit as arranged.

DANC 610. Professional Internship (1-4)
Involvement in intensive internships with professional dance companies in the Cleveland area bridging academic and professional lives. Internships range from six weeks to one semester.

DANC 640. M.F.A. Thesis Production I (3)
Preproduction conception in area of specialization researched and documented under appointed advisor, in accord with production syllabus, and subcommittee approval.

DANC 641. M.F.A. Thesis Production II (3)
Production implementation, post production evaluation/defense, and advisory assessment.

DANC 644. M.A. Project (1-12)
Research and development of a Master of Arts project in Theater.

THTR 100. Introduction to Performance (3)
A course designed to provide the non-major or undeclared liberal arts major limited experience with a basic understanding of performance and the theater. Fundamentals in improvisation, vocabulary, and scene study are stressed. This course fulfills THTR 101 should the undeclared student select theater as his or her major or minor.

THTR 101. Acting I: Fundamentals (3)
This course is designed to expose the theater major or minor to the development of the actor’s basic tools. Relaxation, concentration, and improvisation are taught along with basic scene study work.

THTR 102. Acting II: Exploration of Craft (3)
This course continues the work begun in THTR 101 with emphasis on action, emotional life, and text analysis as the essential elements of the actor’s work. Prereq: THTR 101.

THTR 105. Introduction to Stagecraft (3)
An introduction to scenic construction and painting, hands-on oriented to workshop skills.

THTR 123. Theater in Culture: From Shaman to Steam Engine (3)
An introductory exploration of theater forms and practice from their origins in ritual to the scripts and staging of 19th century Europe. In addition to material presented in lecture/discussion format, the class will attend local University and professional theater productions. This course fulfills General Education requirements and is intended for non-theater majors and minors.

THTR 124. Theater in Culture: From Steam Engine to Cyberspace (3)
Using selected dramatic texts from the 19th century to present day, the course explores the roles of production participants and audiences in their historical, cultural, and contemporary contexts. Material is presented in lecture/discussion format, augmented by live theater performances and audio-visual resources.

THTR 201. Movement for the Actor (3)
The course focuses on developing a kinesthetic awareness of the body and its use as a theatrically expressive instrument. Exercises will encompass development of flexibility, strength building, alignment, motor skills, and concentration. Prereq: THTR 101 or THTR 102.

THTR 223. Introduction to Scenic Design (3)
An introduction to visual design for the stage through established theories and knowledge of the theater as a physical space. Approaches practical problems of scenic design as well as professional potential of the field.

THTR 224. Introduction to Lighting Design (3)
A “grounds up” guide to theatrical lighting for the stage. Focus made upon instrumentation, choices made in the design process, aesthetics of presentation. Combines theory with practical application.

THTR 228. Theater History I (3)
Acquaints the student with theatrical and dramatic realism in Europe, the United States, and Russia (1880s through 1960s). Offered as THTR 228 and WLIT 228.

THTR 229. Theater History II (3)
Focuses on the theatrical traditions of Europe and the United States from the beginning of the eighteenth century to the beginning of the twenty-first in an effort to look at the history and literature of Western theater from the point of view of the society in which it originated. This course also examines how theater reflects the assumptions of a culture and how theater artists use their medium to express their belief or disbelief in those systems. Offered as THTR 229 and WLIT 229.

THTR 316. Screenwriting (3)
Theory and practice of dramatic writing, in the context of examples, classic and contemporary. Recommended preparation: ENGL 203 or ENGL 213 or ENGL 214 or ENGL 303 or ENGL 304. Offered as ENGL 305 and THTR 316.

THTR 321. Acting III: Contemporary Technique (3)
An exploration of advanced contemporary acting technique based on the work of Michael Chekhov. Provides advanced acting students with the tools necessary to work effectively and consistently with contemporary texts, with emphasis placed on psychological gesture and geste. Prereq: THTR 101 and THTR 102.

THTR 322. Acting IV: Classical Technique (3)
An exploration of techniques to approach classical theater, with emphasis on the works of Shakespeare. Presents the challenges of working with heightened language in classical texts, and provides skills necessary to transfer modern acting methods to these more poetic plays. Prereq: THTR 102.

THTR 326. Acting V: Camera Technique (3)
Acting for the Camera class with emphasis on how it differs from onstage work. Interviews, scenes, and exercises will be used to highlight the differences and similarities. Emphasis on contemporary table work. Prereq: THTR 231 or THTR 232.

THTR 380. Topics in Theater (3)
The course will offer varying topics such as theater history (national and international), theater criticism, world-theater, and special areas of dramatic literature that will not be covered in the general theater courses. This course will expose students to a wider range of dramatic ideas.

THTR 388. Acting and Directing (3)
A discussion and practicum exploring the problems faced by an actor in various audition situations. Development of an audition repertory for the actor for stage, video and film. Prereq: Senior Theater major.

THTR 389. Advanced Playwriting (3)
Theory and practice of dramatic writing with special focus on the craft of writing a full-length play. Offered as ENGL 314 and THTR 314. Prereq: ENGL 305 or THTR 312.

THTR 391. SAGES Dept Seminar
Coreq: FSTS 100.
film, in which reading and practicum assignments will culminate in the student submitting an original full-length screenplay. Offered as ENGL 316 and THTR 316. Prereq: THTR 312.

THTR 327. American Theater and Playwrights (3)
Designed to provide students an overview of the development of theater in the United States and to familiarize them with the work and themes of selected American playwrights. Offered as AMST 327 and THTR 327.

THTR 329. Dramatic Literature (3)
Dramatic text analyzed in the context of theatrical production. Major analytical tools introduced.

THTR 330. Play Directing I (3)
This course will begin a two-semester study of the art and craft of stage direction of plays. Topics covered will include history of the profession, directorial theory and practice, development of skills such as text analysis, design and concept, and general problem solving. Prereq: THTR 101 and THTR 102, and upperclass status.

THTR 331. Play Directing II (3)
This course will continue with the basic concepts learned in THTR 330 and will expand them in regard to actual production. Topics will include directing mechanics, ground planning, blocking, and visualization, staging and working with actors. The course will culminate in a faculty supervised directing project for public performance. There are three evening labs for this course. Prereq: THTR 330, and upperclass status. 

SAGES Senior Capstone

THTR 334. Shakespeare: Histories and Tragedies (3)
Close reading of a selection of Shakespeare’s tragedies and history plays (e.g., “Richard the Third,” “Julius Caesar,” “Hamlet,” “King Lear”). Topics of discussion may include Renaissance drama as a social institution, the nature of tragedy, national history, gender roles, sexual politics, the state and its opponents, theatrical conventions. Assessment may include opportunities for performance. Offered as ENGL 324, ENGL 424, and THTR 334.

THTR 335. Shakespeare: Comedies and Romances (3)
Close reading of selected plays of Shakespeare in the genres of comedy and romance (e.g., “The Merchant of Venice,” “Twelfth Night,” “Measure for Measure,” “The Tempest”). Topics of discussion may include issues of sexual desire, gender roles, marriage, the family, genre conventions. Assessment may include opportunities for performance. Offered as ENGL 325, ENGL 425, and THTR 335.

THTR 352. Costume Design and Construction (3)
Design and ornamentation of stage costumes and accessories. Laboratory. Recommended preparation: THTR 123 and THTR 124 or consent of department.

THTR 370. Modern Acting Theories in Practice (3)
From Boleslavski to Bogart, this course is designed to offer the advanced undergraduate student an introduction to a wide range of modern acting theories through reading, seminar discussion, and comparison of select theories in extended scene study. Readings and exercises are drawn from the works of Stanislavski-based theorists and practitioners as well as leading anti-realist texts. Texts reflect both character-based approaches and movement-based approaches to modern actor training. Prereq: THTR 101 and THTR 102 or DANC 103 and DANC 104.

THTR 375. Voice for the Stage I (3)
Development of the actor’s vocal instrument. Work in articulation, range, and flexibility. Prereq: THTR major or consent of department.

THTR 376. Voice for the Stage II (3)
Continuation of THTR 375. Prereq: THTR 375.

THTR 380. Stage Management (3)
Designed to acquaint student with the numerous skills and techniques needed to encompass the demands of historical dramatic texts. The work will center around period movement for the theater.
and to achieve a level of mastery over articulation appropriate dialect using the Skinner narrow IPA set, current speech skills, to teach them a stage-appro-

THTR 479. American Stage Speech (2)
Designed to evaluate the graduate student actors’ current speech skills, to teach them a stage-appropriate dialect using the Skinner narrow IPA set, and to achieve a level of mastery over articulation and diction. Prereq: Course limited to first-year M.F.A. candidates in Acting Program.

THTR 485. Rehearsal and Production (1-3)
Practicum for students participating in production work in the Department of Theater and Dance. Supervised laboratory experience in technical theater, construction techniques, scenery, costumes, lighting, and props; production; ticket office operations, promotion, publicity and public relations; house management; wardrobe responsibilities; stage management; assistant directing; and other production positions relating to the mainstage performances in Eldred Theater. Students are recommended to take one credit hour per production, with a maximum of 8 credit hours allowed during their undergraduate career.

THTR 501. Text Analysis for the Actor (2)
An introduction to the craft of reading a theatrical text from an actor’s point of view. Methods for analyzing the action and dialogue of a play will be applied to dramatic text so that the actor can learn to transform a one-dimensional text into a three-dimensional performance.

THTR 509. Seminar: Introduction to Performance Theory (2)
Research seminar designed to acquaint the theater student with the major theoretical writings of performance theory. Readings on the creative process and archetypal mythology. Exploration of anthropological, psychological, and cultural sources of art and the theatrical impulse.

THTR 512. Graduate Audition Lab (1-2)
THTR 530. Ensemble Technique (1-2)
A practicum course structured to explore the use of ensemble dynamic techniques in a rehearsal/performance environment, as well as to develop a set of exercises which encourage and sustain the actor’s channels of interpersonal communication during a range of rehearsal and performance situations. Prereq: Must be candidate in M.F.A. Acting program.

THTR 531. Acting: Research and Performance I (3)
The various elements of the actor’s process considered on advanced levels. Integration of rehearsal discoveries into a practical performance situation. Limited to M.F.A. candidates.

THTR 532. Acting: Research and Performance II (3)
The various elements of the actor’s process considered on advanced levels. Exploration of rehearsal techniques for characterization. Limited to M.F.A. candidates.

THTR 533. Acting: Research and Performance III (3)
Sequential courses designed to explore the various elements of the actor’s process on advanced levels and to integrate the discoveries made into a practical performance situations. Limited to M.F.A. candidates. Prereq: THTR 531 or THTR 532.

THTR 534. Acting: Research and Performance IV (3)
Sequential courses designed to explore the various elements of the actor’s process on advanced levels and to integrate the discoveries made into a practical performance situation. Prereq: THTR 531 or THTR 532 or THTR 533.

THTR 540. The Business of the Business (2)
This course covers the basic knowledge needed for an actor to plan and manage a career in the theater. Included is discussion of union rules and applications for AEA, AFTRA, and SAG. Discussion of basic marketing techniques, including development of an individual marketing plan for each student. Guest lecturers might include IRS experts on the actor’s special needs, casting directors, and commercial agents.

THTR 576. Advanced Voice Technique (3)
Vocal instruction individualized to the particular needs of advanced M.F.A. Acting students. This may include the exploration of dialect skills, developing the skills for extraordinary uses of the voice, or continued exploration of skills necessary for classic and poetic texts. Required of M.F.A. candidates in the Acting program. Prereq: THTR 473 and THTR 474.

THTR 579. American Stage Speech II (3)
This course will continue the work begun in THTR 479 American Stage Speech, continuing the work on IPA, articulation, and general speech clarity for the stage. Exercises from the Berry and Rodenberg Schools of thought will be used in addition to the speech basics of Skinner. Prereq: THTR 479.

THTR 580. Stage Dialects (2)
This survey course will examine the use and application of major stage dialects in the American theatre using a phonetic tool set as a basis for understanding sound substitutions. The student will also study the ways in which rhythmic changes and resonance and tension shifts affect the dialects. Prereq: Graduate standing.

THTR 581. Classical Speech and Text (2)
This course will study ways in which the actor’s speech instrument is used differently in classical texts, particularly those of Shakespeare. Students will study tools for analyzing a line of text in order of understanding how to use the words and sound of the line.

THTR 601. Special Projects (1-3)
(Credit as arranged.)

THTR 610. Professional Internship (1-4)
Involvement in intensive internships with professional theaters in the Cleveland area bridging
academic and professional lives. Internships range from six weeks to one semester.

THTR 620. Advanced Role Analysis Preparation I (3)
Study and performance of scenes involving methods of approaching various types of plays and the specific problems they present to the individual actor. Analysis, action, characterization, and subtext. Open only to M. F. A. Acting students.

THTR 621. Advanced Role Analysis Preparation II (3)
Continued study and performance of scenes involving methods of approaching various types of plays and the specific problems they present. Prereq: THTR 620.

THTR 630. Performance Studio (3)
A performance laboratory, ensemble-based practicum in which the student works to integrate effectively a wide range of performance skills culminating in a studio production. May be taken two times in the last two semesters of graduate study. Prereq: THTR 534.

THTR 642. Thesis Portfolio I (1)
Course designed specifically for candidates in the Master of Fine Arts program in Acting. Graduate students enroll for the course during their third year of study, although work spans three years of study, based on roles the M.F.A. actor has created. A portfolio is prepared, according to requirements set forth in the department’s M.F.A. Handbook, and is presented to the faculty during the spring semester of the third year, in a formal oral defense. Satisfactory completion of the portfolio and its oral defense are among the requirements for awarding the Master of Fine Arts degree. Course limited to M.F.A. candidates in the Acting program.

THTR 643. Thesis Portfolio II (1)
Course designed specifically for candidates in the Master of Fine Arts program in Acting. Graduate students enroll for the course during their third year of study, although work spans three years of study, based on roles the M.F.A. actor has created. A portfolio is prepared, according to requirements set forth in the department’s M.F.A. Handbook, and is presented to the faculty during the spring semester of the third year, in a formal oral defense. Satisfactory completion of the portfolio and its oral defense are among the requirements for awarding the Master of Fine Arts degree. Course limited to M.F.A. candidates in the Acting program.

WASHINGTON STUDY PROGRAM
111 Mather House
http://politicalscience.case.edu/undergrad-washst.htm
Phone: 216-368-2696
Alexander P. Lamis, Director
E-mail: alexander.lamis@case.edu

The Washington Study program provides students with the opportunity to complete a full-time, research-intensive internship in Washington, D.C. By participating in a semester-length program during the fall or spring (WASH 002A), students earn 9 credit hours; for a summer internship (WASH 002D), they earn 3 credit hours (WASH 002D). In addition, students earn 3 credit hours by developing a portfolio based on their internship experiences (WASH 002B). The credits earned can be counted as general electives or applied to a student’s major or minor, with the prior consent of the individual department(s).

As part of the Washington Study program, students participate in a seminar and attend a weekly lecture/discussion group (WASH 002C).

To be eligible for the program, a student is expected to be a junior or senior and have at least a 3.0 GPA. The program director, the student’s major advisor, and the appropriate dean must approve each application. Students must ensure that their participation will not prevent them from meeting on-campus residency or other university requirements.

WOMEN’S AND GENDER STUDIES PROGRAM
223 Mather Memorial
www.case.edu/artsci/womn
Phone: 216-368-2702; Fax: 216-368-2676
Susan W. Hinze, Director
E-mail: susan.hinze@case.edu

The goal of the Women’s and Gender Studies Program is to educate students in interdisciplinary approaches to feminist theories of women, gender, culture, and society. Students are exposed to a variety of forms of critical thinking in relation to (1) the social construction of knowledge and philosophy; (2) approaches to science and medicine informed by “feminist empiricism” and “feminist standpoint” theories; (3) historized and cross-cultural accounts of gender and gender inequality; (4) literary criticism; (5) contemporary theories of art, performance, language, jurisprudence, social science, and religion in the context of women’s experience; and (6) studies of the body as a focal point for theorizing relations among the arts and sciences.

Women’s and Gender Studies is an interdisciplinary program that prepares students to think critically and creatively within a framework employing gender as a central category of analysis. The program is set up to test and challenge the technologies and limitations of gender roles in a multitude of cultural and historical settings. It is designed to familiarize students with the analytical and hermeneutic tools of research and interpretation, and to create awareness of the ethical, political, and aesthetic dimensions of gender in history and culture.

PROGRAM FACULTY

Susan W. Hinze, Ph.D.
Associate Professor of Sociology; Director, Women’s and Gender Studies Program

Eileen Anderson-Fye, Ed.D.
Assistant Professor of Anthropology

Alice Bach, Ph.D.
Archbishop Paul J. Hallinan Professor of Catholic Studies, Department of Religious Studies

Karen Beckwith, Ph.D.
Flora Stone Mather Professor, Department of Political Science

Diana Bilimoria, Ph.D.
Professor of Organizational Behavior, Weatherhead School of Management

Susan S. Case, Ph.D.
Associate Professor of Organizational Behavior, Weatherhead School of Management

Margaretmary Daley, Ph.D.
Associate Professor of Modern Languages and Literatures

Gilbert Doho, Ph.D.
Associate Professor of Modern Languages and Literatures

Kimberly K. Emmons, Ph.D.
Assistant Professor of English

Christopher Flint, Ph.D.
Associate Professor of English

T. Kenny Fountain, Ph.D.
Assistant Professor of English

Atwood D. Gaines, Ph.D.
Professor of Anthropology

Mary Grimm, M.A.
Associate Professor of English

Anne Helreich, Ph.D.
Associate Professor of Art History

Laura E. Hengehold, Ph.D.
Assistant Professor of Philosophy

Jill Korbin, Ph.D.
Professor of Anthropology
1. WGST 201 Introduction to Gender Studies (cross-listed as HSTY 270/ENGL 270/PHIL 270/RLGN 270)

2. One of the following courses:
   WGST 301 Women, Creativity and the Arts
   WGST/ANTH 365 Gender and Sex Differences in Cross-Cultural Perspective
   ENGL 371 Topics in Women’s and Gender Studies
   WGST/HSTY 318 History of Black Women in the U.S.
   WGST/HSTY 353, 354 Women in American History I and II
   WGST/SOCI 326 Gender, Inequality and Globalization

ELECTIVE COURSES (24 HOURS):
Student select eight courses from among the approved Women’s and Gender Studies courses, at least two each from arts, humanities, and social sciences.

Minor
The program in Women’s and Gender Studies also offers an undergraduate minor. Fulfillment of the minor requires completion of eighteen credit hours, including WGST 201 (Introduction to Gender Studies).

To help ensure a comprehensive course of study in a particular area of interest, each student's combination of courses and the structure of an independent study must be approved by the program advisor.

COURSE DESCRIPTIONS

WGST 201. Introduction to Gender Studies (3)
This course introduces women and men students to the methods and concepts of gender studies, women's studies, and feminist theory. An interdisciplinary course, it covers approaches used in literary criticism, history, philosophy, political science, sociology, anthropology, psychology, film studies, cultural studies, art history, and religion. It is the required introductory course for students taking the women's studies major. Recommended preparation: ENGL 150 or USFS 100. Offered as ENGL 270, HSTY 270, PHIL 270, RLGN 270, and WGST 201.

Global & Cultural Diversity

WGST 207. Women and Religion (3)
Examination of feminist perspectives on religion, such as the status of women in Western and non-Western religions, the nature and purpose of religious beliefs and practices from the standpoints of religious and non-religious feminists, the current status of feminist philosophies of religion, and the efforts of feminists to transform traditional religions and to create new religions.
Offered as RLGN 207 and WGST 207.

WGST 222. Gender in U.S. Society (3)
The focus of this course is on unique and convergent experiences of men and women in U.S. society. Different social expectations and opportunities encountered by men and women in the context of marriage and the family, work settings, and in informal organizations will be addressed. Legislation and social policy dealing with gender issues will be considered.
Offered as SOCI 222 and WGST 222.

WGST 228. Sociology of Sexuality (3)
This course analyzes the issues of sex and sexuality from a sociological point of view. It is centered on the notion that what we consider to be ‘normal’ or ‘natural’ about sex and sexuality is, in reality, socially constructed. One's viewpoint on the issues surrounding sexuality are influenced by the social context in which they live, as opposed to the purely biological viewpoint that presupposes some sense of normalcy or naturalness regarding sexual relations. A range of topics will be covered, including readings that discuss the variations of sexuality and the notions of sexual “deviance” in order to explore the cultural and societal variation that exists along the lines of gender, race, ethnicity, sexual orientation, age and disability.
Offered as SOCI 228 and WGST 228.

WGST 268. Women in the Bible: Ethnographic Approaches to Rite and Ritual, Story, Song, and Art. (3)
Examination of women in Jewish and Christian Biblical texts, along with their Jewish, Christian (and occasionally Muslim) interpretations. Discussion of how these traditions have shaped images of, and attitudes toward, women in western civilization.
Offered as RLGN 268 and WGST 268.

WGST 301. Women, Creativity and the Arts (3)
WGST 301/EETH 301 is one of two core courses for the program in Women’s and Gender Studies and an elective course for the ETHS minor. All WGST majors are to take one course concentrating on the subject of women and the arts specifically. This course also fulfills the cultural diversity requirement. In this course, students will focus on two areas of study: a) women and creativity and b) women and activism through the arts. A history of women in the arts will be covered, but the general focus of the course is on women in the arts since the 1960s in particular, and on artwork that reflects or provokes social change. “Arts” are defined in the broadest of sense. That is, students will study women's production in painting, photography, graphic design, sculpture, dance, film, music, and theater. A variety of learning techniques will
be applied: Students will look at feminist theories on art, be introduced to the notion of cyberfeminism, study actual artwork and its reproductions, understand the role of art in feminist activism and how women "create" differently from men, and work closely with several feminist artists/activists through various programs on campus and the community in order to facilitate the planning and carrying out of artistic production. Subsequently, students will interact with children in Cleveland schools in conjunction with these artists giving master classes, and be exposed to art exhibits abroad through videoconferencing with the Algerian Cultural Center in Paris and locally through University Circle Institutions. Offered as WGST 301 and ETHS 301.

WGST 312. Women in the Ancient World (3)
The course offers a chronological survey of women's lives in Greece, Hellenistic Egypt, and Rome. It focuses on primary sources as well as scholarly interpretations of the ancient record with a view to defining the construction of gender and sexuality according to the Greco-Roman model. Additionally, the course aims to demonstrate how various methodological approaches have yielded significant insights into our own perception of sex and gender. Specific topics include matriarchy and patriarchy; the antagonism between male and female in myth; the legal, social, economic, and political status of women; the ancient family; women's role in religion and cult; ancient theories of medicine regarding women; paederasty and homosexuality.
Offered as CLSC 312 and WGST 312.

WGST 318. History of Black Women in the U.S. (3)
Chronologically arranged around specific issues in black women's history organizations, participation in community and political movements, labor experiences, and expressive culture. The course will use a variety of materials, including autobiography, literature, music, and film.
Offered as ETHS 318, HSTY 318, and WGST 318.

WGST 322. Feminist Theory, Women's History, Gender History (3)
A reading seminar designed to expose students to current theory and methods in feminist history, as well as feminist scholarship more generally. It includes a variety of topics representative of interests and concerns shared by feminist historians, as well as a range of methodological approaches and theoretical debates. The course aims to impart a sense of the ways in which feminist theory has been applied to and has transformed historical scholarship.
Offered as HSTY 322, WGST 322, HSTY 422, and WGST 422.

WGST 325. Philosophy of Feminism (3)
Dimensions of gender difference. Definition of feminism. Critical examination of feminist critiques of culture, including especially politics, ideology, epistemology, ethics, and psychology. Readings from traditional and contemporary sources.
Offered as PHIL 325 and PHIL 425 and WGST 325.

WGST 326. Gender, Inequality, and Globalization (3)
Using a sociological perspective, this course examines how major societal institutions, including the economy, polity, medicine, religion, education and family, are structured to reproduce gendered inequalities across the globe. Attention is given to the intersections of race/ethnicity, social class, gender, and sexuality in social systems of power and privilege. Of critical importance is how gender figures in the relationship between Economic North and Economic South countries. We will elucidate how gender norms vary by culture and exert profound influence on the daily, lived experiences of women and men. The course will be informed by recent scholarship on feminism, women's movements, and globalization.
Offered as SOCI 326 and WGST 326.

WGST 335. Women in Developing Countries (3)
This course will feature case studies, theory, and literature of current issues concerning women in developing countries primarily of the French-speaking world. Discussion and research topics include matriarchal traditions and FGM in Africa, the Tunisian feminist movement, women, Islam, and tradition in the Middle East, women-centered power structures in India (Kerala, Pondicherry), and poverty and women in Vietnam, Laos, and Cambodia. Guest speakers and special projects are important elements of the course. Seminar-style format, taught in English, with significant disciplinary writing in English for WGST, ETHS, and some WLIT students, and writing in French for FRCH and WLIT students. Writing assignments include two shorter essays and a substantial research paper.
Offered as ETHS 335, FRCH 335, WLIT 335, WLIT 335, FRCH 435 and WLIT 435.

WGST 352. African Feminisms (3)
This course traces the history of African feminism from its origins within traditions through to a more contemporary theoretical analysis of gender, marriage, and motherhood seen from a Afrocentric perspective. Approaches studied are those that pertain to anthropology, history, literature, sociology, and culture. African feminist theory of scholars such as Filomena Steady, Cheikh Anta Diop, Buchi Emecheta, Ifi Amadiume, Obioma Nnane-ka, Oyeronko Oyeuwmi, and Calixthe Beyala will be studied and there will be some comparative analysis of Western theories to show how African feminisms are clearly distinct. Theories on these feminisms will be presented, and in the process, students will look at cases of women in Cameroon, Nigeria, Ghana, Kenya, and Senegal. It is commonly believed that African women are defined for a long time according to constructs of Western anthropology. This course will thus look at social institutions such as woman-to-woman marriage, matriarchy, and various women's rituals in order to identify African constructs of gender, family, kinship, marriage, and motherhood.
Offered as ETHS 352 and WGST 352.

WGST 353. Women in American History I (3)
The images and realities of women's social, political, and economic lives in early America. Uses primary documents and biographers to observe individuals and groups of women in relation to legal, religious, and social restrictions.
Offered as HSTY 353, WGST 353, and HSTY 453.

WGST 354. Women in American History II (3)
With HSTY 353, forms a two-semester introduction to women's studies. The politics of suffrage and the modern woman's efforts to balance marriage, motherhood, and career. (HSTY 353 not a prerequisite.)
Offered as HSTY 354, WGST 354, and HSTY 454.

WGST 365. Gender and Sex Differences: Cross-Cultural Perspective (3)
Gender roles and sex differences throughout the life cycle considered from a cross-cultural perspec-
WGST 372. Work and Family: U.S. and Abroad (3)
Covers the impact on human lives of the interface between work and family; the different ways gender structures the experience of work and family depending upon racial and ethnic background, social class, age, and partner preference; the impact of historical context on work-family experiences; work-family policies in the United States and other countries. Offered as SOCI 372, WGST 372, and SOCI 472.

WGST 373. Advanced Topics in American Women's History (3)
This advanced seminar is designed to allow students to investigate aspects of American women's history that are not deeply explored in other courses. The two central purposes of the course are to move students forward in their study of American women's history and to provide advanced study for graduate students and other students interested in women-focused topics. The topic is subject to change, but may be any of the following or something similar: women and medicine, images of women in popular culture, growing up female, women and political movements, women and war, etc. Recommended preparation: HSTY 353/453 or HSTY 354/454. Offered as HSTY 373, WGST 373, and HSTY 473.

WGST 383. Gender Issues in Feminist Art: The 20th/21st Century (3)
An in-depth thematic approach to issues affecting works of art by and about women. Focus on the late 20th century. Emphasis on a specifically modern use of feminine myths, subjects and modes of production, and feminist criticism. Offered as ARTH 383, WGST 383 and ARTH 483.

WGST 396. SAGES Capstone (3)
Capstone experience in the fields of Women's and Gender Studies for an in-depth, independent project of particular interest to the student. Students are strongly encouraged to work with a WGST program faculty member, but some projects may be supervised by faculty in other areas or by other qualified professionals. All capstones require a WGST faculty advisor's approval of the proposal prior to registration. Open to juniors and seniors majoring in Women's and Gender Studies. Prerequisite: WGST 201; Junior or Senior standing with major/minor in WGST. SAGES Senior Cap

WGST 399. Independent Study (1-3)
Independent research project in the fields of Women's and Gender Studies. Project proposals must be approved by a WGST faculty advisor. Students are strongly encouraged to work with a WGST program faculty member, but some projects may be supervised by faculty in other areas or by other qualified professionals with a WGST faculty advisor's approval. Credit varies with the scope and depth of the project. Prerequisite: WGST 201.

WGST 422. Feminist Theory, Women's History, Gender History (3)
A reading seminar designed to expose students to current theory and methods in feminist history, as well as feminist scholarship more generally. It includes a variety of topics representative of interests and concerns shared by feminist historians, as well as a range of methodological approaches and theoretical debates. The course aims to impart a sense of the ways in which feminist theory has been applied to and has transformed historical scholarship. Offered as HSTY 322, WGST 322, HSTY 422, and WGST 422.

WORLD LITERATURE PROGRAM

104 Guilford House
www.case.edu/artsci/worldlit
Phone: 216-368-3950; Fax: 216-368-2870
Florin Berindeanu and Susanne Vees-Gulani, Co-Directors
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The World Literature program seeks to educate students as citizens of a global community. World literature is a discipline that draws together literatures and cultures of a wide variety of countries and regions, including Western and non-Western ones. It emphasizes literatures and cultures of the past (ancient Greece and Rome, for example) as well as those of the present. It understands "minority" or "third-world" literatures as being just as worthy of study as European literatures; it recognizes the importance of the "classics" of both the West and East. The program requires study in a language other than English, thus emphasizing that literature and language are intimately related.
ELECTIVES (12 HOURS):
1. Four courses, chosen in consultation with the World Literature faculty advisor

All literature courses at the 200 and 300 levels offered by the Departments of Modern Languages and Literatures, Classics, and English are approved as World Literature courses.

UNDERGRADUATE HONORS
The honors program in world literature is for especially talented and dedicated majors. Requirements for honors are: 1) a GPA of at least 3.5 in the major, and 2) an honors thesis completed over the course of two semesters in the senior year, devoted to the investigation of a literary or cultural topic. Honors students enroll in WLIT 397 and 398 and write their thesis under the supervision of a WLIT faculty advisor. The thesis must be approved by a second faculty member and receive a grade of B or better. Students who qualify receive their degrees “with Honors in World Literature.” A registration/proposal form for students electing honors must be completed by the end of the second week of classes in each of the two semesters.

Minor
(15 HOURS)
The minor in world literature requires the foundation sequence WLIT 211-212 and nine credits of electives, chosen in consultation with the World Literature faculty advisor. These are normally chosen from World Literature, Modern Languages and Literatures, English, and Classics offerings. At least one of the electives must be a course in a literature originally not in English, although it may be in translation.

GRADUATE PROGRAM
In cooperation with the Departments of English and Modern Languages and Literatures, the program offers the Master of Arts degree in world literature, emphasizing Francophone and Anglophone literatures. Interested students should consult one of the program directors.

COURSE DESCRIPTIONS
WLIT 203. Gods and Heroes in Greek Literature (3)
This course examines major works of Greek literature and sets them in their historical and cultural context. Constant themes are war, wandering, tyranny, freedom, community, family, and the role of men and women within the household and the ancient city-state. Parallels with modern life and politics will be explored. Lectures and discussions. Offered as CLSC 203 and WLIT 203.

WLIT 204. Heroes and Hustlers in Latin Literature (3)
This course constitutes the second half of a sequence on Classical literature. Its main themes are heroism vs. self-promotion, love vs. lust, and the struggle between democracy and tyranny. These topics are traced in a variety of literary genres from the period of the Roman republic well into the empire. Parallels with modern life and politics will be drawn. Offered as CLSC 204 and WLIT 204.

WLIT 211. World Literature I (3)
Survey of literature from antiquity to 1600. May include Western and non-Western texts by Homer, Virgil, Ovid, St. Augustine, Dante, Boccaccio, Rabelais, Cervantes, Sel Shonagon, Basho, and the Bhagavad Gita.

WLIT 212. World Literature II (3)
Survey of literature from 1600 to present. May include Western and non-Western texts by Swift, Voltaire, Rousseau, Tolstoi, Baudelaire, Austen, Mann, Kafka, Lesperont, Marmon Silk, Soyinka.

WLIT 225. Japanese Popular Culture (3)
This course highlights salient aspects of modern Japanese popular culture as expressed in animation, comics and literature. The works examined include films by Hayao MiyaZaki, writings by Kenji MiyaZawa, Haruki Murakami and Banana Yoshimoto, among others. The course introduces students to essential aspects of modern Japanese popular culture and sensibility. Offered as JAPP 225 and WLIT 225.

WLIT 228. Theater History I (3)
Acquaints the student with theatrical and dramatic realism in Europe, the United States, and Russia (1880s through 1960s). Offered as THTR 228 and WLIT 228.

WLIT 229. Theater History II (3)
Focuses on the theatrical traditions of Europe and the United States from the beginning of the eighteenth century to the beginning of the twenty-first in an effort to look at the history and literature of Western theater from the point of view of the society in which it originated. This course also examines how theater reflects the assumptions of a culture and how theater artists use their medium to express their belief or disbelief in those systems. Offered as THTR 229 and WLIT 229.

SAGES Dept Seminar

WLIT 235. Asian Cinema and Drama (3)
Introduction to major Asian film directors and major traditional theatrical schools of India, Java/Bali, China, and Japan. Focus on the influence of traditional dramatic forms on contemporary film directors. Development of skills in cross-cultural analysis and comparative aesthetics. Offered as ASIA 235 and WLIT 235.

WLIT 245. Classical Japanese Literature in Translation (3)
Readings, in English translation, of classical Japanese poetry, essays, narratives, and drama to illustrate essential aspects of Japanese culture and sensibility before the Meiji Restoration (1868). Lectures explore the sociohistorical contexts and the character of major literary genres; discussions focus on interpreting the central images of human value within each period. Japanese sensibilities compared to and contrasted with those of Western and other cultures. Offered as JAPP 245 and WLIT 245.

WLIT 255. Modern Japanese Literature in Translation (3)
Focus on the major genres of modern Japanese literature, including poetry, short story, and novel (shosetsu). No knowledge of Japanese language or history is assumed. Lectures, readings, and discussions are in English. Films and slides complement course readings. Offered as JAPP 255 and WLIT 255.

WLIT 285. The Hispanophone World (3)
A survey of the imaginative literatures in a variety of genres from the Spanish-speaking world, including texts authored by Hispanics living in the United States. The selections will help students gain a greater understanding and appreciation of the impact and adaptation of Spanish language and culture among widely diverse populations of the world over the past centuries. Counts towards Spanish major as related course. No knowledge of Spanish required. Offered as SPAN 285 and WLIT 285.

WLIT 290. Masterpieces of Continental Fiction (3)
Major works of fiction from the 19th century and earlier. Offered as ENGL 290 and WLIT 290.

WLIT 291. Masterpieces of Modern Fiction (3)
Major works of fiction of the 20th century. Offered as ENGL 291 and WLIT 291.

WLIT 295. The Francophone World (3)
The course offers an introduction to the Francophone World from a historical, cultural, and literary perspective. The Francophone World includes countries and regions around the globe with a substantial French-speaking population (and where French is sometimes, but not always, an official language): North America (Louisiana, Quebec, and Acadia); North Africa (Tunisia, Morocco, Algeria, and Egypt); the Middle-East (Lebanon, etc.)
Syria); the Caribbean (Martinique, Guadeloupe, Haiti); South-East Asia (Vietnam); and Europe (France, Belgium, Switzerland, and Luxembourg). FRCH 295 provides a comprehensive overview of the Francophone World, while focusing on a particular area or areas in any given semester. In this particular semester we will focus on the Caribbean, the Maghreb, and select countries of Sub-Saharan Africa (Senegal, Cameroon). Our inquiry will include the study of their colonization histories, of the Independence period (broadly speaking, the 1960s), and of the post colonial era through film, literature, and readings of significant political/theoretical texts. Offered as ETHS 295, FRCH 295, and WLIT 295.

WLIT 300. The City in Literature (3)
Focus on major cities of the world as catalysts and reflections of cultural and historical change. Interdisciplinary approach utilizing the arts, literature, social sciences. Examples include Berlin at the turn of the century; Paris in literature and film; Tokyo in history and literature. Offered as WLIT 300 and WLIT 400.

WLIT 308. The Paris Experience (3)
Three-week immersion learning experience living and studying in Paris. The focus of the course is the literature and culture of the African, Arab, and Asian communities of Paris. Students spend a minimum of fifteen hours per week visiting cultural centers and museums and interviewing authors and students about the immigrant experience. Assigned readings complement course activities. Students enrolled in FRCH 308 do course work in French. WLIT 308 students have the option of completing course work in English. Graduate students have additional course requirements than those of undergraduates. Offered as FRCH 308, WLIT 308, FRCH 408, and WLIT 408.

WLIT 314. Love Poetry from Sappho to Shakespeare (3)
Introduction to the love poetry of ancient Greece and Rome and its impact on the later European tradition in such poets as Petrarch, Chaucer, and Shakespeare. Readings will focus especially on questions of generic convention, audience expectation, and the social setting of love poetry in the different ages under consideration. No knowledge of the original languages required. Offered as CLSC 314 and WLIT 324.

WLIT 315. Mysticism and Literature (3)
This co-taught seminar will explore and compare mystical elements in selected literary and theoretical works from the West and the East. Comparisons will focus on a number of interrelated sub-themes such as mind, language, alienation, innocence, experience, life, death, cosmogony, cosmology, good, evil, God/gods, and nature (the ecosystem). Offered as WLIT 315, MLIT 415.

WLIT 316. Greek Tragedy (3)
This course provides students the opportunity to read a significant number of ancient Greek tragedies in modern English translations. We shall read, study, and discuss selected works by Aeschylus, Sophocles, and Euripides, and attempt to understand the plays as literature composed for performance. We shall study literary elements within the plays and theatrical possibilities inherent in the texts. As we read the plays, we shall pay close attention to the historical context and look for what each play can tell us about myth, religion, and society in ancient Athens. Finally, we shall give occasional attention to the way these tragic dramas and the theater in which they were performed have continued to inspire literature and theater for thousands of years. Lectures will provide historical background on the playwrights, the plays, the mythic and historical background, and possible interpretation of the texts as literature and as performance pieces. Students will discuss in class the plays that they read. The course has three examinations and a final project that includes a short essay and a group presentation. Offered as CLSC 316, WLIT 316, WLIT 416.

WLIT 335. Women in Developing Countries (3)
This course will feature case studies, theory, and literature of current issues concerning women in developing countries primarily of the French-speaking world. Discussion and research topics include matriarchal traditions and FGM in Africa, the Tunisian feminist movement, women, Islam, and tradition in the Middle East, women-centered power structures in India (Kerala, Pondicherry), and poverty and women in Vietnam, Laos, and Cambodia. Guest speakers and special projects are important elements of the course. Seminar-style format, taught in English, with significant disciplinary writing in English for WGST, ETHS, and some WLIT students, and writing in French for FRCH and WLIT students. Writing assignments include two shorter essays and a substantial research paper. Offered as ETHS 335, FRCH 335, WLIT 335, WGST 335, FRCH 435 and WLIT 435. SAGES Dept Seminar Global & Cultural Diversity

WLIT 338. The Cameroon Experience (3)
Three-week immersion learning experience living and studying in Cameroon. The focus of the course is the culture, literature, and language of Francophone Cameroon, with some emphasis on Anglophone Cameroon. Students spend a minimum of fifteen hours per week visiting cultural sites and attending arranged courses at the University of Buea. Students will prepare a research paper. Course work is in French. To do course work in English, students should enroll in WLIT 338 or ETHS 338.
Offered as ETHS 338, FRCH 338, WLIT 338, ETHS 438, FRCH 438, and WLIT 438.

WLIT 339. Japanese Women Writers (3)
Contributions of women writers to the literature of pre-modern and modern Japan; investigations of how their works exemplify and diverge from ‘mainstream’ literary practices. Emphasis on the social and cultural contexts of the texts. Offered as JAPN 345 and WLIT 345.

WLIT 355. Modern Japanese Novels and the West (3)
This course will compare modern Japanese and Western novelists, drama, and novels. Comparisons will focus on the themes of family, gender and alienation, which subsume a number of interrelated sub-themes such as marriage, home, human sexuality, ama (dependence), innocence, experience, death, God/gods, and nature (the ecosystem). Offered as JAPN 355, WLIT 355.

WLIT 363H. African-American Literature (3)
A historical approach to African-American literature. Such writers as Wheatley, Equiano, Douglass, Jacobs, DuBois, Hurston, Hughes, Wright, Baldwin, Ellison, Morrison. Topics covered may include slave narratives, African-American autobiography, the Harlem Renaissance, the Black Aesthetic, literature or protest and to assimilation. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100.
Offered as ENGL 363H, ETHS 363H, WLIT 363H, ENGL 463H, and WLIT 463H.

WLIT 365. German Literature in Translation (3)
Goethe defined “World Literature” (Weltliteratur) as “Intellectual Trade Relations” (geistiger Handelsverkehr). This course gives students the opportunity to study German literary works in translation and thus to trade intellectual relations with a literary culture previously unknown to them. Counts toward the German major only as a related course. No knowledge of German required. Offered as GRMN 365 and WLIT 365.

WLIT 365E. The Immigrant Experience (3)
Study of fictional and/or autobiographical narrative by authors whose families have experienced immigration to the U.S. Among the ethnic groups represented are Asian-American, Jewish-American, Hispanic-American. May include several ethnic groups or focus on a single one. Attention is paid to historical and social aspects of immigration and ethnicity. Maximum 6 credits. Recommended preparation: ENGL 150 or USFS 100.
Offered as ENGL 365E, WLIT 365E, ENGL 465E, and WLIT 465E.

WLIT 365N. Topics in African-American Literature (3)
Selected topics and writers from nineteenth and twentieth-century African-American literature. May focus on a genre, a single author or a group of
WLT 385. Hispanic Literature in Translation (3)
Critical analysis and appreciation of representative literary masterpieces from Spain and Latin America, and by Hispanics living in the U.S. Texts cover a variety of genres and a range of literary periods, from works by Cervantes to those of Gabriel Garcia Marquez. The course will examine the relationship between literature and other forms of artistic production, as well as the development of the Hispanic literary text within the context of historical events and cultural production of the period. Counts toward Spanish major only as related course. No knowledge of Spanish required. Offered as ETHS 385, SPAN 385, SPAN 485, WLT 385, and WLT 485.

WLT 387. Literary and Critical Theory (3)
A survey of major schools and texts of literary and critical theory. May be historically or thematically organized. Maximum 6 credits.
Offered as ENGL 387, WLT 387, ENGL 487, and WLT 487.

WLT 388. Translation (3)
Literary translation forms the basis of most readers' familiarity with world literature. In an age of globalization, translation will be of increasing importance. The practice of translation has long been the province of creative writers. This course complements and draws together creative writers and students of foreign languages, showing that their practices overlap. Students should have knowledge of one language other than English to the 202 (intermediate) level.
Offered as WLT 388 and WLT 488. Prereq: Language other than English to the 202 level.

WLT 390. Topics in World Literature (3)
In-depth examination of specific critical and literary theories and of their relevance for literature and culture studies. Authors, works and instructor may vary. Offered as WLT 390 and WLT 490.

WLT 391. Introduction to Text Semiotics (3)
Introduction to Text Semiotics addresses both students of literature and students in Cognitive Science. Most of the authors included in the reading list extend their linguistic approach towards fields that intersect literature, psychology, philosophy, aesthetics, and anthropology. The scholarly traditions of text analysis and structural theory of meaning, including authors from classical formalism, structuralism, structural semiotics, and new criticism will be connected to cognitive theories of meaning construction in test, discourse, and cultural expressions in general. The focus of this course, taught as a seminar, is on empirical studies, specific text analyses, discourse analyses, speech act analyses, and other studies of speech, writing, and uses of language in cultural contexts. This course thus introduces to a study of literature and cultural expressions based on cognitive science and modern semiotics—the new view that has been coined Cognitive Semiotics.
Offered as COGS 391 and WLT 391.

WLT 395. French Literature in Translation (3)
Topics vary according to student and faculty interest. May include Francophone literature, literature and cinema, women writers, contemporary literature. Counts toward French major only as related course. No knowledge of French required. Offered as FRCH 395, WLT 395, FRCH 495, and WLT 495.

WLT 397. Honors Thesis I (3)
Intensive study of a literary, linguistic, or cultural topic with a faculty member, leading to the writing of a research paper. Prereq: Senior status.

WLT 398. Honors Thesis II (3)
Continuation of WLT 397. Prereq: WLT 397 and senior status.

WLT 399. Independent Study (1-3)
For majors and advanced students under special circumstances.

WLT 400. The City in Literature (3)
Focus on major cities of the world as catalysts and reflections of cultural and historical change. Interdisciplinary approach utilizing the arts, literature, social sciences. Examples will include Berlin at the turn of the century; Paris in literature and film; Tokyo in history and literature. Offered as WLT 300 and WLT 400. Prereq: Graduate standing.

WLT 408. The Paris Experience (3)
Three-week immersion learning experience living and studying in Paris. The focus of the course is the literature and culture of the African, Arab, and Asian communities of Paris. Students spend a minimum of fifteen hours per week visiting cultural centers and museums and interviewing authors and students about the immigrant experience. Assignments and readings complement course activities. Students enrolled in FRCH 308 do course work in French. WLT 308 students have the option of completing course work in English. Graduate students have additional course requirements than those of undergraduates. Offered as FRCH 308, WLT 308, FRCH 408, and WLT 408. Prereq: Graduate standing. Global & Cultural Diversity

WLT 415. Mysticism and Literature (3)
This co-taught seminar will explore and compare mystical elements in selected literary and theoretical works from the West and the East. Comparisons will focus on a number of interrelated sub-themes such as mind, language, alienation, innocence, experience, life, death, cosmogony, cosmology, good, evil, God/gods, and nature (the ecosystem). Offered as MLIT 315, MLIT 415.

WLT 416. Greek Tragedy (3)
This course provides students the opportunity to read a significant number of ancient Greek trag-
edies in modern English translations. We shall read, study, and discuss selected works by Aeschy-
lus, Sophocles, and Euripides, and attempt to un-
derstand the plays as literature composed for per-
formance. We shall study literary elements within the
plays and theatrical possibilities inherent in the
texts. As we read the plays, we shall pay close at-
tention to the historical context and look for what
each play can tell us about myth, religion, and
society in ancient Athens. Finally, we shall give
occasional attention to the way these tragic dra-
mas and the theater in which they were performed
have continued to inspire literature and theater
for thousands of years. Lectures will provide his-
torical background on the playwrights, the plays,
the mythic and historical background, and possi-
ble interpretation of the texts as literature and as
performance pieces. Students will discuss in class
the plays that they read. The course has three ex-
aminations and a final project that includes a short
to and a group presentation. Offered as CLSC
316, WLIT 316, WLIT 416.

WLIT 435. Women in Developing Countries
(3)
This course will feature case studies, theory, and
literature of current issues concerning women in
developing countries primarily of the French-
speaking world. Discussion and research topics
include matriarchal traditions and FGM in Africa,
the Tunisian feminist movement, women, Islam,
and tradition in the Middle East, women-centered
power structures in India (Kerala, Pondicherry),
and poverty and women in Vietnam, Laos, and
Cambodia. Guest speakers and special projects
are important elements of the course. Seminar-
style format, taught in English, with significant
disciplinary writing in English for WGST, ETHS,
and some WLIT students, and writing in French
for FRCH and WLIT students. Writing assign-
ments include two shorter essays and a substantial
research paper.
Offered as ETHS 335, FRCH 335, WLIT 335,
WGST 335, FRCH 435 and WLIT 435.
SAGES Dept Seminar
Global & Cultural Diversity

WLIT 438. The Cameroon Experience
(3)
Three-week immersion learning experience liv-
ing and studying in Cameroon. The focus of the
course is the culture, literature, and language of
Francophone Cameroon, with some emphasis on
Anglophone Cameroon. Students spend a mini-
mum of fifteen hours per week visiting cultural
sites and attending arranged courses at the Univer-
sity of Buea. Students will prepare a research pa-
ter. Course work is in French. To do course work
in English, students should enroll in WLIT 338 or
ETHS 338.
Offered as ETHS 338, FRCH 338, WLIT 338,
ETHS 438, FRCH 438, and WLIT 438.
Global & Cultural Diversity

WLIT 463H. African-American Literature
(3)
A historical approach to African-American litera-
ture. Such writers as Wheatley, Equiano, Doug-
las, Jacobs, DuBois, Hurston, Hughes, Wright,
Baldwin, Ellison, Morrisonis. Topics covered
may include slave narratives, African-American
autobiography, the Harlem Renaissance, the Black
Aesthetic, literature or protest and to assimilation.
Maximum 6 credits. Recommended preparation: ENGL
150 or USFS 100.
Offered as ENGL 363H, ETHS 363H, WLIT
363H, ENGL 463H, and WLIT 463H.
Global & Cultural Diversity

WLIT 465E. The Immigrant Experience
(3)
Study of fictional and/or autobiographical narra-
tive by authors whose families have experienced
immigration to the U.S. Among the ethnic groups
represented are Asian-American, Jewish-American,
Hispanic-American. May include several ethnic
groups or focus on a single one. Attention is paid
to historical and social aspects of immigration and
ethnicity. Maximum 6 credits. Recommended prepa-
reration: ENGL 150 or USFS 100.
Offered as ENGL 365E, WLIT 365E, ENGL
465E, and WLIT 465E.
Global & Cultural Diversity

WLIT 465N. Topics in African-American
Literature (3)
Selected topics and writers from nineteenth and
twentieth-century African-American literature.
May focus on a genre, a single author or a group of
authors, a theme or themes. Maximum 6 credits.
Recommended preparation: ENGL 150 or USFS 100.
Offered as ENGL 365N, ETHS 365N, WLIT
365N, ENGL 465N, and WLIT 465N.
Global & Cultural Diversity

WLIT 465Q, Post-Colonial Literature (3)
Readings in national and regional literatures from
former European colonies such as Australia and
African countries. Maximum 6 credits. Recom-
mended preparation: ENGL 150 or USFS 100.
Offered as ENGL 365Q, ETHS 365Q, WLIT
365Q, ENGL 465Q, and WLIT 465Q.
Global & Cultural Diversity

WLIT 466G. Minority Literatures (3)
A course dealing with literature produced by eth-
nic and racial minority groups within the U.S.
Individual offerings may include works from several
groups studied comparatively, or focus on a single
group, such as Native Americans, Chicanos/Chi-
canas, Asian-Americans, Caribbean-Americans.
African-American works may also be included.
May cover the entire history of the U.S. or shorter
periods. Maximum 6 credits. Recommended prepa-
reration: ENGL 150 or USFS 100.
Offered as ENGL 366G, WLIT 466G, ENGL
466G, and WLIT 466G.
Global & Cultural Diversity

WLIT 468A. Film History, Theory, and
Criticism (3)
This course is an introduction to the three major
approaches to cinema that together constitute the
field of film studies. The course will be broken into
three units: film theory; film criticism; and film
history. Screening one film per week, we will con-
sider each film in light of the particular unit’s and
week’s focus. Recommended preparation: ENGL
150 or USFS 100.
Offered as ENGL 368A, WLIT 368A, ENGL
468A, and WLIT 468A.

WLIT 468C. Topics in Film (3)
Individual topics in film, such as a particular na-
tional cinema, images of women in film, film com-
edy, New Wave film, literature and film. Maxi-
mum 12 credits.
Offered as ENGL 368C, WLIT 368C, ENGL
468C, and WLIT 468C.

WLIT 485. Hispanic Literature in Transla-
tion (3)
Critical analysis and appreciation of representa-
tive literary masterpieces from Spain and Latin
America, and by Hispanics living in the U.S. Texts
cover a variety of genres and a range of liter-
ary periods, from works by Cervantes to those of
Gabriel Garcia Marquez. The course will examine
the relationship between literature and other forms
of artistic production, as well as the development
of the Hispanic literary text within the context of
historical events and cultural production of the pe-
riod. Counts toward Spanish major only as related
course. No knowledge of Spanish required.
Offered as ETHS 385, ETHS 485, SPAN 385,
SPAN 485, WLIT 385, and WLIT 485.
Prereq: Graduate standing.

WLIT 487. Literary and Critical Theory (3)
A survey of major schools and texts of literary and
critical theory. May be historically or thematically
organized. Maximum 6 credits.
Offered as ENGL 387, WLIT 387, ENGL 487,
and WLIT 487.

WLIT 488. Translation (3)
Literary translation forms the basis of most read-
ers’ familiarity with world literature. In an age of
globalization, translation will be of increasing im-
portance. The practice of translation has long been
the province of creative writers. This course com-
plements and draws together creative writers and
students of foreign languages, showing that their
practices overlap. Students should have knowledge
of one language other than English to the 202 (in-
termediate) level.
Offered as WLIT 388 and WLIT 488.
Prereq: Graduate standing.

WLIT 490. Topics in World Literature (3)
In-depth examination of specific critical and lit-
erary theories and of their relevance for literature
and culture studies. Authors, works and instructor
may vary.
Offered as WLIT 390 and WLIT 490.
Prereq: Graduate standing.

WLIT 495. French Literature in Transla-
tion (3)
Topics vary according to student and faculty inter-
est. May include Francophone literature, literature and cinema, women writers, contemporary literature. Counts toward French major only as related course. No knowledge of French required. Offered as: FRCH 395, WLIT 395, FRCH 495, and WLIT 495.
Prereq: Graduate standing.

WLIT 590. Seminar in World Literature (3)
Topics vary depending on student and instructor interests; may include Postcolonial literature; Latin American literature and film; African Anglophone and Francophone literature.
Prereq: Graduate standing.

WLIT 595. Independent Research (1-3)
For graduate students under special circumstances.
Prereq: Graduate standing.

WLIT 601. Independent Study (1-18)
For graduate students under special circumstances.
Prereq: Graduate standing.
MANDEL CENTER FOR NONPROFIT ORGANIZATIONS

11402 Bellflower Road
Cleveland, OH 44106-7167
Phone: 216-368-2275
Fax: 216-368-8592
http://www.case.edu/mandelcenter/

Founded in 1984, the Mandel Center for Nonprofit Organizations, at Case Western Reserve University, is one of the pre-eminent nonprofit management academic centers in the world. The center offers nationally recognized graduate programs focused on developing the nonprofit community and its leaders, conducts cutting-edge research on the nonprofit sector, offers executive education and other non-credit professional development programs, and sponsors a leading journal featuring nonprofit management researchers’ work. The Mandel Center is a university-wide academic center distinguished by the quality of its faculty, by the strength of its ties with nonprofit leaders, and by its close relationships with its four partner schools at Case Western Reserve University – the College of Arts and Sciences, the School of Law, the Mandel School of Applied Social Sciences, and the Weatherhead School of Management. The Mandel Center’s mission is to strengthen – through education, research, and community service – the effectiveness of nonprofit leaders and managers and the organizations they serve.

In pursuit of that mission, the Mandel Center offers the Master of Nonprofit Organizations (M.N.O.) degree, an executive M.N.O. degree option, a Certificate in Nonprofit Management (CNM), and several dual degree and credential programs in cooperation with its four partner schools. The Mandel Center also collaborates with the Executive Doctor of Management (E.D.M.) program at the Weatherhead School of Management to offer practice-oriented nonprofit studies at the doctoral level. The Mandel Center founded and continues to sponsor Nonprofit Management and Leadership, the first and foremost journal of nonprofit management in the United States. Finally, the center provides leadership development services to the community of nonprofit organizations in the form of executive education, peer-to-peer learning, distinguished public lectures, and professional development programs for professionals working in nonprofit organizations.

FACULTY

Laura B. Chisolm, J.D.  (Case Western Reserve University)  
Professor of Law  
School of Law

Steven P. Feldman, Ph.D.  
(Wharton School of the University of Pennsylvania)  
Associate Professor of Management Policy  
Weatherhead School of Management

Robert L. Fischer, Ph.D.  
(Wharton University)  
Research Associate Professor  
Mandel School of Applied Social Sciences

David C. Hammad, Ph.D.  
(Columbia University)  
Hiram C. Hayden Professor of History  
College of Arts and Sciences

Jean Kilgore, Ph.D.  
(Case Western Reserve University)  
Senior Lecturer, Marketing and Policy Studies  
Weatherhead School of Management

David Miller, Ph.D.  
(University of Pittsburgh)  
Associate Professor of Social Work  
Mandel School of Applied Social Sciences

Duncan Neuhauser, Ph.D.  
(University of Chicago)  
Charles Elton Blanchard, M.D. Professor of Health Management  
School of Medicine

Paul F. Salipante, Jr., Ph.D.  
(University of Chicago)  
Professor of Labor and Human Resource Policy  
Weatherhead School of Management

Joseph White, Ph.D.  
(University of California, Berkeley)  
Lucenberg Family Professor of Public Policy  
Chair, Department of Political Science  
College of Arts and Sciences

EMERITUS FACULTY

Arthur Blum, D.S.W.  
(Western Reserve University)  
Grace Longwell Coyle Professor Emeritus  
Mandel School of Applied Social Sciences

Pranab Chatterjee, Ph.D.  
(University of Chicago)  
Grace Longwell Coyle Professor Emeritus

Mandel School of Applied Social Sciences  
Robert P. Lawry, J.D.  
(University of Pennsylvania)  
Professor Emeritus  
School of Law

John A. Yankey, Ph.D.  
(University of Pittsburgh)  
Leonard W. Mayo Professor Emeritus of Family and Child Welfare  
Mandel School of Applied Social Sciences

AFFILIATE FACULTY

Diana Bilimoria, Ph.D.  
(University of Michigan)  
Associate Professor of Organizational Behavior  
Weatherhead School of Management

Steve Bullock, M.B.A.  
(College of St. Thomas)  
Adjunct Instructor  
Mandel School of Applied Social Sciences

Barbara Clemenson, E.D.M.  
(Case Western Reserve University)  
Adjunct Instructor  
Mandel School of Applied Social Sciences

Fred Collopy, Ph.D.  
(Wharton School of the University of Pennsylvania)  
Professor of Information Systems  
Chair, Department of Information Systems  
Weatherhead School of Management

Claudia J. Coulton, Ph.D.  
(Case Western Reserve University)  
Lillian E Harris Professor of Urban Research and Social Change  
Mandel School of Applied Social Sciences

David Crampton, Ph.D.  
(University of Michigan)  
Associate Professor of Social Work  
Mandel School of Applied Social Sciences

Paul H. Feinberg, LL.M.  
(New York University)  
Adjunct Professor of Law  
School of Law

Brian Gran, Ph.D.  
(Northwestern University)  
Associate Professor of Sociology  
College of Arts and Sciences

John Kleinhenz, Ph.D.  
(University of Notre Dame)
Programs provide the management skills and knowledge needed to address a range of issues confronting nonprofits today. The Mandel Center offers a master's degree in nonprofit management, one of the only specialized degrees of its type in the world. The center also offers an Executive Option master's degree for established professionals, a certificate in nonprofit management, and a dual degree or certificate with the Mandel School of Applied Social Sciences, the Weatherhead School of Management, and the School of Law.

Professional Development
The Mandel Center serves nonprofit leaders with a number of professional development opportunities. The center directs its offerings at the intersection of community needs and the distinctive and substantial knowledge base of the Mandel Center’s Program Faculty. The center works closely with professionals in the field to ensure that its programs contain content that is relevant and easily applicable to the dynamic environment in which today's nonprofits operate. As a result, the center’s professional development programs provide a greater depth of understanding of a topic not only through substantive content grounded in the latest research, but through application techniques and support that enables participants to apply their knowledge to make meaningful positive changes in their workplace. For more information, visit www.case.edu/mandelcenter/professionaldev.

Research
Research efforts are supported by faculty who are national leaders in the field of nonprofit management. This research is published in leading academic journals, including Nonprofit Management and Leadership, which the Mandel Center founded in 1990 and continues to sponsor. Nonprofit research projects and papers are also shared through conferences, seminars, lectures, symposia, and special publications. For more information, visit www.case.edu/mandelcenter/research.

NONPROFIT MANAGEMENT EDUCATION
With a Mandel Center degree or certificate, a student will gain the skills needed to meet the persistent demands of nonprofit leaders today. The center’s faculty consists of highly skilled professionals who have a wealth of expertise from both an academic and community perspective and the center’s teaching approach is dynamic and interactive with an emphasis on management skills and knowledge needed to address a wide range of issues confronting nonprofits today.

Master’s Programs

**MASTER OF NONPROFIT ORGANIZATIONS (M.N.O.)**
The Master of Nonprofit Organizations degree consists of 60 credit hours of academic work taken over two years of full-time study, or approximately 48 months of part-time study. Part-time students may accelerate their progress depending upon the number of courses they take in any given semester. Classes are offered primarily in the evening and on weekends to accommodate working professionals. The M.N.O. is based on a multidisciplinary curriculum consisting of four thematic areas: Nonprofit Purposes, Traditions, and Contexts; Analytic Thinking for Nonprofit Leaders; Generating and Managing Resources for Nonprofit Organizations; and Leading Nonprofit Organizations. Students take 33 hours of required courses and 27 hours of elective courses. This structure allows the student broad latitude to customize his or her program of study to meet professional interests and needs.

**M.N.O. CURRICULUM (60 CREDITS)**

<table>
<thead>
<tr>
<th>Required Courses (33 Credits)</th>
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</thead>
<tbody>
<tr>
<td>Course</td>
</tr>
<tr>
<td>MAND 401</td>
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<tr>
<td>MAND 405</td>
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<tr>
<td>MAND 409A</td>
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<td>MAND 409B</td>
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<td>MAND 410</td>
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<td>MAND 411</td>
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<td>MAND 420</td>
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<tr>
<td>MAND 424</td>
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<tr>
<td>MAND 425</td>
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</tbody>
</table>

MANDEL CENTER PROGRAMS
The Mandel Center supports the mission of nonprofits through a blend of services and programs that nurture the development and prosperity of nonprofit organizations and their leadership.

Graduate Education
Programs provide the management skills and knowledge needed to address a range of issues confronting nonprofits today. The Mandel Center offers a master's degree in nonprofit management, one of the only specialized degrees of its type in the world. The center also offers an Executive Option master's degree for established professionals, a certificate in nonprofit management, and a dual degree or certificate with the Mandel School of Applied Social Sciences, the Weatherhead School of Management, and the School of Law.

**MAJOR COURSES**

**MAND 409A** Strategic Planning for Nonprofit Organizations: Practicum I

**MAND 409B** Strategic Planning for Nonprofit Organizations: Practicum II

**MAND 410** Quantitative Analysis for Nonprofit Organizations

**MANDEL CENTER FOR NONPROFIT ORGANIZATIONS**

Lecturer
Weatherhead School of Management
Mark Light, Ph.D.
(Antioch University)
Adjunct Instructor
Mandel School of Applied Social Sciences
Kelly McMann, Ph.D.
(University of Michigan)
Assistant Professor of Political Science
College of Arts and Sciences
Sharon E. Milligan, Ph.D.
(University of Pittsburgh)
Associate Professor of Social Work
Mandel School of Applied Social Sciences
Michele Murphy, M.N.O.
(Case Western Reserve University)
Adjunct Instructor
Mandel School of Applied Social Sciences
August Napoli, Jr., B.A.
(University of Steubenville)
Adjunct Instructor
Mandel School of Applied Social Sciences
Deborah O’Neil, Ph.D.
(Case Western Reserve University)
Adjunct Instructor
Mandel School of Applied Social Sciences
Elliot Posner, Ph.D.
(University of California, Berkeley)
Assistant Professor of Political Science
College of Arts and Sciences
Mohan Reddy, Ph.D.
(Case Western Reserve University)
Dean; Albert J. Weatherhead, III Professor of Management
Weatherhead School of Management
Michele Seyranian, M.N.O.
(Case Western Reserve University)
Adjunct Instructor
Mandel School of Applied Social Sciences
Janus Small, M.A.
(University of Cincinnati)
Adjunct Instructor
Mandel School of Applied Social Sciences

MANDEL CENTER PROGRAMS
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**M.A. IN NONPROFIT MANAGEMENT EDUCATION**

**MAND 401** Introduction to the Nonprofit Sector

**MAND 405** Ethics and Professionalism for Nonprofit Leaders

**MAND 409A** Strategic Planning for Nonprofit Organizations: Practicum I

**MAND 409B** Strategic Planning for Nonprofit Organizations: Practicum II

**MAND 410** Quantitative Analysis for Nonprofit Organizations

**MAND 411** Nonprofit Leadership Dialogs: Major Trends and Issues

**MAND 420** Nonprofit Organization & Management

**MAND 424** Economics for Nonprofit Managers

**MAND 425** Financial Accounting & Reporting for Nonprofit Organizations
Elective Courses (27 Credits)

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAND 406</td>
<td>Nonprofit Public Policy and Advocacy</td>
<td>3</td>
</tr>
<tr>
<td>MAND 407</td>
<td>Earned Income for Nonprofit Organizations</td>
<td>3</td>
</tr>
<tr>
<td>MAND 408</td>
<td>Philanthropic Fundraising for Nonprofit Organizations</td>
<td>3</td>
</tr>
<tr>
<td>MAND 412</td>
<td>Leadership for Nonprofit Organizations</td>
<td>3</td>
</tr>
<tr>
<td>MAND 422</td>
<td>Organizational Assessment &amp; Program Evaluation in Nonprofit Organizations</td>
<td>3</td>
</tr>
<tr>
<td>MAND 427</td>
<td>International Non-Governmental Organizations</td>
<td>3</td>
</tr>
<tr>
<td>MAND 432</td>
<td>Marketing for Nonprofit Organizations</td>
<td>3</td>
</tr>
<tr>
<td>MAND 440</td>
<td>Management Information Systems for Nonprofit Organizations</td>
<td>3</td>
</tr>
<tr>
<td>MAND 444</td>
<td>Program Design in Nonprofit Organizations</td>
<td>3</td>
</tr>
<tr>
<td>MAND 486</td>
<td>Leading and Managing Nonprofit Arts and Cultural Organizations</td>
<td>3</td>
</tr>
<tr>
<td>MAND 489</td>
<td>Trusteeship: The Governance of Nonprofit Organizations</td>
<td>3</td>
</tr>
<tr>
<td>MAND 501</td>
<td>Special Problems and Topics (directed study)</td>
<td>1-6</td>
</tr>
</tbody>
</table>

Electives may also be selected from courses offered by other schools at Case Western Reserve University.

MASTER OF NONPROFIT ORGANIZATIONS EXECUTIVE OPTION

The M.N.O. - Executive Option is a professional degree option designed for nonprofit managers and practitioners with at least 10 years of professional experience and five years or more of management and/or supervisory experience. The M.N.O. - Executive Option is based upon the Master of Nonprofit Organizations curriculum.

The M.N.O. - Executive Option consists of 45 credit hours typically taken over 18 months of full-time study or approximately three years of part-time study. Classes are offered primarily in the evening and on weekends to accommodate working professionals. M.N.O. - Executive Option students typically take 30 hours of required courses and 15 hours of elective courses. Students who have taken prior coursework in the required areas may, with faculty approval, replace specific required courses with other elective courses.

Admission to this option will be considered only at the time of initial admission into the Mandel Center's master's degree program. Students may not apply for this option once they have matriculated into the 60-hour program.

Certificate Program

CERTIFICATE IN NONPROFIT MANAGEMENT (CNM)

The Certificate in Nonprofit Management is a non-degree professional certificate consisting of 15 credit hours of graduate-level coursework: one required course, Introduction to the Nonprofit Sector (MAND 401), and four courses drawn from the Mandel Center course list (see above). CNM students may elect to attend one or more sessions of Nonprofit Leadership Dialogs: Major Trends and Issues (MAND 411) with prior permission of the instructor.

Classes are offered primarily in the evening and on weekends to accommodate working professionals. The typical student takes one year to complete the program. CNM courses may be chosen from the center’s multidisciplinary curriculum, which encompasses four thematic areas: Nonprofit Purposes, Traditions, and Contexts; Analytic Thinking for Nonprofit Leaders; Generating and Managing Resources for Nonprofit Organizations; and Leading Nonprofit Organizations. A CNM student may select courses from any of the curricular themes and may customize a program of study to meet professional interests and needs.

DUAL DEGREE OPTIONS

The Mandel Center currently offers dual degree programs to enable students to combine the Master of Nonprofit Organizations degree (M.N.O.) with a degree from the Mandel School of Applied Social Sciences (M.S.S.A./M.N.O.), the School of Law at Case Western Reserve University (J.D./M.N.O.), or the Department of Music in the School of Graduate Studies (M.A./M.N.O.).

ALL DUAL DEGREE STUDENTS:

a. must be admitted to each degree program separately, and
b. must receive both degrees simultaneously to be granted credit for specific courses taken in the other program.

Please contact the Mandel Center or the appropriate professional school for specific curriculum, sequence options, and complete information about dual degree programs.

M.S.S.A./M.N.O.

This program combines the Master of Nonprofit Organizations (M.N.O.) degree with the Master of Science in Social Administration degree (M.S.S.A.). It provides career preparation for students with interests in nonprofit management, social service, and the social work profession.

New students can apply to both programs simultaneously or separately. Students who choose to begin their studies in the M.S.S.A. program must apply to the M.N.O. program prior to completing their first semester of M.S.S.A. courses. M.S.S.A./M.N.O. students continue to register at their initial school of enrollment throughout the dual degree program.

For more information on the M.S.S.A. degree, please visit http://msass.case.edu/academic/.

J.D./M.N.O.

This program combines the Master of Nonprofit Organizations (M.N.O.) degree with the Juris Doctor degree (J.D.). It provides preparation for students interested in, for example, practicing law within a nonprofit organizational setting; working as a program officer in a foundation; serving as a leader or manager of a nonprofit organization; working in the area of nonprofit public policy and advocacy; or working in the field of planned giving.

New students can apply to both programs simultaneously or at separate times. Students who choose to begin their studies in the J.D. program must apply to the M.N.O. program prior to completing their first year at the School of Law. J.D./M.N.O. students continue to register at their initial school of enroll-
MANDEL CENTER FOR
NONPROFIT ORGANIZATIONS

ment throughout the dual degree program.
For information on the J.D. degree, please visit http://law.case.edu/curriculum/.

M.A./M.N.O.
This program combines the M.N.O. degree with the Master of Arts in Music History (M.A.). It provides preparation for students who desire to blend a strong background in music and the arts with management in nonprofit organizations.

Students in either program must be admitted within the first year of study to the other program in order to be admitted to dual degree status. New students may apply to both programs simultaneously or at separate times.

For more information on the M.A. degree, visit http://music.case.edu/musicology/ma.php/.

DEGREE/CERTIFICATE OPTIONS
The Mandel Center currently offers degree/certificate programs with the Weatherhead School of Management (M.B.A./CNM), the Mandel School of Applied Social Sciences (M.S.S.A./CNM), and the School of Law at Case Western Reserve University (J.D./CNM).

All degree/certificate students:

a. must be admitted to each program separately, and
b. must receive both credentials simultaneously to be granted credit for specific courses taken in the other program.

Please contact the Mandel Center or the appropriate professional school for specific curriculum, sequence options, and complete information about certificate programs.

M.B.A./CNM
M.B.A. students with a career focus in the management of nonprofit organizations may obtain a Certificate in Nonprofit Management (CNM) by completing 15 credit hours of Mandel Center courses (9 of the 15 credit hours may be counted as M.B.A. electives). By enrolling in one additional course in two of the last three semesters of the M.B.A. program, full-time students may complete the M.B.A. and the CNM without extending their course of study or incurring additional tuition fees. M.B.A. students must apply to the degree/certificate program no later than the end of the first year in the M.B.A. program (or at the end of the first semester in the accelerated M.B.A. curriculum).

Students wishing to propose any modification in the recommended sequence of study on the basis of prior course work, past experience, or professional interest must present a request, in writing, for consideration by the Weatherhead M.B.A./CNM faculty advisor.

For more information on the M.B.A. degree and for a complete listing of Mandel Center courses that are eligible for both the M.B.A. and the CNM, visit:
http://weatherhead.case.edu/academics/master/mba/certificates/nonprofit/.

M.S.S.A./CNM
The M.S.S.A./CNM combines the Master of Science in Social Administration degree (M.S.S.A.) with the Certificate in Nonprofit Management. It provides career preparation for students with interests in nonprofit management, social service, and the social work profession.

The program consists of fifteen credit hours of Mandel Center courses. MSASS students interested in the M.S.S.A./CNM should contact their advisor or the Mandel Center for more information.

M.S.S.A. students should apply to the degree/certificate program no later than the end of their first semester in the M.S.S.A. program.

For more information on the M.S.S.A. degree, visit http://msass.case.edu/academic/.

J.D./CNM
The J.D./CNM combines the Juris Doctor degree (J.D.) with the Certificate in Nonprofit Management. It provides preparation for students interested in, for example, practicing law within a nonprofit organizational setting; working as a program officer in a foundation; serving as a leader or manager of a nonprofit organization; working in the area of nonprofit public policy and advocacy; or working in the field of planned giving.

The program consists of five courses. Law of Nonprofit Organizations (LAWS 234) is required and the remaining four courses are chosen in consultation with the J.D./CNM faculty advisor.

Students should apply to the degree/certificate program no later than the end of the second year at the School of Law.

For more information on the J.D. degree, please visit http://law.case.edu/curriculum/.

For more information on the center’s certificate or master’s programs, call 800-435-6669 or contact:

Director of Recruitment
216-368-6025
E-mail: mncoadmissions@case.edu
http://www.case.edu/mandelcenter/grad/

ADMISSIONS INFORMATION

Master of Nonprofit Organizations (M.N.O.) Degree
The following are required to apply for the M.N.O.:

a. Completed application for admission. The form can be completed online, printed in hard copy, and mailed to the Admissions Office. The application should be signed and the applicant should keep a copy of the form for his or her records.
b. $25 application fee
c. Personal essay
d. Two (2) letters of recommendation from individuals qualified to comment on the applicant’s nonprofit experience and/or the applicant’s ability to master graduate level work, as well as his/her interpersonal and communication skills.

Please use the recommendation forms included in the Mandel Center application packet or download the recommendation form (PDF) found on the Mandel Center’s web site at http://www.case.edu/mandelcenter/grad/admissions/RecommendationForm.pdf. See the instructions on the recommendation form for mailing to the recommenders.
e. Current resume or vitae
f. Baccalaureate degree evidenced by official sealed transcripts (the sealed transcripts must be sent directly to the Mandel Center from each institution attended) *

International students must provide official transcripts that have been translated into English, and, if the grading system at the student’s academic institution cannot be compared with the United States system, the transcript must be evaluated by a service qualified to convert foreign academic credentials into their U.S. equivalents (e.g. World Education Services).

g. GMAT score (www.mba.com). For the program recipient of the GMAT score, choose “Case Western Reserve University - Weatherhead School of Management - Master of Nonprofit Organizations” from the GMAT Program Database (which is done at the
time of the test), An applicant cannot be fully admitted until the official scores have been received by Weatherhead.

h. TOEFL score (international students only) (www.toefl.org). Official scores must be received by the Weatherhead School of Management (Code: 1105) before an applicant can be admitted.

i. Free Application for Federal Student Aid (FAFSA) - complete this form if applying for Mandel Center scholarships and/or federal loans.

M.N.O. - EXECUTIVE OPTION

The admission requirements for the M.N.O. - Executive Option are the same as those for the M.N.O. with the following differences:

a. The applicant must articulate in the personal essay why he/she is qualified for the M.N.O. - Executive Option.

b. The applicant must submit three (3) letters of recommendation. At least one letter must be written by an individual who has supervised the applicant in his/her managerial career, and who can discuss the scope of the applicant's managerial duties and the effectiveness of the applicant as a manager.

c. The applicant must meet with Mandel Center faculty members to determine whether he or she has the requisite level of experience to meet the M.N.O. - Executive Option requirements.

CERTIFICATE IN NONPROFIT MANAGEMENT (CNM)

The application procedures for the CNM are the same as those for the M.N.O., except that a GMAT score is not required.

DUAL DEGREE AND DEGREE/CERTIFICATE PROGRAMS

Applicants to a dual degree or degree/certificate program must make separate application to and be admitted by each of the separate programs (see Dual Degree Program and Degree/Certificate Program pages).

*Dual degree or degree/certificate students who have completed a semester or more of coursework in their initial school of enrollment at the time that they apply for the M.N.O. or CNM must also provide the Mandel Center Admissions Office with a copy of their transcript from that school.

ENTRANCE SEMESTERS AND APPLICATION DEADLINES

Applicants for the M.N.O. or CNM may enter the program in the fall, spring, or summer semesters. The deadline for the fall semester is June 1, for the spring semester is December 1, and for the summer semester is May 1. Applicants are admitted on a rolling admissions basis.

WAIVER POLICY

A total of six credit hours are eligible for waiver, subject to the following requirements:

Courses to be waived must have been taken from an accredited institution within five years of the date of application to the M.N.O. degree program. A grade of at least a B must have been earned. A Mandel Center faculty member must make written approval of the waived course. Courses will not be waived based upon work experience. A student must register for and complete at least 54 credits toward the M.N.O. degree in residence at the university in addition to courses waived. A waived course may reduce degree requirements.

TRANSFER CREDIT

Courses granted transfer credit must be approved as applicable to the M.N.O. program. Courses must be taken at an accredited institution and be approved prior to enrollment. A grade of at least B must be earned and these grades are not counted in the cumulative grade point average. Transfer credit is limited to six credits.

SUBSTITUTION

An additional nine credits may be approved for substitute credit. Substitute courses replace required M.N.O. courses but do not reduce the total number of credits required to complete the program. Substitute courses must be selected and approved in accordance with a clearly defined written proposal consistent with student interests/needs and the M.N.O. program mission.

For more information on the admissions process, call 1-800-435-6669 or contact:

Director of Recruitment
216-368-6025
E-mail: mcnoadmissions@case.edu
http://www.case.edu/mandelcenter/grad/

CAREER DEVELOPMENT AND MANAGEMENT

The Mandel Center provides career assistance and internship and mentoring opportunities. In addition, nonprofit job openings are posted on Case CareerLink, the online career management system available through Case Western Reserve University’s Career Center.

Internships are optional experiences that enable students to gain valuable professional experiences, often by working on a special project, in a nonprofit setting. An internship is designed to last a minimum of one semester, during which the student works from 10-20 hours per week.

The mentor program is another optional experience that enables a student to be matched one-on-one with a prominent nonprofit executive in the Cleveland area. This is an opportunity to discover the realities of the workplace, network with professionals who share similar interests, obtain valuable and personalized guidance from a seasoned professional, or to work side by side with one’s mentor. Students can participate in the fall and/or spring semesters.

In addition, the Mandel Center is fortunate to have a staff with in-depth knowledge and extensive and varied employment histories in the nonprofit sector locally, regionally and nationally. Students may contact the Mandel Center for personalized support and discussion around career goals, objectives and opportunities.

For more information, please visit http://www.case.edu/mandelcenter/career/.

FINANCIAL INFORMATION

Tuition

The tuition charges for 2009-2010 for the M.N.O. degree and CNM program are $1,375 per credit or $16,500 per semester for full-time M.N.O. students taking 12 or more credits. The cost for the CNM program depends upon the number of credit hours taken. Tuition covers instructional costs and computer usage. Books and living expenses are separate student expenses. Tuition is due and payable according to the university’s tuition payment policy for each semester in which course work is undertaken.

Technology Fee

Students are charged the student technology fee in the fall and spring semesters based on the number of credit hours registered for in each semester. For more information, visit http://www.case.edu/mandelcenter/grad/finance/.

Financial Aid

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MANDEL CENTER FOR NONPROFIT ORGANIZATIONS

Information about scholarships or other financial aid assistance is available at http://www.case.edu/mandelcenter/grad/finance/.

Please note: Initial scholarship and financial aid decisions are typically made in the spring for the following fall, so application by April 30 to the M.N.O. or CNM program is encouraged. Requests for financial assistance received after June 1 will be considered based on availability of funds. Earlier application deadlines apply for full tuition scholarships.

ACADEMIC REGULATIONS

Registration
Registration for the M.N.O. and CNM programs is through the Weatherhead School of Management. The Mandel Center’s academic advisor must approve all schedules prior to registration.

Refer to the Weatherhead School section of this Bulletin for information about course changes and withdrawals. For additional information, call the Mandel Center at 216-368-8566.

Course Loads
Full-time graduate students are required to register for a minimum of 12 credits per semester. Part-time students typically register for 6 credits per semester.

Non-Degree Students
Individuals may register as non-degree students and take a maximum of 12 credit hours through a total of four (4) Mandel Center graduate level courses in the Weatherhead School of Management Non-Degree Program. For questions about this option, please contact the Mandel Center Admissions Office at 216-368-6025 or 1-800-435-6669 or visit http://www.case.edu/mandelcenter/grad.

Retention and Graduation Requirements

M.N.O. PROGRAM
Retention requirements for continued study in the M.N.O. program:

- Minimum G.P.A. after 15 credit hours of study: 2.5
- Minimum G.P.A. after 23 credit hours of study: 2.7
- Minimum G.P.A. after 29 credit hours of study: 3.0
- Minimum G.P.A. for graduation: 3.0

A student will be placed on academic probation after any semester in which the minimum G.P.A. is not attained. A student who is on academic probation in a particular semester will be allowed one additional semester to attain the minimum G.P.A. in order to continue in the M.N.O. program.

A candidate for the M.N.O. degree must file an application to graduate not later than two months before the commencement at which the degree is expected. The filing of this application is the responsibility of the M.N.O. candidate. Contact the Mandel Center at 216-368-8566 for more information. Eligibility of the candidate to graduate at the time requested will be verified upon receipt of the application.

RETENTION REQUIREMENTS FOR STUDENTS IN THE CNM PROGRAM

A CNM student who earns a final grade below a B in any course may no longer continue in the program. There is no academic probation period for the CNM, due to the short duration of the program.

A candidate for the CNM program must file an application to graduate not later than two months before the expected graduation date. The filing of this application is the responsibility of the CNM candidate. Contact the Mandel Center at 216-368-8566 for more information. Eligibility of the candidate to graduate at the time requested will be verified upon receipt of the application.

TIME LIMITATION

All requirements for the CNM program must be completed within two years from the date of the student’s initial registration.

TRANSCRIPTS

Official transcripts for course work completed may be obtained from the University Registrar’s Office at http://www.case.edu/provost/registrar/transcri.htm/.

COURSE DESCRIPTIONS (MAND)

Course Descriptions

MAND 401. Introduction to the Nonprofit Sector (3)
An examination of the social history of nonprofit organizations in the United States, to develop an historical perspective and a sense of magnitude, scope, and functions of the nonprofit sector and its relationships with business and government. This course will explore the theoretical bases upon which social scientists have sought to understand the role of the nonprofit sector in our economy and in our political and social systems, and will explore the issues that will shape the future of the sector. Eligible for M.B.A. credit.

MAND 405. Ethics and Professionalism for Nonprofit Leaders (3)
This course is an application of ethical frameworks and analysis to nonprofit organizations. Using cases and essays, the course will help nonprofit managers become better equipped to address ethical problems and dilemmas in their work in the following areas: ethics of boards, ethics and leadership, ethics and organizational culture, professional ethics, and ethics and fundraising. Eligible for M.B.A. credit.

MAND 406. Nonprofit Public Policy and Advocacy (3)
This course is an introduction to the institutions and processes that make up the political environment of nonprofit organizations in the United States. The course will examine the role of civil society in a democracy, take a general overview of American political institutions and the cultural beliefs that undergird them, and examine the important elements of the public policy process: the framing of issues, the role of political entrepreneurs and organized interests, elections, the legislative process and strategies for influencing it, and the roles of executive institutions and the courts. Emphasis will be placed on the ways that nonprofit advocates can advance their goals in the public policy process. Eligible for M.B.A. credit.
MAND 407. Earned Income for Nonprofit Organizations (3)
In this course, students will examine the entrepreneurial behavior of nonprofit-sector organizations in identifying new and varied sources of income to supplement the traditional contribution base. Using cases, students will explore the nontraditional sources of income that drive the tax-exempt sector, analyze data, and make management decisions. Eligible for M.B.A. credit.

MAND 408. Philanthropic Fundraising for Nonprofit Organizations (3)
This course will provide current and future nonprofit leaders with a detailed survey of the practices, principles, and process of fundraising, enabling them to effectively create, participate in, and manage fund development programs and staff. Successful fundraising is shown to be communication-based and built upon solid relationships with defined constituencies of donors and potential donors. Eligible for M.B.A. credit.

MAND 409A. Strategic Planning for Nonprofit Organizations: Practicum I (3)
This is the first of a two-course, integrated, practicum series designed to provide "hands-on" experiences in planning for, designing, and conducting strategic planning in nonprofit organizations. Students will learn to assess organizational readiness, facilitate the design of strategic planning processes, create a variety of approaches involving key stakeholders, and finalize a planning design suited to organizational culture. Eligible for M.B.A. credit. MAND 409A is the first part of a two-part sequence, the second part of which is offered the following semester.

MAND 409B. Strategic Planning for Nonprofit Organizations: Practicum II (3)
This is the second of a two-course, integrated practicum series designed to provide "hands-on" experience in planning for, designing, and conducting strategic planning in nonprofit organizations. Student teams will continue to consult with their nonprofit organizations to implement the committee deliberation phase of the planning process designed during the first practicum. Eligible for M.B.A. credit. MAND 409B is the continuation of a two-part course sequence. Prereq: MAND 409A.

MAND 410. Quantitative Analysis for Nonprofit Leaders (3)
This course is designed to give students basic understanding and working knowledge of data analysis, statistical concepts, use of computers, research designs for program planning and evaluation, and quantitative techniques for problem solving. The intent is to ensure that executives and leaders are able to effectively utilize and interpret statistical data, technical reports, research findings, and evaluation studies, and employ basic quantitative methods in their own analysis of problems and policies. Not eligible for M.B.A. credit.

MAND 411. Nonprofit Leadership Dialogs: Major Trends and Issues (1)
This course is intended to enable students to learn about major nonprofit leadership issues and trends through interaction and dialog with successful nonprofit leaders. It is also designed to provide outside nonprofit leaders with the opportunity to learn about the quality of the Mandel Center's student body. Eligible for M.B.A. credit.

MAND 412. Leadership for Nonprofit Organizations (3)
This course examines leadership from nonprofit political, managerial, and sociological perspectives. Concepts of leadership will be applied to nonprofit organizations through case discussion, student experience, and class exercises. The course integrates theory-based and practice-based approaches and prepares students to participate in leader-follower dynamics in the nonprofit setting. Eligible for M.B.A. credit.

MAND 420. Nonprofit Organization and Management (3)
This course will focus on theories of organization and general concepts and principles of management, governance, and leadership. Organizational design, behavior, performance, and effectiveness will be studied, and the special character and management problems of nonprofit organizations will be highlighted and analyzed. Eligible for M.B.A. credit.

MAND 422. Organizational Assessment and Program Evaluation in Nonprofit Orgs. (3)
The course is designed to introduce students to the approaches to organizational assessment and evaluation of organizational issues and problems. The class will explore a variety of ways of viewing organizations, assessing their stage of development, look at factors that influence or interfere with their forward progress, review the dimensions essential to nonprofit organizations and explore some processes useful to enable change. In addition, the course will focus on the process of creating and measuring program outcomes. Eligible for M.B.A. credit.

MAND 424. Economics for Nonprofit Managers (3)
This course is designed to familiarize students with basic ideas of microeconomic analysis so that they may apply this reasoning to important resource-related decisions facing contemporary nonprofit organizations. This introductory course will orient the student to the role of nonprofit organizations in a market economy, familiarizing the student with basic concepts of microeconomic analysis and how they apply to resource-related decisions, and provide the student with tools and concepts for analyzing pricing, compensation, outsourcing, investment of funds, and engaging in partnerships. Not eligible for M.B.A. credit.

MAND 425. Financial Accounting and Reporting for Nonprofit Organizations (2)
A working knowledge of accounting principles and practices as they pertain particularly to nonprofit organizations is stressed in this course. Topics include basic concepts of accounting, generation and use of accounting information, understanding and use of standard accounting reports, and the nuances of fund accounting and other subjects especially germane to nonprofit organizations. Not eligible for M.B.A. credit.

MAND 426. Financial Management for Nonprofit Organizations (3)
This course focuses on techniques and principles of financial management including budgeting, finance and investment decision making. Topics include budget formulation, analysis and planning, present value analysis, cost-effectiveness, cash flow analysis, portfolio management, and venture planning. Special emphasis will be given to the unique problems of nonprofits in capital formation, generating earned income, managing endowments, gifts and grants, and tax planning. Not eligible for M.B.A. credit. Prereq: MAND 425.

MAND 427. International Non-Governmental Organizations (3)
This course examines the role of voluntary associations in the international arena and, in particular, the multiple roles of international non-governmental organizations in affecting international political and economic outcomes. The course also examines the theoretical issues surrounding NGOs and international relations, particularly the relationship between global civil society and international political outcomes. Eligible for M.B.A. credit.

MAND 428. The American Nonprofit Sector in its Contexts (1)
This one-credit-hour intensive-format course is designed to enable students to learn what they need to know about the U.S. nonprofit sector
in order to serve successfully as executive leaders of nonprofit organizations. This class will help students (1) understand how individual nonprofit organizations and the nonprofit sector as a whole fit into the U.S. political and legal systems and into the U.S. economy, (2) distinguish the nonprofit sector of American society from the for-profit and the governmental sectors, (3) compare and contrast the U.S. nonprofit sector with its counterparts in other nations, and (4) evaluate the key current issues facing nonprofits in the United States. Not eligible for M.B.A. credit.

MAND 430. Managing Human Resources in Nonprofit Organizations (3)

Theories and principles of managing people in organizations are addressed in this course, including motivation theory and human resource development strategies. Particular attention is devoted to issues critical to nonprofit organizations, such as the management of volunteers, management of professionals, working with trustees, and staff/board relationships. Eligible for M.B.A. credit.

MAND 432. Marketing for Nonprofit Organizations (3)

This course provides students with a comprehensive overview of the principles and techniques of nonprofit marketing and with an understanding of the multiple contexts in which they are applicable—marketing of products and services, marketing to potential funders, marketing of ideas and behaviors (social marketing and advocacy). The focus of the course is on managerial decision-making to achieve organizational objectives and enhance organizational viability. Eligible for M.B.A. credit.

MAND 440. Management Information Systems for Nonprofit Organizations (3)

An examination of how the management of organizations in contemporary society can be understood as the managing of systems and operations that require the processing and analysis of information. Basic concepts and models of systems analysis, management information and decision systems, and operations management will be explained and applied to the analysis and control of organizational processes and the relationship of the organization to its environment. Computer-based models may be used to analyze problems, policies, and practices of organizations in a variety of nonprofit industries. Not eligible for M.B.A. credit.

MAND 444. Program Design in Nonprofit Organizations (3)

Program design and development are of critical importance in nonprofit organizations. Through this course students will have the opportunity to design a program using a specific analytic framework. Students will learn: (1) to address the demands of multiple constituencies and competing values in program development process, (2) skills for developing and implementing programs in the nonprofit sector, and (3) to examine issues of diversity as they affect organizations and community efforts and explore personal values and ethics as these influence programs and interventions. Eligible for M.B.A. credit.

MAND 450. Law of Nonprofit Organizations (3)

This course provides the student with a basic grounding in the laws and regulations governing nonprofit organizations. Content will include the procedures for incorporating, reporting, and maintaining tax-exempt status as a nonprofit organization, a familiarity with legal principles and research methods, and an overview of the legal, regulatory, and policy issues facing contemporary nonprofit organizations. Eligible for M.B.A. credit.

MAND 486. Leading and Managing Nonprofit Arts and Cultural Organizations (3)

This course addresses major issues affecting the leadership and management of arts organizations, the values and assumptions which have influenced arts organizations in the past, and current trends in society which may call those assumptions into question. Emphasis is given to issues of cultural sensitivity for leaders, managers and audiences as well as broadening the perspectives of future leaders so they may productively and creatively manage their institutions and careers. Eligible for M.B.A. credit.

MAND 489. Trusteeship: Governance of Nonprofit Organizations (3)

This elective course deals with the definition, history and concept of trusteeship, the areas of responsibilities of Boards of Trustees, the authority of Boards and the limits on its exercise, the organization of Boards and their committees, and the Board’s relationships with the Executive Director, the staff and the organization’s constituencies. Eligible for M.B.A. credit.

MAND 501. Special Problems and Topics (1 - 18)

An elective which provides the opportunity for an individualized, structured course of study in an area of special interest to the student, and is arranged by mutual agreement between the student and an appropriate faculty member.
MANDEL SCHOOL OF APPLIED SOCIAL SCIENCES

11235 Bellflower Road
Phone 216-368-2290; Fax 216-368-8670
Grover C. Gilmore, Ph.D., Dean
and Professor

MISSION STATEMENT
The mission of the Mandel School is to provide and integrate professional social work education, research, and service to promote social justice and empowerment in communities through social work practices locally, nationally and internationally.

A HISTORY OF INNOVATION
Ranked among the nation’s top graduate schools of social work by U.S. News and World Report, and ranked number one in Ohio, the Mandel School of Applied Social Sciences has always committed itself to learning from and fostering the best in social work practice and to building social work’s knowledge base. Since its founding in 1915 as the nation’s first university-affiliated professional graduate school of social work, the Mandel School has been an innovator in professional education, where educators, researchers and practitioners work side-by-side to investigate, study and disseminate knowledge to bridge the gap between the classroom and communities in which social workers practice.

The Mandel School provides students with a solid foundation designed to build core competencies with its innovative Ability-Based Learning Environment, which allows graduates a great degree of flexibility and portability. Students choose concentrations in either Community and Social Development or Direct Practice, which offers specializations in Aging; Alcohol and Other Drug Abuse; Children, Youth and Families; Health; and Mental Health. Certificate programs include early intervention, gerontology, health systems management, nonprofit management, and school social work. Dual-degree programs enable Mandel School students to obtain their social work degree concurrently with a master’s degree in bioethics, law, management, or nonprofit management.

The Mandel School believes that advanced practitioners are strategists of change, working in partnership with others to enhance the caring capacity of communities. The concentrations structure cross-trains Mandel School students, who build foundations in both areas that bring a breadth of knowledge to their work lives, allowing them the flexibility to pursue their interests even as they change over time. The school prepares advanced practitioners who become lifelong learners with the abilities needed to practice ethically and effectively with diverse populations and with systems of various sizes and types. Students learn to understand the dynamics of problematic social situations and to identify the strengths and resources in individuals, families and communities that offer the best hope of solutions. The school is committed to a vision of social work practice as a force of social justice, empowerment, and the building of healthy communities. That commitment extends beyond our national borders with the Mandel School’s award-winning program of international study options.

The Mandel School counts among its alumni many prominent educators, government officials, accomplished practitioners, researchers, advocates, public-policy-makers, and chief executives of national and regional agencies. Faculty achievements in professional organizations, research, and agency consultation further extend the school’s reputation as an active participant in the advancement of social work practice.

A Mandel School education is more than preparation. It is an opportunity to join a national network of scholars and practitioners who are shaping the course of social work in communities throughout the world. The Mandel School is ranked seventh in faculty productivity among social work schools by Academic Analytics.

For nearly one hundred years, the Mandel School of Applied Social Sciences has stood at the forefront of social work education, introducing innovations in teaching, research, and practice at every step of the way, with an approach that integrates theory and practice like no other.

At the heart of the Mandel difference is experience—not just the in-depth experience of our distinguished faculty—but the experience students obtain working in the real world of social work from the time they start their education here. Mandel is unique among social work schools for its students’ paid field placements, providing invaluable work experience, and, by making the education more affordable, extending the opportunity to an even broader range of students. Students learn through the Mandel School’s teaching and by their own doing. What they discover in a classroom on a Tuesday they apply to real life at their placements on Wednesday. Graduates leave the Mandel School prepared to handle the demands of social work because they already know what they are.

Mandel students take their places alongside long-time professionals in a variety of social work fields in placements at one of the more than 350 agencies with which the Mandel School collaborates, understanding firsthand the challenges of social work and sharing in its rewards. In a broad spectrum of local and regional organizations, students develop skills in direct practice, policy analysis and development, research, management and community development.

The Mandel Center for Nonprofit Organizations (a university-wide academic center)
Founded in 1984, the Mandel Center for Nonprofit Organizations, at Case Western Reserve University, is one of the pre-eminent nonprofit management academic centers in the world. The center offers nationally recognized graduate programs focused on developing the nonprofit community and its leaders, conducts cutting-edge research on the nonprofit sector, offers executive education and other non-credit professional development programs, and sponsors a leading journal featuring nonprofit management researchers’ work. The Mandel Center is distinguished by the quality of its faculty, by the strength of its ties with nonprofit leaders, and by its close relationships with four partner schools at Case Western Reserve University—the College of Arts and Sciences, the School of Law, the Mandel School of Applied Social Sciences, and the Weatherhead School of Management. For more information, please refer to the Mandel Center for Nonprofit Organizations’ section of this publication.

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Director, Intensive Weekend Program

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(University of Washington)  
Chair, Ph.D. Program

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Rebecca W. Zirm  
Director of Recruitment, Mandel Center

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Professor (this needs proper consistent format-  
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Timothy F. Hagan, B.A.  
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Distinguished Visiting Faculty

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Ralph S. and Dorothy P. Schmitt Professor

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Assistant Professor

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Mark L. Joseph, Ph.D.  
(University of Chicago)  
Assistant Professor

Eva Kahana, Ph.D.  
(University of Chicago)  
Professor

Marjory Klein, M.S.S.A.
The Master of Science in Social Administration (M.S.S.A.) program prepares students for advanced social work practice in a variety of settings. The master’s curriculum is designed to address the wide range of skills and functions required of a professional social worker. Mandel School students are instructed on the various theories of individual and group behavior as well as community systems theory. The application of this knowledge, along with the appropriate use of practice principles and techniques, is a major educational objective.

The curriculum is divided into two levels: foundation and advanced. The foundation curriculum (21 credit hours) includes the knowledge, values, processes, and skills essential for the general practice of social work. It consists of general courses in social work methods, human development theory, social policy, research methods, and an introductory semester of field education. The advanced curriculum (39 credit hours) builds on the professional foundation and provides for advanced knowledge and practice skills in the concentration selected by the student. Concentrations include the following: aging; alcohol and other drug abuse; children, youth and families; health; mental health; and community development. School social work is available as a special emphasis.

ABILITY BASED LEARNING ENVIRONMENT (ABLE)
The M.S.S.A. program incorporates an ability-based learning environment that enables students to develop and demonstrate mastery of eight core social work abilities. Classroom courses and field education are designed to help students develop each ability and continuously assess their learning throughout the educational experience. Mastery of the abilities is demonstrated in the field practicum and documented in a cumulative learning portfolio.

• Intentionally Use Yourself: Students demonstrate an awareness of “self” and use relationships as key components in social work practice. Students can accurately assess their impact on others and plan to use their knowledge and skills to accomplish professional tasks.

• Apply Social Work Methods: Effective community-based practice integrates all other abilities. MSASS graduates are able to assess problems, weigh intervention alternatives, implement change strategies, and evaluate results. They recognize that lasting solutions to social problems arise from community strengths.

• Integrate Social Work Values and Ethics: Students demonstrate their commitment to core social work values – service, justice, dignity and worth of the individual, importance of human relationships, and integrity. They are able to manage ethical conflicts competently.

• Value a Diverse World: Students understand and appreciate a diverse world; they learn to employ culturally sensitive intervention strategies that are specifically suited to the client population.

• Think Critically: Students think critically about their practice and its knowledge base. They bring this critical perspective to the social problems and situations they encounter.

• Communicate Effectively: Students have the oral, written, and attending skills that allow
them to communicate effectively and appropriately for the audience and setting. They will make appropriate use of audiovisual and communication technologies.

- **Advocate for Social Justice**: Students are effective advocates for social change and identify advocacy as a major responsibility of the profession. Students employ a range of advocacy strategies with individuals, families, groups, and communities.

- **Succeed in the World of Work**: Mandel School graduates are life-long learners, committed to ongoing professional development and success in the world of work. They are effective team members, employ productive work habits, and exhibit leadership skills.

Mandel School faculty place a high priority on the integration of theory with practice. To facilitate this integration, field work is done concurrently with course work. Through field education, students have the opportunity to acquire new skills and apply their classroom learning in their practice setting. The school is affiliated with over 300 agencies in the Greater Cleveland area, creating a vast network of field education as well as employment opportunities. Students are required to complete over 900 clock hours of field education. The school and the affiliated agency or field setting agree on the content and conditions of field education, including the qualifications of social workers who serve as field instructors. Field placement decisions are based on educational criteria, with student interests and career objectives taken into consideration.

**CONCENTRATIONS:**
- Community and Social Development
- Direct Practice

**DIRECT PRACTICE SPECIALIZATIONS:**
- Aging
- Alcohol and Other Drug Abuse
- Children, Youth and Families
- Mental Health
- Health

Health specialization is offered only in the full-time format.

**PLAN OF INSTRUCTION FOR THE M.S.S.A. DEGREE:**

**TWO-YEAR**
The traditional full-time program is a four-semester program.

**ADVANCED STANDING**
Up to 15 hours of advanced standing may be granted to students who have completed their bachelor's degree in social work from an institution that is accredited by CSWE in the past seven years.

The Twelve-Month Advanced Standing Program is available to students with a strong academic record in their, B.S.W. program. This program follows a fall, spring, and summer pattern and is intended for the student who has clear professional goals and can manage an accelerated format of study. Students complete their degree in August.

Admission to the Twelve-Month Advanced Standing Program is open to students who have a bachelor's degree in social work (B.S.W.) from an accredited program completed within the past seven years. Grades of B or better must have been attained in all foundation social work courses.

Because of the short time frame for completing the Twelve-Month Advanced Standing Program, dual degrees, individualized curricula, and the school social work emphasis are not available in this program.

**SENIOR YEAR IN PROFESSIONAL STUDIES PROGRAM**
Undergraduate students of superior ability and achievement may be admitted to the Mandel School at the end of their junior year. This program enables qualified college seniors who are majoring in social work related fields to begin their first year of graduate study during what would normally be their last year of undergraduate work. Exceptional undergraduate students who are firmly committed to social work as a profession can earn both their undergraduate and graduate degrees in five years.

A student in the Senior Year in Professional Studies Program is permitted to substitute the first year (31 semester hours) at the Mandel School for the last year of undergraduate work. The bachelor's degree will be granted by the undergraduate college when the student has completed his or her first year at the Mandel School.

Students applying for this program must be interviewed by an admissions officer as part of the application process to explore the candidate's level of maturity, knowledge of social work, and readiness for professional education. Application for this program should be made prior to the second semester of the junior year.

To qualify for this program, students must demonstrate superior academic ability and achievement during their first three years of undergraduate study. All applicants must (a) have sufficient coursework in the social and behavioral sciences by the end of their junior year; (b) hold a cumulative grade point average of at least 3.25; have successfully completed three-quarters of the major and minor courses in there area of concentration. Acceptance into the Senior Year in Professional Studies Program is contingent upon receipt of a written statement from the dean of the applicant's undergraduate college, outlining any remaining requirements.

**Note**: This program is available to students at Case Western Reserve University, Hiram College, the College of Wooster, Baldwin Wallace College, John Carroll University and Fisk University, by joint agreement with these institutions. Interested students from other institutions are encouraged to speak with the director of admissions.

**INTENSIVE WEEKEND PROGRAM**
The school offers an opportunity for employed human service professionals to pursue a social work degree full time. Classes meet one weekend per month throughout the calendar year and students are required to attend all classes. Students complete four courses each year (six during the first year), and complete all program requirements in three years.

Courses consists of four distinct components:
- a four week preparation period that includes readings and a written assignment;
- two weekends of classes, one month apart;
- a four-week study period between class weekends, during which time additional readings and written assignments are completed;
- a final study period of approximately three weeks, during which time the final course assignment is completed and materials for the next course are received.

Note: Two four-day weekends (including Thursdays) are scheduled for January and February in the first year of the foundation program.

**PART-TIME DEGREE PROGRAM**
Students may opt to complete their degree work on a part-time basis during their first year. During the second, third, and fourth years students complete field education requirements and carry a full-time, or nearly full-time, load.
Part-time students select classes from the full-time weekday schedule. These classes meet once a week for two hours. Employed professionals may participate in this program if they can arrange a flexible work schedule.

The part-time program may be completed in three years. Students granted advanced standing may complete the program in fewer semesters. Part-time students are required to register for a minimum of six credit hours per semester. A student must complete all degree requirements in a maximum of five years.

**Special Focus and Certificate Programs**

*(available to full-time students only)*

**M.S.S.A./C.N.M. (CERTIFICATE IN NONPROFIT MANAGEMENT)**

The M.S.S.A./C.N.M. combines the Master of Science in Social Administration degree (M.S.S.A.) with the Certificate in Nonprofit Management (C.N.M.) offered by the Mandel Center for Nonprofit Organizations. It provides career preparation for students with interests in nonprofit management, social service, and the social work profession. Students may complete the C.N.M. along with one of the regular M.S.S.A. concentrations. The program consists of five Mandel Center courses as well as the Legislative and Political Processes course offered by the Mandel School. Mandel School students interested in the M.S.S.A./C.N.M. should contact their advisor or the Mandel Center for more information.

To obtain a Certificate in Nonprofit Management, students must apply directly to the Mandel Center. M.S.S.A./C.N.M. students must be admitted to each program separately and must receive both credentials simultaneously to be granted credit for specific courses taken in the other program. For more information, please contact the Mandel Center's director of recruitment at 216-368-6025 or by email at mcnoadmissions@case.edu or visit http://www.case.edu/mandelcenterr/.

**SCHOOL SOCIAL WORK**

The School Social Work program is designed to train school social workers and provide them with the competencies to practice in a variety of traditional and non-traditional primary and secondary education settings. Such competencies include assessing the needs of school children, designing and implementing interventions, and making referrals to other professionals and agencies as needed. School social workers are able to function collaboratively with other professionals and assist the school and the community in mobilizing necessary resources on behalf of children and adolescents.

The School Social Work program educates master's level social work students for practice in school settings. The program is (a) consistent with State of Ohio regulations and professional standards developed by the National Association of Social Workers, and (b) a cooperative offering between the Mandel School of Applied Social Sciences at Case Western Reserve University and the Division of Education at Baldwin-Wallace College. Students in the program complete the Master of Science in Social Administration (M.S.S.A.) degree at the Mandel School with a concentration in Children, Youth and Families. As part of the M.S.S.A. degree, students complete three education courses at Baldwin-Wallace College, a seminar on School Social Work Practice, and field practicum in an approved school social work setting. After the completion of all required field work and coursework, a student can apply to the State of Ohio to receive a license/certificate in school social work.

This program can be completed only by two-year and eighteen-month students (not twelve-month students). Intensive weekend students can also complete this program if they are able to enroll in some full-time program classes.

**LOUIS B. STOKES FELLOWSHIP PROGRAM**

This program is designed to meet the needs of educating community development professionals for the challenges of revitalizing urban neighborhoods.

**MENTAL HEALTH FELLOWS PROGRAM**

The Mandel School offers a program of study that is designed with the needs of mental health and drug and alcohol boards in mind. The Intensive Weekend Program accommodates the schedules of mental health professionals to allow them to keep their current employment while obtaining a Master of Science in Social Administration.

**DUAL DISORDERS FELLOWS PROGRAM**

This program gives employed mental health and substance abuse professionals the opportunity to enhance their education, credentials and experience by earning a master's degree while staying in their current jobs and attending classes one weekend per month. The program is also structured to provide financial support to students by forcing a partnership among the employed student, his or her employer, the local community mental health or substance abuse services board, and the Mandel School.

**International education opportunities**

Qualified students may choose to participate in number of multi-disciplinary study-tours abroad, many during spring break, which will help them to familiarize themselves with a variety of social policies of other countries, which have in the past including The Netherlands, Guatemala, China, Bangladesh and Israel, among others.

**Dual and Interdisciplinary Degree Programs**

*(available to full-time students only)*

**Dual Social Work and Law (M.S.S.A./J.D.) Program**

A dual-degree program established by the Mandel School of Applied Social Sciences and the university’s School of Law makes it possible for selected full-time students to pursue an integrated program of studies and receive the M.S.S.A. and J.D. degrees. This program allows completion of both degrees within four years rather than the normal five years. Applicants for the dual-degree program must apply to and meet the admission requirements of both professional schools.

**Dual Social Work and Master of Nonprofit Organizations (M.S.S.A./M.N.O.) Program**

This program combines the Master of Nonprofit Organizations (M.N.O.) degree with the Master of Science in Social Administration degree (M.S.S.A.). It provides career preparation for students with interests in nonprofit management, social service, and the social work profession.

Students must apply and be accepted for each degree program to qualify. Students who choose to begin their studies in the M.S.S.A. program must apply to the M.N.O. program prior to completing their first semester of M.S.S.A. courses. New students can apply to either program simultaneously or separately. Dual-degree students must receive the M.N.O. and M.S.S.A. degrees simultaneously to be granted credit for specific courses taken in the other program. For more information, please contact the Mandel Center's director of recruitment at 216-368-6025 or by email
Joint Social Work and Master's in Business Administration (M.S.S.A./M.B.A.)

The M.S.S.A./M.B.A. is designed for candidates who wish to prepare for advanced social work practice in a variety of direct practice and community and social development settings, while developing the skills to assume management responsibility within those settings. Candidates must apply separately to each program.

Joint Social Work and Master of Arts in Bioethics (M.S.S.A./M.A.)

The joint-degree program with bioethics enables students to obtain graduate preparation in bioethics, an interdisciplinary program offered in the School of Medicine, along with their social work degree.

Candidates must apply separately to the Mandel School and the Department of Bioethics of the School of Medicine. The website for the bioethics program is: http://www.case.edu/med/bioethics/masters.htm/.

Students in this joint degree program should plan on two years plus one summer of graduate study.

NON-DEGREE STUDY

Some courses may be taken on a non-degree basis with the permission of the assistant dean for academic affairs. A maximum of 12 hours earned on a non-degree basis may be counted toward requirements for the master's degree if the student is subsequently admitted as a degree candidate.

Admissions and Application Information

Admission to the master's degree program at the Mandel School of Applied Social Sciences is granted on a selective basis determined by the quality of the total application. An applicant for admission is expected to meet the following minimum requirements:

1. A bachelor's degree from an accredited college or university.
2. Evidence of capacity to succeed in graduate level social work education based on undergraduate work and any previous graduate work. Previous work must include courses in social and behavioral sciences strong enough to ensure the applicant's ability to do creditable work at the graduate level.
3. A minimum undergraduate grade-point average is 2.7. A Miller Analogies Test or Graduate Record Exam is required for applicants with less than a 2.7 grade point average. In exceptional cases, applicants who lack the required academic credentials but whose other qualifications are outstanding may be admitted on a probationary basis. Students who enter on probation may not carry more than 15 credit hours in their first semester. Probationary students must achieve at least a 3.0 grade point average in their first semester of course work (minimum of six credits) to have their probationary status removed and continue in the program. Students who enter on probation may carry no more than 13 credit hours and may not enroll in field education during their first semester.
3. Evidence of a combination of personal qualities and values that are considered essential for the professional practice of social work: strong moral character; strong analytical and verbal skills; a caring and compassionate nature; and a personal commitment to social justice, empowering individuals, and serving vulnerable and under-represented groups.
4. The school may request a personal interview or additional information about an applicant if necessary.

ADMISSION PROCEDURES

The Mandel School catalog and application materials can be secured from the Office of Student Services, Mandel School of Applied Social Sciences, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio 44106-7164 or by calling 800-863-6772 or by visiting our website at http://msass.case.edu/.

Students for full-time study are admitted in the fall semester. Applications are accepted on a rolling admissions basis but the latest application date is April 15 (July 1 for Intensive Weekend), though prospective students are strongly encouraged to apply early (December/January) for admission.

Advanced Standing

Advanced standing may be granted to students who have earned a bachelor's degree in social work within the past seven years from an institution accredited by the Council on Social Work Education. Students must have earned a grade of B or better in each social work foundation course for which advanced standing credit hours are given.

Proficiency Examinations

Students without a bachelor's degree in social work may waive the foundation courses in policy, socio-behavioral theory, and research, by passing a proficiency examination. Successful completion of the exam(s) exempts the student from the requirement to complete the course(s). Elective course(s) may be substituted in order to fulfill graduation requirements. There is no fee or penalty associated with taking the proficiency exams. However, each exam may be taken only once. Exams are offered prior to the start of fall and spring semesters. Students must make reservations to take those exams with the Mandel School Admissions Office.

Transfer

Students who are transferring to the Mandel School from another accredited graduate school of social work may apply for transfer credit for up to one full year of academic work and field education. Transfer students from social work programs must submit field work evaluations, official transcripts, and course syllabi.

In addition to the above, the following are required from those transferring from other schools of social work:

An evaluation of first-year field experience performance from the dean, field education director or faculty advisor of the school.

Transfer credit (6 hour limite) may be given for related, but non-social work, coursework completed within the past five years. Credit hours must not have been applied toward a previous graduate degree. Students must have received a grade of B or better in any course for which transfer credit is sought.

International Students

Applicants from other countries follow the regular application procedure. International students must have completed available social work training in their own countries, and have had paid experience in the social welfare field prior to entering the professional degree program. International students are required...
Tuition
In the 2009-2010 academic year, tuition for the Mandel School of Applied Social Sciences in the full-time master’s degree program (12-16 credit hours) is a flat rate of $33,000, or $1100 per credit hour.

A non-refundable tuition deposit of $100 is required of all master’s degree candidates at the time of acceptance. This deposit will be applied toward tuition for the degree program. Complete information about academic policies, procedures, and financial aid is available by contacting the Office of Student Services, Mandel School.

DOCTORAL PROGRAM

Doctor of Philosophy
The purpose of the program is the preparation of scholars, teachers, and leaders to generate new knowledge on the policies and programs of social welfare and the practice of social work. Accordingly, we emphasize the creative and evaluative skills necessary for independent inquiry. The program prepares students to be knowledgeable in the following:

- Relevant areas of the social and behavioral sciences;
- Research design, statistics, and the philosophy of science;
- Theory-building and theories of social welfare; and
- Methods for the application and transmission of knowledge in the human services.

In addition to this foundation knowledge, students develop specialized expertise in policy analysis and program planning, or social work practice theory; and in one or more substantive areas of social welfare. Effort is made to provide an educational climate in which critical analysis and creative thinking flourish. The program core emphasizes philosophical and scientific approaches to theory development, the content and boundaries of theoretical social welfare, statistics, and advanced research methodologies, and the social and behavioral science foundations underpinning social welfare programs and social work practice.

The area of specialization enables the student to apply social science theory, analytical approaches, and research tools to a social problem or issue in either social welfare policy or social work practice. Students are encouraged to focus on a substantive policy or practice area during the period of specialization. This facilitates the development of a dissertation proposal. Permeating the content of the entire program is a focus on the development and transmission of knowledge as a part of an educational process.

Students with a specific career interest in teaching, regardless of their area of specialization, are encouraged to take courses in social work education, learning theories, and teaching strategies as an integral part of the educational plan. Teaching mentorships are available.

Students can pursue special interests through individual reading and tutorial courses. In addition, regular course offerings in other departments of the university are available to students. Practical experiences on faculty-conducted research projects are made available to doctoral students.

A total of 36 credit hours of course work is required, plus 18 hours of dissertation credit. A qualifying examination, given after completion of course work, determines each student’s eligibility for degree candidacy. The degree is awarded following successful completion of the dissertation.

The school reserves the right to require additional courses, which may not be credited toward the doctoral requirements, if the faculty believes the student has insufficient knowledge in core areas of the curriculum, or to assist students in their intellectual and professional development.

Formats of the Ph.D. Program
In response to the different needs and interests of potential Ph.D. students, the Mandel School offers two formats for meeting course and degree requirements. Program requirements under both formats include taking 12 courses (36 credit hours), passing a qualifying exam, and completing a dissertation.

The Alternative Program

Structures Are:

THE FULL-TIME PROGRAM
Under this format, full-time students can complete course requirements and individualized research fellowships over two academic years.

Plan of Study: Full-Time Doctoral Program
FIRST FALL SEMESTER
- SASS 608 Philosophy of Science and Theory Building (required)
- SASS 610 Theories of Human Behavior: Macro and Micro Dimensions (required)
- SASS 613 Advanced Research Design (re-
required)

FIRST SPRING SEMESTER
• SASS 609 Theories of Social Welfare and Social Justice (required)
• SASS 614 Models of Qualitative Research (required)
• SASS 615 Social Statistics and Data Analysis (required)

SECOND FALL SEMESTER
• SASS 616 Applied Regression and General Linear Model (required)
• SASS 620 Theory and Research Base of Social Work Practice or
• SASS 621 Social Work Policy (one required)
Choose one of:
• SASS 637 or 632 or course outside of MSASS

SECOND SPRING SEMESTER
• SASS 618 Measurement Issues in Quantitative Research (required)
• SASS 630 Seminar in Social Work Education (required)
Choose one of:
• SASS 635 Methodological Issues In Quantitative Research (required)
• SASS 617 Specialization Seminar (elective)
OR
• SASS 637 Independent Study
• SASS 632 or course outside of MSASS

THIRD YEAR
The qualifying exam is taken beginning of fall semester
• 3 hours of SASS 701 In Fall
• 3 hours of SASS 701 in Spring

FELLOWSHIP COURSES
• SASS 701 Dissertation (18 credit hrs required)

Students must register each semester until the dissertation is complete. SASS 701 hours are not required during the summer semester, unless the student is defending his/her dissertation.

THE PART-TIME PROGRAM
The part-time format accommodates social work professionals who must maintain their employment commitments but wish to pursue Ph.D. study through the completion of a minimum of three courses per year. Financial assistance is available to students in this program.

ADMISSION TO DOCTORAL PROGRAM
Through the School of Graduate Studies of Case Western Reserve University, the Mandel School of Applied Social Sciences offers a Ph.D. in social welfare. To be admitted to the Ph.D. program, a candidate should have a master’s degree from an accredited school of social work or a master’s degree in a related field and demonstrate a superior record in undergraduate and graduate studies. Application to the Ph.D. program will be considered from persons with master’s degrees in allied fields with the recognition that their program will include equivalency requirements related to knowledge of social welfare. The Graduate Record Examination is required for application to the Ph.D. program. Applicants should have a score of at least 1200 on the combined Verbal and Quantitative Section of the Graduate Record Examination. A minimum grade point average of 3.0 for baccalaureate and master’s degree study is expected.

Additional materials considered in reviewing applications include the completed application form and a written statement, with the non-refundable application fee; official transcripts of all previous undergraduate and graduate courses taken for credit; and letters of recommendation. In addition, students from other countries must submit results of the Test of English as a Foreign Language (TOEFL) with a desired score of 600 or its equivalent.

For application information, please visit the program website at http://msass.case.edu/doctorate/

ACADEMIC POLICIES FOR PH.D. IN SOCIAL WELFARE

Faculty Advisors
Each doctoral student is assigned a faculty advisor to assist in the planning of his or her educational experience. At the appropriate time, a dissertation advisor is appointed after consultation with the student.

Qualifying Examination
The qualifying examination for doctoral candidates is taken after completion of coursework. The exam is intended to test the student’s ability to critically analyze and integrate knowledge.

Admission to Candidacy
Students are admitted to candidacy for the Ph.D. degree upon the successful completion of the qualifying examination. To be admitted to candidacy, the candidate also must have maintained an average of 3.0 and received no more than one course grade of C or lower. To remain in the program, students must maintain a minimum of a cumulative 3.0 average and receive no more than one grade of C or lower.

Dissertation Requirements
Each candidate for the Ph.D. degree must submit a written dissertation as evidence of his or her ability to conduct independent research at an advanced level. The dissertation must present a significant contribution to knowledge in the student’s field, and at least a portion of the content must be suitable for publication in a reputable professional journal or as a book or monograph.

The dissertation prospectus must be completed and accepted within two calendar years after the student has been admitted to candidacy, and the dissertation must be completed and accepted within five calendar years after admission to candidacy. It is to the student’s advantage to make steady progress in his or her research and aim for early completion of the dissertation.

Once a student registers for SASS 701 Dissertation, he or she must continue to register each succeeding regular semester (fall and spring) until the dissertation is complete unless granted a leave of absence. The minimum requirement for the dissertation is 18 hours.

All requirements for the Ph.D. degree must be completed within a period of five consecutive calendar years after a student is admitted to candidacy, including periods of leaves of absence.

Doctoral Program Financial Aid
Financial aid is available to admitted students in the form of tuition assistance and research and training fellowships.

CONTINUING EDUCATION PROGRAM
Opportunities to increase practical knowledge and skills are offered to human services practitioners in a variety of workshops, institutes, and cosponsored events. Every effort is made to provide practitioners with information that addresses (1) current social issues and practi-
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The Mandel School is approved by the State of Ohio Counselor and Social Worker and Marriage and Family Therapist Board to provide continuing professional education to social workers and counselors. Courses offered in the MSASS Continuing Education Program usually meet license renewal requirements for these and other professionals i.e., psychologists, nurses, nursing home administrators and chemical dependency counselors.

General inquiries should be sent to: Director, Continuing Education Program, Mandel School of Applied Social Sciences, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio 44106-7164. Brochures describing these programs are issued regularly, and individuals are placed on a mailing list on request.

COURSE DESCRIPTIONS (SASS)

Course Descriptions

SASS 350. Seminars in Applied Social Sciences (3)
Survey of special subject areas. Topics vary in response to faculty and student interests. Small group discussion. Prerequisite depends on content.

SASS 390. Independent Study for Undergraduates (1 - 3)
Individual study in Applied Social Sciences involving specific programs of reading, research, and special projects. Requires prior approval of faculty member directing the project. Recommended preparation: 12 hours of social science courses; approval of MSASS associate dean.

SASS 391. Seminar on Community Needs and Services (3)
The course is directed towards students interested in exploring the relationship between community needs and service delivery. The course will have both a classroom and experiential community component. The goal of the course is to provide students an opportunity to experience first-hand the application of theoretical knowledge to community needs.

SASS 426. Research Methods in Social Work (3)
This course provides an overview of the basic concepts used in the conduct of scientific inquiry and the tools of research methodology. It introduces students to the issues involved in the design, implementation, analysis and utilization of social research. Students are encouraged to focus on a practice-related research problem in their individual or group research projects, as well as to focus on research issues relevant to their specialization, field of practice, or field of practicum setting. Students are alerted to the risks of cultural bias in research throughout the course through examples and scientific readings.

SASS 440. Human Development I: Child and Adolescent (3)
This course offers an overview of normal individual development throughout the life cycle. Psychosocial theory, learning theories, and social role theory constitute the theoretical base for this foundation course. Developmentally determined objectives and tasks for every life stage are examined in the context of biological, genetic, psychological, familial, and sociocultural factors. Special emphasis is placed on the impact of gender, health, and minority status, and on community institutions of human development. This course supports the foundation social work methods course by introducing substantive content on human development as a framework for assessment, prevention, and intervention with psychosocial problems. Curricularly related to the advanced sociobehavioral courses on human development and developmental dysfunction, this course provides a basic understanding of normal human development, which can serve as a contextual framework for developmental deviations from the norm.

SASS 441. Human Development II: Adult (3)
This course builds on SASS 440 Human Development I (child & adolescent) by compassing the general themes of feeling (emotion), thinking (cognition), and acting (behavior) with adult emotional, cognitive, and behavioral development. Students will understand the differences and similarities between earlier (child and adolescent) and later (adult, including older adult) emotional, cognitive, and behavioral development by examining, across the life-span, the life-span, the idea, the idea/concept of: (1) adult development as gains/losses, (2) adult development as plasticity and variation (i.e. development can take many forms and can change), (3) adult development as risks, conflicts, protective factors, and resilience and (4) adult development as context (e.g. family, society, gender culture, ethnicity, social class, discrimination, sexual orientation, and socio-historical (i.e., cohort contexts). Prereq: SASS 440.

SASS 470. Social Policy (3)
This course provides basic perspectives on social policies related to poverty, health, aging, mental health, substance abuse, and discrimination. An analytical framework is used to systematically identify, define, and analyze social problems and policies. The course also introduces the student to social planning and service delivery.

SASS 477. Direct Practice Foundation Methods Skills (3)
The goal of this course is to develop culturally competent social work generalist practitioners who are armed with the knowledge and skills necessary to practice ethically with individuals and families in diverse social work practice settings. The course introduces major social work theories (i.e., systems-ecological theory) and intervention approaches (i.e., problem-solving). Understanding and practicing the skills necessary to carry out generalist practice will be a major focus on both lectures and skills lab.

SASS 478. Macro and Policy Practice Skills (3)
This course focuses on the development and application of practice skills in work with task groups, communities, and social policy institutions. It includes both didactic and experiential teaching and learning. The course is built on first semester foundation learning, particularly in the areas of social policy, diversity, discrimination, and oppression, and the direct practice skills lab. It will also draw on knowledge taught in the second semester course on theories of groups, organizations, and communities. Finally, there will be interaction with the field seminar and the field practicum. Prereq: SASS 477.

SASS 484. Theories of Oppression and Social Justice (3)
This course provides students with a basis for developing their ability to value a diverse world and to understand how discrimination and oppression operate to limit the life opportunities of members of minority and disenfranchised groups. Students will have the opportunity to develop and enhance their personal and professional awareness of their own cultural identity and to use this as a basis for developing their competence to work with individuals and groups different from themselves. Selected theoretical perspectives
will provide a descriptive and explanatory framework for critically analyzing the manifestation of discrimination and oppression and their impact on the affected populations. Social work’s response to discrimination and oppression within the profession and in society at large will also be examined.

SASS 495. Field Education Seminar (1)
This seminar prepares students for entry into field education. The course introduces students to a number of topics that are considered basic to beginning the social work field practicum.

SASS 500. Special Topics in Applied Social Sciences (1 - 6)

SASS 505. Adoption: Practice and Policy (3)
This course covers the concepts, knowledge, skills, and policies associated with contemporary adoption practice. The practice method reflects a triad perspective, meaning that adoption is examined from the viewpoints of birth parents, adoptees, and adoptive parents. For each topic area, social work roles, activities, tasks, and skills are explored along with policy issues. Exemplars and case studies are presented for illustration purposes. Consideration of triad needs at different life cycle stages are presented. The issues of ethnically competent adoption practice are emphasized throughout the course in each content area.

SASS 510. Health Disparities (3)
This course aims to provide theoretical and application tools for students from many disciplinary backgrounds to conduct research and develop interventions to reduce health disparities. The course will be situated contextually within the historical record of the United States, reviewing social, political, economic, cultural, legal, and ethical theories related to disparities in general, with a central focus on health disparities. Several frameworks regarding health disparities will be used for investigating and discussing the empirical evidence on disparities among other subgroups (e.g., the poor, women, uninsured, disabled, and non-English speaking populations) will also be included and discussed. Students will be expected to develop a research proposal (observational, clinical, and/or intervention) rooted in their disciplinary background that will incorporate materials from the various perspectives presented throughout the course, with the objective of developing and reinforcing a more comprehensive approach to current practices within their fields. Offered as CRSP 510, EPBI 510, MPH 510, NURS 510, and SASS 510.

SASS 515. Family Caregiving (3)
The purpose of this interdisciplinary graduate-level seminar is to explore the theoretical research, policy, and practice issues related to informal caregiving of the elderly. Topics will include the historical and cultural context of family caregiving, theoretical paradigms (i.e., adult development, stress and coping), characteristics of caregivers (i.e., gender, relationship, race, ethnicity, employment status, geographical setting), characteristics of the elderly care-receiver (i.e., type of cognitive and physical impairments), ethics, physical and mental health outcomes, service delivery issues, institutionalization, and bereavement. Through readings, discussions, guest lectures, and paper presentations, students will learn about the complexities of informal caregiving of the elderly from a range of disciplinary perspectives in order to improve assessment and practice skills in a variety of settings. Students are encouraged to focus on issues relevant to their discipline, specialization, or field of practice for their seminar papers.

SASS 517. Family System Interventions (3)
This course covers the knowledge, concepts, and skills associated with working families. The practice method will reflect a family systems approach, integrating theories and approaches within a systemic perspective. It will build practice skills in assessing, interviewing, and intervening with families and emphasize a strength-based perspective on intervention with families. Considerations of family issues at different developmental stages will be presented. The issue of ethnically competent and community-based social work practice with families will be stressed throughout the course for each content area. Prereq: SASS 477 or SASS 400TR.

SASS 532. Analytic Tools for Social Community Development (3)
Students will be able to use quantitative and qualitative methods for gathering, analyzing and interpreting information that can support community and social development. Students will develop the skills to apply geographic information system (GIS) tools, community survey methods, ethnographic methods, social indicators and demographic analysis. Students will also be introduced to web tools for community organizing and development. Prereq: SASS 426 or SRCH 426 or SASS 400TR.

SASS 534. Community and Social Development Perspectives (3)
An overview of the community and social development field. This course covers the history of community and social development in the U.S. and abroad, theoretical and empirical underpinnings of this work, major approaches, institutions and public policy related to community and social development. Focus will be placed on understanding and analyzing community power, and the relationship between community and regional power structures. The history of institutional involvement in community and social development (e.g., World Bank, United Nations, Banking Industry, Intermediaries, etc.) will be traced as well as the policies that affect community and social development.

SASS 537. Medical Aspects of Disabilities (3)
The focus is on the study of children with disabilities and chronic health conditions. Related issues of development, diagnosis, treatment, and family concerns are included. Continuum of care from hospital to home considered. Involvement of the family as a member of the treatment and care team is emphasized. Context of treatment is considered from a multidisciplinary team approach.

SASS 538. Global Aging (3)
A silent revolution is taking place as we enter the 21st century. The “globe” is graying! Population aging is a worldwide phenomenon. This rapidly changing demographic environment has important implications for social policy and the quality of life. The Global Aging Course examines the historical, economic, social, and political dimensions of the aging revolution. It then focuses on cross-national comparisons of policies and programs for older persons. Finally, global issues and action identified by the United Nations International Plan of Action on Aging are discussed.

SASS 539. Early Intervention: Theories and Practice (3)
This course both describes the characteristics of young children with disabilities and examines the intervention models and practices that are used to address the developmental and social-emotional needs of these children. The course describes the legislative and philosophical foundations for contemporary early intervention practice. It discusses the meaning of evidence based practice and examines contemporary early intervention practices from this perspective. The readings and assignments for this course have been designed to reflect the course objectives.

SASS 547. Problem Identification, Screening and Assessment/Diagnosis (3)
This course will provide a bio-psycho-social approach to identification, screening, assess-
ment and diagnoses of common psychosocial problems/dysfunctions experienced clients. This course introduces the student to the etiology, recognition and diagnoses of these problems in the context of social work practice. Through use of a competency-based model, students will be introduced to techniques used to screen, assess and diagnose problems such as serious mental illness, suicidality, depression and anxiety, substance abuse, child abuse, elder abuse, and exposure trauma. Students will also become familiar with the use of the DSM IV TR in providing axis I diagnostic formulations. A skills-based approach will be used in presenting students with specific screening, assessment and diagnostic protocols. This course is designed to incorporate a range of issues associated with stages across the lifespan from childhood to late life. Prereq: SASS 477 or SASS 400 TR.

**SASS 549. Theory/Practice Approaches in Direct Practice Social Work (3)**

This required, three credit course introduces selected theories and practice approaches commonly used in social work with individuals, families and groups. The course is designed to provide students with knowledge of theoretical explanations and practice frameworks commonly used in direct social work practice. The course also encourages students to apply critical thinking skills to theory and its practical applications. Case presentations, class discussions and assignments will require students to apply various theoretical perspectives to common problems and issues in social work practice. The course will highlight the use of professional social work values and attention to human development issues, diversity and cultural perspectives as they apply in each theory or framework. Prereq: SASS 477 or SASS 400 TR.

**SASS 563. Resources for Community And Social Development (3)**

Students will be able to understand and utilize the methods to identify, garner, and effective-ly use resources that promote community and social development. These methods can be applied to expanding resources for individuals, families, communities, and society, as well as to generate resources for organizations. While primarily focusing on financial resources, the course will also consider the important means of positioning an agency or organization to attract and receive resources and collaborate with others to put those resources to their most effective use. The skills that students practice in the course will include fund raising, grant development, financing, strategic partner-

**SASS 564. Social Work Practice in Alcohol and Other Drug Abuse (3)**

SASS 564 is an advanced direct practice concentration course focused upon knowledge, skills and values important for social work practice with people who abuse and/or are dependent on alcohol and other drugs. The content of SASS 564 directly builds upon the foundation direct practice course (SASS 477) and the required advanced course in screening and assessment (SASS 576). SASS 564 takes a bio-psycho-social approach to prevention, assessment and treatment of alcohol and other drug abuse and dependency (AODA) problems. This course introduces the student to the etiology and treatment of alcohol and other drug abuse in the context of social work practice. The historical background and the development of the evidence base of alcohol and other drug treatment interventions, self-help groups, and conceptual models of addiction will be presented. Students will explore their own attitudes and values toward AODA problems and how these affect treatment outcome as well as commonly used prevention and treatment approaches in social work with people who abuse and/or are dependent upon alcohol and other drugs. The course will use case materials to illustrate similarities and differences among various populations including minority/ethnic identity groups. Prereq: SASS 477 or SASS 400 TR.

**SASS 565. Community-Based Practice with Children and Families (3)**

This course covers knowledge, concepts, and tools associated with contemporary child welfare practice. The practice method reflects a family centered or family based approach, meaning that the welfare of children cannot be considered separately from the families of which they are a part. For each topic area, major social work roles, activities, tasks and skills are explored along with problems and issues in implementation. Program exemplars and case studies are presented for illustration purposes and practical application of the skills and techniques presented. Child welfare services that promote safety, permanency, and child well-being are presented. Consideration of family needs at different developmental stages of the child and family life cycle are also presented. The issue of culturally competent community based social work practice is stressed throughout the course for each content area. While this is primarily a methods course, program delivery and policy issues are discussed as they relate to the socio-political and organizational contexts of practice. Prereq: SASS 477 or SASS 400 TR.

**SASS 567. CSD Practice I: Strategies for Assessing, Building and Organizing (3)**

This course covers the frameworks and models in community assessment, community building and community organizing with a focus on the social processes in community development in the United States and internationally. Students will participate in a comparative analysis of models and learn specific skills used in community organizations and development practice, such as strategic planning, participatory action research, consciousness raising, and direct action. Through real world experience and case studies students will develop skills in neighborhood assessment, civic engagement, empowerment, leadership development, group work, relationship building, social capital formation, conflict resolution, democratic process, social policy analysis and change, and other methods. The course will provide specific applications of these models in relation to the dynamics of diversity and social justice.

**SASS 569. CSD Practice II: Strategy for Designing and Implementing Community (3)**

Students will learn about the design and implementation of community development in the U.S. and internationally. Content will include neighborhood revitalization, affordable housing, workforce development, business development, cooperatives, micro-enterprise, and other models of development that originated internationally and have been adapted in the United States. Attention will be given to globalization and the cultural and economic context—whether in disadvantaged communities in the U.S. or in the developing world—and to the skills that foster cultural competence. Students will practice the skills necessary for mobilizing human capital, designing community and social change, revitalizing neighborhoods, promoting productive employment, and affecting social policy. Students will learn to apply these change strategies in ways that promote sustainable development and social justice in both this country and around the world. Prereq: SASS 567
SASS 574. Legal Issues in Social Work (3)
This course surveys the legal system as it affects social work, either direct service practice or in the development of human service policies and programs. Students are exposed to the basic trial court procedures and have the opportunity to develop necessary skills to testify. A paper is required in which the student analyzes and integrates the legal and social work issues on a proposed topic of interest.

SASS 575. Travel and Study Seminar (3)
This course acquaints the student with the socio-political factors that influence the development of social welfare systems in a selected country and the impact of these systems on the development of social welfare systems in a selected country and the impact of these systems on the development and functioning of individuals, families, groups, or communities. The role of the emerging social work profession in social change is explored via the social welfare system. Topics focus on the health care, mental health, aging, child, and/or educational systems and are oriented towards direct practice, management, or community development.

SASS 576. Integrative Seminar in Alcohol and Other Drug Abuse Treatment (3)
This course is an advanced level course in the Alcohol and Other Drug Abuse Specialization that provides opportunities for students to increase their knowledge of topics in the areas of assessment, diagnosis and treatment of alcohol and other drug disorders. The seminar builds upon course material in Foundation Methods (477) and in the advanced methods course (SASS 549 and SASS 564). The seminar is intended to help students understand the evidence base for the treatment of substance use disorders and to explore selected areas of social work practice in intervention in the context of that evidence. Community applications of theory and techniques are stressed. The integrative Seminar in AODA Treatment uses a seminar format and provides students the opportunity to interact with treatment professionals from various treatment and practice settings. The seminar format also facilitates individual learning: each student selects his or her own topic to pursue in depth. Each student is responsible for leading a minimum of one seminar presentation. Each student will select the topic for the seminar in consultation with the instructor. Coreq: SASS 477 and SSWM 564 or SASS 564.

SASS 580. Social Work Practice in Mental Health: Children and Adolescents (3)
This advanced methods course builds on the content from required foundation social work methods, policy and human development courses including Direct Practice Methods and Skills, Mental Health Policy and Service Delivery. This course complements the content of advanced methods courses including Social Work with People Who Have Chronic Mental Illness, Social Work in Child Abuse and Family Violence, and Interventions in Alcohol and Other Drug Abuse. This course develops biopsychosocial knowledge and intervention techniques related to professional settings specializing in child and adolescent mental health: hospitals, child guidance agencies, family service agencies, mental health centers, and residential treatment centers. Students learn to use development and clinical theory to guide interventions while, maximizing individual strengths, social work treatment centers. Students learn to use development and clinical theory to guide interventions while, maximizing individual strengths, social work values and ethics, and empowerment. Social and economic risk factors, such as poverty, discrimination, and oppression, are considered in the intervention process and in the utilization of mental health services. In addition, students learn to think critically about the myriad ways cultural diversity influences parenting, child and adolescent norms and expectations. Students utilize assessment skills, coupled with knowledge of development and clinical theory to explore clinical case studies. Prereq: SASS 440 and SASS 477 or SASS 400-TR.

SASS 581. Social Work Practice with Older Adults (3)
This course is an advanced methods course that builds on the knowledge gained in Foundation Methods. The content of SASS 581 directly builds upon the foundation direct practice course (SASS 477) and the required advanced course in screening and assessment (SASS 576). It is also a required course in the Aging Specialization for the MSSA. The course will focus on the persistent principles and emerging emphases in direct practice with older adults and their families. Students will be asked to develop a model of practice based on knowledge of this unique population, social work values, and practice concepts. The course includes special issues in assessment, strengths-base case management, and intervention approaches known to be effective with emotional disorders in older adults. Prereq: SASS 477 or SASS 400-TR.

SASS 583. Social Work Practice in Mental Health Adults (3)
This advanced methods course builds on the content from required foundation social work methods, policy, and advanced sociobehavioral theory courses including Direct Practice Methods and Skills, Mental Health Policy and Service Delivery, Advanced Child and Adolescent Development and Dysfunction, and Adult Psychopathology. This course complements the content of advanced methods courses including Social Work with People Who Have Chronic Mental Illness, Social Work in Child Abuse and Family Violence, and Interventions in Alcohol and Other Drug Abuse. This course develops biopsychosocial knowledge and intervention techniques related to professional settings specializing in child and adolescent mental health: hospitals, child guidance agencies, family service agencies, mental health centers, and residential treatment centers. Students learn to use development and clinical theory to guide interventions while, maximizing individual strengths, social work values and ethics, and empowerment. Social and economic risk factors, such as poverty, discrimination, and oppression, are considered in the intervention process and in the utilization of mental health services. In addition, students learn to think critically about the myriad ways cultural diversity influences parenting, child and adolescent norms and expectations. Students utilize assessment skills, coupled with knowledge of development and clinical theory to explore clinical case studies. Prereq: SASS 477 or SASS 400-TR.

SASS 584. Integrative Seminar in Mental Health: Children and Adolescents (3)
Integrative Seminar in Mental Health: Children and Adolescents is an advanced level course, a capstone course in the Mental Health Child and Adolescent Specialization, that provides opportunities for students to increase their knowledge of assessment, diagnosis and treatment. This course builds on the course material in SASS 580, SASS 477, SASS 549, and SASS 576. The seminar is intended to help students integrate theory and practice, especially in the context of public mental health and community-based, social service practice. The integrative Seminar in Social Work Practice with Children and Adolescents uses a seminar format facilitates individual learning and promotes a learning-to practice, reflective approach. The seminar assumes there are numerous evidenced-based models and practices and focuses student learning on the role of the professional use of self in the implementation of theory, technique, model, or intervention.

SASS 586. Ethical Issues in Social Work Practice (3)
The main focus of the seminar is to relate
ethical principles to direct practice. Through lecture, discussion, group projects, and case examples, students gain a deeper understanding of ethical issues related to confidentiality, justice, client autonomy, whistleblowing, and other areas of great importance to social work practice today.

SASS 587. Integrative Seminar in Mental Health: Adults (3)
The Integrative Seminar in Social Work Practice with Adults is an advanced level course, a capstone course in the Mental Health Adult Specialization, that provides opportunities for students to increase their knowledge of assessment, diagnosis and treatment. This course builds on course material in SASS 583, SASS 477, and SASS 576. The seminar is intended to help students integrate theory and practice, especially in the context of public mental health and community-based, social service practice. The Integrative Seminar in Social Work Practice with Adults uses a seminar format and provides students the opportunity to interact with professionals, from various treatment and practice settings. The seminar format facilitates individual learning and promotes a learning to practice, reflective approach. The seminar assumes there are numerous evidence-based models and practices and focuses student learning on the role of the professional use of self in the implementation of theory, technique, model, or intervention.

SASS 589. Social Work in Health: Chronic Illness (3)
This course is an interest-focused seminar, which consists of the instructor's didactic presentations and students' individual presentations. The instructor addresses the unique features of practice in healthcare settings within a community-based context perspective. Various social work interventions appropriate for use in healthcare are explored. Additional content focuses on developmentally determined issues for chronically ill children, adolescents, young adults, middle-aged adults, and older adults, including sensitivity to issues of diversity in practice populations. Students select one chronic illness for intensive study. The chronic illness must be an organically-based disease process, not a mental illness or an addiction. Prereq: SASS 477 or SASS 400TR.

SASS 590. Field Practice (1 - 12)
SASS 594. Independent Study Abroad (1 - 12)
(Credit as arranged.)
SASS 598. Individual Reading (1 - 12)
Special written permission needed. See MSASS registrar.

SASS 601. Field Education I (2)
The overall goal of this course is to provide graduate level social work students with field related opportunities to develop foundation level competencies in the eight abilities by helping students apply knowledge of social work theory, skills, values and ethics acquired in the classroom in an agency setting. These collective experiences provide students with a forum to develop social work skills, integrate and operationalize the values and ethics inherent in professional practice, and confront social injustice as self-reflective, competent developing practitioners. The field instructor is based at the social service setting and provides the direct instruction of the student. The faculty advisor, who is based at the Mandel School, serves as a link between all parties, interprets the requirements and standards of the school, and participates and consults in the design of the student's learning experience. The field instructor assigns tasks to the student according to the requirements of the Mandel School and the educational and experiential level of the student. Student, field instructor, and faculty field advisor all participate in various ways in the evaluation of the student's work; the faculty advisor is responsible for assigning the grade.

SASS 602. Field Education II (3)
This course is designed to be taken by entering Advanced Standing students in the first semester of their master's program and by Foundation level social work students in the second semester of their master's program. It consists of a field practicum and participation in professional development opportunities. For students entering the program with advanced standing, there is an additional requirement of four logs and an integrative assignment, and periodic meetings with a field faculty advisor in addition to the field conference. The overall goal of this course is to provide graduate level social work students with field related opportunities to continue to develop foundation level competencies in the eight abilities by helping students apply knowledge of social work theory, skills, values and ethics acquired in the classroom in an agency setting. The periodic meetings with the field faculty advisor are designed to provide students with an opportunity to integrate classroom and field learning. These collective experiences provide students with a forum to develop social work skills, integrate and operationalize the values and ethics inherent in professional practice, and confront social injustice as self-reflective, competent, developing practitioners. Students spend 336 hours in field and professional development in SASS 603. Prereq: SASS 602 or equivalent.

SASS 603. Field Education III (3)
The overall goal of this course is to provide graduate level social work students with field related opportunities to continue to develop advanced level competencies in their area of concentration in the eight abilities by helping students apply knowledge of social work theory, skills, values and ethics acquired in the classroom in an agency setting. The periodic meetings with the field faculty advisor are designed to provide students with an opportunity to integrate classroom and field learning. These collective experiences provide students with a forum to develop social work skills, integrate and operationalize the values and ethics inherent in professional practice, and confront social injustice as self-reflective, competent, developing practitioners. Students spend 336 hours in field and professional development in SASS 603. Prereq: SASS 601 or SASS 400TR.

SASS 604. Field Education IV (3)
This course is designed to be taken by students in their advanced course of study. It consists of a field practicum and participation in professional development opportunities. The overall goal of this course is to provide graduate level social work students with field related opportunities to continue to develop advanced level competencies in their area of concentration in the eight abilities by helping students apply knowledge of social work theory, skills, values and ethics acquired in the classroom in an agency setting. The periodic meetings with the field faculty advisor are designed to provide students with an opportunity to integrate classroom and field learning. These collective experiences provide students with a forum to develop social work skills, integrate and operationalize the values and ethics inherent in professional practice, and confront social injustice as self-reflective, competent, developing practitioners. Students spend 336 hours in field and professional development in SASS 604. Prereq: SASS 603 or equivalent.

SASS 608. Philosophy of Science and Theory Building (3)
This is a required foundation course. The nature of theory is examined. Inductive and deductive methods for knowledge building are reviewed. Course content draws from philoso-
phy of science as well as empirical and phenomenological research.

SASS 609. Theories of Social Welfare and Social Justice (3)
This is a foundation course required for all students. Theories of social welfare and social justice are examined. Course content draws from moral philosophy, economics, political science, cultural anthropology, sociology, history, psychology, and social welfare theory and provides students with a broad orientation to the field of theoretical social welfare.

SASS 610. Theories of Human Behavior: Macro and Micro Dimensions (3)
This course deals with labeling, socialization, ecological, structural-functional, and conflict theories as macro-level theories. This course ends with a review of cultural, social reproduction, and postmodern orientations.

SASS 613. Advanced Research Design (3)
This foundation course in research methods is required of all students. It is a prerequisite to the quantitative and qualitative courses. Research designs and methods relevant to social welfare planning, policy development, practice and administration are examined.

SASS 614. Models of Qualitative Research (3)
This required course introduces the social scientific paradigms for qualitative research and then explores varying qualitative research models, including ethnography, grounded theory and life history methods. Prereq: SASS 608, SASS 613, and SASS 618.

SASS 615. Social Statistics and Data Analysis (3)
This foundation course (or its equivalent) is required of all students. Content includes univariate, bivariate and inferential statistics, and the use of electronic data processing technology to manage and analyze data. Prereq: SASS 613.

SASS 616. Applied Regression and the General Linear Model (3)
This is the second required course in the research methods sequence for MSASS doctoral students. At the end of this course, students will be able to apply ordinary least squares regression and logistic regression in the analysis of social science data. They will learn to formulate research questions and hypotheses, specify statistical models, carry out the appropriate analyses, interpret their findings, and communicate their results clearly and effectively. Prereq: SASS 615 or equivalent approved by instructor.

SASS 617. Specialization Seminar (3)
This course focuses on problem definitions and research issues related to specialized populations, fields of service and practice roles. The issues selected as the focus are based on faculty and student interests. Prereq: SASS 614 or SASS 618.

SASS 618. Measurement Issues in Quantitative Research (3)
This course covers the operationalization of social science concepts and development of methods for their measurement. Issues covered include index and scale construction, validity, reliability, questionnaire design, factor analysis, measurement error, and missing data. Prereq: SASS 615 and SASS 616.

SASS 620. Theory and Research Base of Social Work Practice (3)
This course provides a critical overview of the major theories and the body of research informing contemporary social work practice. Theories will include the foundational, such as psychodynamic, ego-psychological, ecological and systems, along with trans-theoretical and post-modern theories. The course will integrate a discussion of the history of scientific inquiry in social work, particularly focusing on practice or intervention studies, systematic reviews and meta-analyses. Criteria for evaluating individual studies and the evidence base in specific practice areas will be included, along with material on the current state of Evidence-Based Practice. Recommended preparation: SASS 610.

SASS 621. Social Welfare Policy (3)
This course focuses on the critical review and application of policy analysis frameworks related to social welfare policy. The conceptual, historical, ideological, and political foundations contributing to the development, formulation, implementation, and monitoring and evaluation of social welfare policies will be critiqued. Social welfare policies intended to ameliorate social ills (e.g., poverty, education, housing) will be analyzed using policy analysis frameworks in a critical and comparative fashion. Policy alternatives to respond to current and future social problems will be critically discussed for feasibility, viability and economic effects. Recommended preparation: SASS 610.

SASS 630. Seminar on Social Work Education (3)
This seminar examines the structure and content of social work education within the context of higher education in American society. Emphasis is placed on curriculum design and course development. The course also is designed to help students develop a strategic approach to teaching based on learning theory. Finally, attention is given to current issues and future directions for social work education.

SASS 632. Research Project (3)
This course provides students with the opportunity to work with specific faculty engaged in research studies either on an individual or group basis. Prereq: 614 and SASS 615.

SASS 635. Methodological Issues in Qualitative Research (3)
This course builds on SASS 614, Models of Qualitative Research. It focuses on the application of specific qualitative data-collection methods, data-analytic approaches, and strategies for representing findings from qualitative investigations. Prereq: SASS 614.

SASS 637. Individual Reading (1 - 18)
This is an individual reading course permitting students to select areas of interest and pursue these interests with specific faculty.

SASS 701. Dissertation Ph.D. (1 - 18)
This course is intended for students who have passed the qualifying examination and are actively working on their dissertation. Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

COURSE DESCRIPTIONS (SPPP)

SPPP 500. Special Topics in Social Work Policy (3)
This seminar course is intended for students who are interested in exploring advanced topics in social policy.

SPPP 502. Alcohol and Other Drug Abuse Policy and Service Delivery (3)
This course explores selected current alcohol and other drug abuse (AODA) problems using a problem analysis framework. Emphasis is placed on current and past AODA problem definitions as they affect policy and program development. Conceptualization of the problems resulting from AODA patterns of use and abuse, causation theories, the impact of cultural and social diversity as well as discrimination upon all client systems, and the role of local and national institutions which advocate for this population group are reviewed. Prereq: SASS 470 or SASS 400TR.

SPPP 510. Mental Health Policy and Service Delivery (3)
This course is designed for students preparing for careers as social workers in the mental health field with an understanding of mental health policy and service delivery at the federal, state, and local levels. Through readings,
lectures, discussion, and written assignments, the course will aid students in developing a macro-level perspective of mental health policies and programs. Prereq: SASS 470 or SASS 400TR.

SPPP 511. Issues in Health Policy and Service Delivery (3)
This course examines health care policy issues and options, and highlights the development of health care policy in the U.S., the influence of health policy development, and the role of social work. It also examines the problems, policy, and program issues in the subsidy, financing, reorganization, and regulatory capacity of health policy. National, state, and local issues will be stressed. The course is for students in the health concentration but also welcomes students from other areas. Prereq: SASS 470 or SASS 400TR.

SPPP 512. Legislative and Political Process (3)
This course focuses on how to deal effectively with legislators, their staff, and legislative systems. The roles of money and information in legislative and political systems are examined. The process through which a bill moves to become law is explored, including critical points of intervention in that process. Lobbying legislators, including presentation of testimony and use of coalitions, is featured. Prereq: SASS 470 or SASS 400TR.

SPPP 513. Aging Policy and Service Delivery (3)
This course reviews current income, health, and social service policies for older Americans. It also investigates patterns and levels of care for the elderly. Trends and issues in policies and programs for seniors are analyzed in the context of the dimensions and differential characteristics of the aging population in the country. Some cross-national comparisons of services for the elderly are included in this analysis. Prereq: SASS 470 or SASS 400TR.

SPPP 520. Homelessness Policy and Service Delivery (3)
This course provides an understanding of homelessness and its incidence and prevalence, its origins, both historical and social, its consequences, and policy-based strategies for its prevention. The course investigates the impact of homelessness on single individuals, families with children, minorities, and vulnerable populations such as the mentally ill and alcoholics. Students, organized into a task force, examine a range of professional and community-based responses to the problem. The task force method enables students to assess the effects of public policy on homeless people, critique the effectiveness and adequacy of local shelter and service programs, and propose community-based strategies to prevent, stop, and better homelessness. Prereq: SASS 470 or SASS 400TR.

SPPP 525. AIDS Seminar (3)
This course is designed to provide an understanding of HIV/AIDS. The nature and prevalence of the disease, including its impact upon vulnerable populations such as children and youth, women, gay and lesbian populations, people of color, prisoners, IV drug users, and street people are examined. The course focuses on public policies, programs, and service delivery for HIV/AIDS at local, state, and national levels. Topics include the policy-making role of advocacy groups, the function of AIDS service organizations, and the design of educational and preventive programs. Prereq: SASS 470 or SASS 400TR.

SPPP 529. Child and Family Policy and Service Delivery (3)
This course focuses on major federal legislation impacting children, youth, and families, examined in the context of community based social work policy/practice. It builds upon the foundation course in social welfare policy and enables students to use an advocacy approach to provide policy-informed services and to participate in policy and implementation and change. Prereq: SASS 470 or SASS 400TR.

COURSE DESCRIPTIONS (SRCH)

SRCH 530. Practice Evaluation (3)
This advanced course prepares direct practice students to examine their own practice with individuals, families, and groups. Attention is given to basic principles of measurement and selection of appropriate measurement instruments for use in direct practice settings. The course is intended to provide students with the technical skills necessary to investigate the components of social work practice and contribute to an empirically validated social work knowledge base. The student is asked to determine the efficacy of his/her practice intervention in field placement by using a suitable design and method. A hands-on project is required using clinical experience from field practice. Prereq: SASS 426 and SRCH 426 or SASS 400-TR.

SRCH 536. Individual Research Practicum (3)
With instructor and research sequence chair approval, an individual program of supervised research experience may be undertaken. This course allows the student to tailor a program of applied research to a specific practice issue or program. Prereq: SASS 426.

COURSE DESCRIPTIONS (SSBT)

SSBT 500. Special Topics in Sociobehavioral Theory (1-3)
This seminar is intended for students who are interested in exploring advanced topics of current interest in sociobehavioral theory.

SSBT 502. Infant and Toddler Development (3)
In this course, students will focus on that segment of the human life span called infancy and toddlerhood, a period of development from conception to age three years. Students will be introduced to the major theories of development and will integrate theory and research as they relate to children’s physical and motor development, perception, intelligence, language and communication development, and social and emotional development. The impact of the family and sociocultural contexts that affect development will be discussed. Discussion, case studies, and observations will be used to facilitate learning. Prereq: SASS 440 or SASS 400TR.

SSBT 527. The Theory and Practice of Leadership (3)
This course assists students preparing for management and leadership roles in social service organizations to understand theories of leadership and translate them into effective leadership practices. The class explores leadership definitions, tasks and responsibilities, and the development of leadership capabilities. Students also examine their personal values, beliefs, skills, and understanding of ethical principles underlying leadership. Prereq: SASS 440 or SASS 400TR.

SSBT 535. Human Sexuality (3)
The course addresses sexuality as an integral part of human functioning and human relationships throughout the life cycle. The formation of sexual identity is addressed, including gender identity, sexual orientation, and sexual intention. The physiological and psychological aspects of sexual behavior are covered, including the effects of aging, chronic illness, and sexually transmitted diseases. The course concludes with practical applications for social work, including an overview of assessment and treatment of sexual dysfunction. Prereq: SASS 440 or SASS 400TR.

SSBT 546. Welfare Reform and Poverty (3)
This course identifies and critically analyzes major theories of urban poverty and their implications for social policy in contemporary American society. Economic, sociocultural, cultural, and integrative theories of poverty
are examined. Case studies of poverty theories for social policy and the elimination of poverty are addressed. Prereq: SASS 440 or SASS 400TR.

SSBT 555. Women’s Issues (3)
This course examines theories that are relevant to the development and socialization of women, and discusses issues that are relevant to women’s lives within the context of oppression based on sexism, racism, ageism, homophobia, and other forms of discrimination. Emphasis is placed on assisting students in becoming more aware of the issues that are specifically relevant to their own development and socialization, and preparing for effective and sensitive professional practice by increasing knowledge about the issues facing women. Prereq: SASS 440 or SASS 400TR.

**COURSE DESCRIPTIONS (SSWM)**

**SSWM 500. Special Topics in Social Work Methods (1 - 3)**
This seminar course is intended for students who are interested in exploring advanced topics of current interest in methods. Prereq: SSWM 400 or SASS 477 or SASS 400TR.

**SSWM 518. Death and Dying (3)**
This course focuses on the concept of death and related topics from a social work perspective. Such topics include the role of death in American culture; the dying process and its institutions; assessment and intervention strategies; life span and family life considerations; and end-of-life decisions. The course provides both theoretical and experiential exposure to the dying process as it relates to self, the dying person, and the bereaved. Students will gain insight into serving the terminally ill, those who need assistance with mourning and grief, and clients dealing with difficult life-and-death decisions regarding loved ones. Prereq: SASS 477 or SASS 400TR.

**SSWM 519. School Social Work Seminar (3)**
This course prepares students to be certified school social workers. The course addresses major issues in American schools; a theoretical framework for school social work services; design, delivery, and evaluation of school social work services; legal and ethical issues; and the roles and intervention strategies of school social workers. It covers student and family problems and areas of need such as disability, truancy, divorce, teen pregnancy, youth depression and suicide, substance abuse, violence, and dropping out of school. This course is required for those participating in a planned program of study leading to state certification as a school social worker. If space permits, other students may enroll if they have or have had school social work experience. Prereq: SASS 477 or SASS 400TR.

**SSWM 530. Managing Organizational Change (3)**
This course provides a conceptual and practical understanding of planned change in human service organizations considering both organizational resources and achieving outcomes for clients. Skills and strategies for identifying needs for change, preparing and managing a change process, and institutionalizing change are critically examined. Prereq: SSWM 400 and SASS 400TR.

**SSWM 531. Strategic Alliances (3)**
This course provides organizational leaders with the concepts and practices critical to the development of interorganizational alliances, from affiliations to mergers and consolidations. Various strategies are examined and existing community-based national and international linkages are explored. Prereq: SASS 477 and SASS 478 and SASS 400TR.

**SSWM 541. Attracting Government, Foundation, and Corporate Support (3)**
This course reviews the trends, types of support available, sources of information, processes for accessing, criteria for decision-making, and the “politics” of grant, contract, in-kind, or other support. Preparation of winning proposals constitutes a special focus. Nonprofit organizations’ accountability, stewardship, and recognition responsibilities or activities are explored. Prereq: SASS 477 or SASS 400TR.

**SSWM 544. Budgeting and Financial Management in Social Service Organizations (3)**
Social service managers must be both responsible and accountable for the management of resources that enhance the provision of effective and efficient services to clients. In this course, students obtain an understanding of the skills, tools, and strategies needed to plan for the financial stability of their organizations. Students use a critical thinking perspective to examine budgetary and financial choices. They are able to understand the impact of power and politics in budget and financial processes. In addition, they are able to recognize ethical dilemmas that are often inherent in financial decision-making. Students demonstrate their understanding of program budgeting, financial reporting, and monitoring as well as other resource management concerns that affect human service managers and organizations. Prereq: SASS 477 or SASS 400TR.

**SSWM 546. International Social Work (3)**
This is an advanced seminar designed for students interested in the international dimensions of the social work profession and social work practice. The seminar focuses on commonalities and differences in the roles and functions of social workers in different nations. It also gives attention to social work as a global profession and social work practice on an international level. Prereq: SASS 477 or SASS 400TR.

**SSWM 563. Social Work Intervent in Co-occurring Mental and Substance Abuse Disorder (3)**
This advanced methods course provides a basic orientation to substance use disorders in persons with mental illness (SAMI). A biopsychosocial framework will be used to explore the etiology, the maintenance and the recovery of both mental and substance use disorders. The historical background of practitioner, programmatic, and institutional barriers that impede the development and application of clinical skills to dually diagnosed individuals will be explored. Emphasis will be placed on strategies for the implementation of services to deal with individuals with co-occurring problems and their families using the evidence-based New Hampshire-Dartmouth Psychiatric Research Center Integrated Treatment (IT) Model. Current assessment techniques and treatment of special populations including, but not limited to: women, minorities, and adolescents will be discussed. Prereq: SASS 477 or SASS 400TR.

**SSWM 573. Home-Based Family Interventions (3)**
This course provides students with an in-depth, comprehensive understanding of family preservation services and practice. Home-Based Family Interventions encompasses the values, attitudes, beliefs, knowledge base, and skills necessary for the beginning home-based worker. The course reviews the theories that guide family-centered services, examines models of family preservation services across various service systems, reviews current research on home-based services, and teaches skills or competencies necessary for home-based family work. A variety of teaching methods is used to learn, observe, and practice new skills. Prereq: SASS 477 or SASS 400TR.

**SSWM 575. Social Work with Persons with Serious Mental Illness (3)**
This course focuses on people who have severe mental illnesses. Students learn primary and tertiary community-based treatment and
rehabilitative approaches, services, and programs. In helping people achieve recovery, students learn the theory and practice skills that underscore the four major approaches to community-based service delivery: the assertive case management model; strengths case management model, psychosocial rehabilitation model, and the recovery model. Within each model, specific attention is placed on practice similarities and differences, especially interviewing assessment, and intervention. Within these practice skills, students learn how to identify social justice and empowerment values that are supported or undermined. Advocacy is highlighted as a central social work value and practice skill that cuts across community-based practice models. Finally, lectures, readings, and discussions examine how gender, ethnicity, and social class produce various experiences of mental illness and various social work interventions. Prereq: SASS 477 or SASS 400TR.

SSWM 579. Cognitive Behavioral Interventions (3)
This course acquaints students with the theoretical, conceptual, and skill bases of several cognitive-behavioral approaches to practice. Topics include assessment, use of tasks and homework, coping skills, cognitive restructuring, and problem solving approaches to practice. The course draws upon students’ field and work experiences to illustrate the application of the concepts and skills under discussion. Prereq: SASS 477 or SASS 400TR

SSWM 582. Social Work in Child Abuse and Family Violence (3)
This course addresses the etiology, investigation, and treatment of child abuse including sexual abuse and the roles of child welfare, health, and mental health agencies. Particular attention is given to direct work with children and adults who have experienced abuse, and to interventions in instances of family violence. Prereq: SASS 440 and SASS 477 or SASS 400TR.

SSWM 584. Social Work with Couples (3)
This course provides an overview of assessment and intervention methods for working with couples around issues of marriage, divorce, and remarriage. Alternate couple forms are discussed. The course emphasizes systems and social learning approaches, communication and negotiation in problem solving and its relevance to assessment, treatment structure, and techniques. Special attention will be given to problem areas such as commitment, sexual dysfunction, chemical dependency, and destructive communication patterns. Prereq: SASS 477 or SASS 400TR.

SSWM 585. Social Work with Groups (3)
A theoretical formulation of the social group work method as a problem solving process is addressed. Exercises are presented in the use of diagnostic skills to determine individual needs and problems for which groups may be helpful, the worker’s role in facilitating group functioning through his/her use of various program media. Attention is given to the significance of goals, agency environment, and policy for direct work with groups. Prereq: SASS 477 or SASS 400TR.

SSWM 586. Race and Class: Implications for Social Work Practice (3)
This course provides students with the opportunity to integrate concentration content within a perspective focusing on social work practice within the context of race and class. Specific attention will be focused on the development of a practice model that takes into account the impact of race and class on social functioning. Students will explore the effects of race and class on critical life areas such as education, housing, access to health care services, and the involvement with the justice system. Prereq: SASS 477 or SASS 400TR.
The School of Dental Medicine is a professional school offering a curriculum leading to the Doctor of Dental Medicine degree (D.M.D.). Advanced education programs in the dental specialties are also available. In conjunction with the School of Medicine, the School of Dental Medicine offers a combined D.M.D./J.M.D. program. The School of Dental Medicine also offers a program of continuing education courses in conjunction with the Greater Cleveland Dental Society for dental practitioners and auxiliaries including dental laboratory technicians.

The School of Dental Medicine was organized June 21, 1892, as the Dental Department of Western Reserve University. For the first 25 years of its existence, the school was located in downtown Cleveland. In 1917, the School of Dental Medicine became an integral part of the university and now occupies a building adjacent to the School of Medicine and the School of Nursing University Hospitals of Cleveland. In 2003 the name of the school officially changed from the School of Dental Surgery to the School of Dental Medicine and the degree offered changed from Doctor of Dental Surgery to Doctor of Dental Medicine.

The School of Dental Medicine is an institutional member of the American Dental Education Association and all of the programs of the School of Dental Medicine are accredited by the Commission of Dental Accreditation. Since its organization, it has conferred degrees on approximately 4,900 graduates.

**ADMINISTRATION**

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Institution</th>
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<tbody>
<tr>
<td>Jerold S. Goldberg, D.D.S.</td>
<td>Dean of the School of Dental Medicine; Professor of Oral and Maxillofacial Surgery</td>
<td>(Case Western Reserve University)</td>
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<tr>
<td>Marsha A. Pyle, D.D.S.</td>
<td>Vice Dean; Professor of Oral Diagnosis and Radiology</td>
<td>(Cleveland State University)</td>
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<tr>
<td>Ronald L. Occhionero, D.D.S.</td>
<td>Associate Dean for Administration; Professor of Comprehensive Care</td>
<td>(Case Western Reserve University)</td>
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**FACULTY**

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<tr>
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<tr>
<td>Avishai Sadan, D.M.D.</td>
<td>Associate Dean of Clinical Affairs; Professor of Comprehensive Care Chair</td>
<td>(Hebrew University, Jerusalem, Israel)</td>
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<tr>
<td>Mark G. Hans, D.D.S., M.S.</td>
<td>Associate Dean of Graduate Studies; Professor of Orthodontics and Chair</td>
<td>(Case Western Reserve University)</td>
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<tr>
<td>Heather M. Siegel, B.A., MPA</td>
<td>Director of Development and Alumni Affairs</td>
<td>(Western Michigan University)</td>
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<tr>
<td>Philip C. Aftoora, B.S.</td>
<td>Director of Student Services</td>
<td>(University of Dayton)</td>
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<tr>
<td>Sally T. Baden, D.D.S., M.S.</td>
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<td>Dennis C. Beeson, D.D.S., M.S.</td>
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<tr>
<td>Nabil E. Bissada, B.D.S. (University of Cairo, Egypt)</td>
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<td>(Case Western Reserve University)</td>
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<tr>
<td>John W. Smolik, M.B.A., C.P.A.</td>
<td>Assistant Dean of Finance, Operations and Information Technology</td>
<td>(Baldwin Wallace College)</td>
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<tr>
<td>Cecilia A. Ash, D.D.S. (Dalhousie University), M.S. (University of Manitoba)</td>
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<td>(Marquette University)</td>
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<td>Maya Chane, D.D.S. (Damascus University)</td>
<td>Senior Instructor of Comprehensive Care</td>
<td>(Case Western Reserve University)</td>
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<td>Sami M. Chogle, D.D.S. (Dharwad University, India), M.S.D. (Case Western Reserve University)</td>
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<td>(university of minnesota)</td>
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SCHOOL OF DENTAL MEDICINE

Assistant Professor of Comprehensive Care
Stanley A. Hirsch, D.D.S. (Case Western Reserve University), M.S. (Indiana University)
Associate Professor of Oral Pathology and Acting Chair
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Associate Professor of Comprehensive Care
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Richard J. Jurevic, D.D.S. (The Ohio State University) M.S.D., Ph.D. (University of Washington) Assistant Professor of Biological Sciences
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Charles J. Love, D.D.S. (Case Western Reserve University) Associate Professor of Comprehensive Care
André K. Mickel, D.D.S., M.S.D. (Case Western Reserve University) Associate Professor of Endodontics
Sena Narendran, B.D.S. (University of Ceylon, Sri Lanka), M.S. (University of London, England) Associate Professor of Community Dentistry
Suchitra S. Nelson, Ph.D. (Case Western Reserve University) Associate Professor of Community Dentistry
Milton Ntragatakis, D.D.S., M.S.D. (Case Western Reserve University) Assistant Professor of Pediatric Dentistry
Ronald L. Occhionero, D.D.S. (Case Western Reserve University) Professor of Comprehensive Care; Associate Professor of Oral Surgery
Dean for Administration
Juan Martin Palomo, D.D.S. (Ponta Grossa State University, Brazil), M.S.D. (Case Western Reserve University) Associate Professor of Orthodontics
Leena Palomo, D.D.S., M.S.D. (Case Western Reserve University) Associate Professor of Periodontics
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Lance Vernon, D.M.D., M.P.H. (University of Pittsburgh) Senior Instructor of Biological Sciences
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Kristin A. Williams, D.D.S., M.P.H. (Case Western Reserve University) Assistant Professor of Community Dentistry
Stephen Wotman, D.D.S. (University of Pennsylvania) Professor of Community Dentistry

FACILITIES

Physical Resources
The entire Health Sciences Center has been designed so that students can travel from the School of Dental Medicine to the School of Medicine, the School of Nursing, the Health Sciences Library, the Health Sciences Dining Room, and any component of University Hospitals without having to go outside.

The dental school building was designed to provide a modern teaching facility. The Multimedia Laboratories are designed and equipped so that the basic sciences (except for anatomy), technique and simulated clinical experience can be carried on by the student in his or her individual area. The 50,000 square foot dental clinic floor consists of two major clinical areas and five specialty clinics. The major clinics are made up of individual cubicles, fully equipped as private operatories. Each student clinician is assigned to one of the individual operatories for the academic year.

Drawing from a local population of more than one million, the clinics provide a broad spectrum of care to the population, affording the student substantial clinical experience. The school cooperates with various organizations of the city in caring for their clients, an arrangement that provides additional clinical experience for students.

LIBRARIES
The Cleveland Health Sciences Library (CHSL) was formed in 1966 by an agreement
between the Cleveland Medical Library Association (CMLA) and Western Reserve University. CHSL operates in two locations: the Allen Memorial Medical Library and the Health Center Library (HCL). The total collection currently numbers 380,000 volumes. More than 1,700 journals are received.

The Allen collection, strongly clinical, serves private and institutional members of the Cleveland Medical Library Association as well as faculty and students of Case Western Reserve University.

The Health Center Library collection of basic science materials is primarily for faculty and students of the schools of dental medicine, medicine, and nursing and the department of biology.

The Dittrick Museum of Medical History, located on the third floor of the Allen Library, contains nearly 20,000 objects related to the history of medicine, dentistry, and pharmacy, with special emphasis on Cleveland and the Western Reserve. The museum also contains a medical archives collection and a rare book room.

Reference staff in both libraries help instruct patrons in the use of the library and its bibliographic resources. Items not available on campus may be obtained through interlibrary loan. Other services provided are quick telephone reference, citation verification, computerized or manual bibliographic searches, and access to the internet. The library staff can provide online searching of more than 100 databases.

HOSPITAL AFFILIATIONS

The School of Dental Medicine has working relationships with many hospitals and health clinics in the Greater Cleveland community. Students have the opportunity to function as dentists and observe hospital routine and operating room techniques in these hospitals. Many members of the faculty hold staff appointments in these extramural health facilities.

University Hospitals is a 974-bed tertiary care facility located across the street from the School of Dental Medicine. Graduate departments in oral and maxillofacial surgery and pediatric dentistry are based at this facility. A variety of educational and research opportunities exist in relation to this affiliation.

The Veterans Administration Medical Center is a modern 780-bed hospital in the University Circle area. The hospital provides dental services for both outpatient and inpatient veterans.

THE FREE CLINIC

The Free Medical Clinic of Greater Cleveland, at 12201 Euclid Avenue, is a nonprofit community service organization that presently offers medical, dental, podiatric, and legal services, as well as family planning and psychological counseling programs for adults and children; provides a patient advocacy program and speakers for community education and training at other health agencies; and operates a hotline seven evenings a week.

Dental students participate in clinical care at this site during clinical rotations and additionally may volunteer their services to any of the programs at the clinic.

THE PROFESSION OF DENTISTRY

The mission of dentistry is the protection and improvement of the health of individuals and society with a concentration on oral health. Professional activities encompass a wide variety of endeavors including the clinical care of individuals, the prevention of disease, the discovery of new knowledge, and the development of procedures and policies that protect and improve health, especially for those populations at risk for disease.

Because oral health is an important concern of society, the role of the dentist continues to be essential and rewarding. Men and women who are interested in scientific studies directly related to the welfare of people should find a strong appeal in dentistry as a life work. It offers an unusual opportunity for public service, community respect, and the use of originality, compassion, and substantial skill and independent judgment on a daily basis.

CONTINUING EDUCATION

The School of Dental Medicine, in conjunction with the Greater Cleveland Dental Society, offers a program of continuing dental education to practicing dentists and auxiliary personnel.

Guest lecturers, including faculty, who have distinguished themselves in one of the many specialty areas of dentistry present courses on an annual basis.

The continuing education courses encompass the expanding horizons of dentistry, covering such subjects as endosseous implants, periodontics, oral medicine, endodontics, dental materials, esthetic dentistry, restorative and prosthetic dentistry, occlusion, practice management, and orthodontics, as well as expanded functions for dental auxiliaries.

These courses are designed to keep the practitioner abreast of current procedures and enrich the participant’s knowledge of the newest and most accepted advances in all subjects of dentistry. Courses may include subject matter of an experimental and/or controversial nature. This material is offered to the profession for educational and informational purposes in a spirit of academic freedom. Participants are given the opportunity to weigh the validity and usefulness of this material according to their own professional experience and judgment.

Case Western Reserve School of Dental Medicine continuing education courses are eligible to fulfill verifiable requirements of some states and of the American Dental Association (ADA). Categories and credits are available on request.

DENTAL EDUCATION PROGRAM

The students who enter the School of Dental Medicine are very carefully selected and already have had many opportunities for intellectual and social development. The years in dental school should permit the continued maturation of the individual and should emphasize the basic knowledge and skills which are common to all dentists. Graduates should continue their dental education during their professional careers and add to the basic concepts taught in dental school by studying the scientific literature and by attending continuing education courses. While in dental school, the student develops an attitude of professionalism and a sense of responsibility toward the patient’s welfare, which will provide optimal dental care.

The Committee on Dental Education studies, reviews, and evaluates the school’s educational goals and objectives, subject matter, grading systems, and clinical and laboratory experiences.
for fellowship credit through the Academy of General Dentistry (AGD). The Case Western Reserve University School of Dental Medicine continuing education program is an ADA-recognized provider (Continuing Education Recognition Program.)

License to Practice Dentistry in Ohio
Currently the license to practice dentistry is granted by the Ohio State Dental Board after successful completion of appropriate examinations.

The candidate must be 21 years of age, show evidence of good moral character, and affirm that he or she understands the Ohio Dental Law.

Specific information about licensure in Ohio and other states should be obtained from the individual state boards of dentistry.

Admission

Admission to the D.M.D. Program
The Case Western Reserve University School of Dental Medicine is a participant in the American Association of Dental Schools Application Service (AADSAS). The online application is available from AADSAS (www.aeda.org) in mid-May and should be submitted as soon as possible after that date to ensure consideration for the primary class by the Admissions Committee. Early applications are strongly encouraged and given priority in the rolling admissions process. To increase the likelihood of receiving primary class consideration, complete application materials should be received in our offices by October 1. The deadline to apply is January 1.

Completed applications must include an application fee and an official copy of the Dental Admissions Test (DAT) score report sent directly to the school. Official transcripts from all post-secondary educational institutions attended and letters of recommendations should be submitted directly to AADSAS. When the application is complete, it will be reviewed by the Admissions Committee. If additional material is required, it will be requested after review of the application. The committee reviews applications continuously throughout the year.

Dental Admissions Test
All applicants are required to take the Dental Admissions Test (DAT). The Dental Admissions Test (DAT) is conducted by the American Dental Association (ADA). The test is administered on computer at Prometric Testing Centers year-round. The testing program is designed to measure general academic ability, comprehension of scientific information, and perceptual ability. Information and registration is available on the ADA's website at www.ada.org.

Letters of Recommendation
The applicant should arrange to have letters of recommendation sent to AADSAS at the time the application is submitted. These should be from the Pre-Dental Advisory Committee at the applicant's undergraduate institution. If no Pre-Dental Advisory Committee exists, letters from two instructors in the basic sciences are acceptable.

Personal Interviews
A personal interview at the School of Dental Medicine, by invitation of the Admissions Committee, is necessary prior to acceptance. The interview will tour the school, receive information about financial aid, and have an opportunity to talk with faculty and students. During the interview, the committee looks for evidence of such personal qualities as integrity, motivation, and maturity. The committee also expects applicants to have been exposed to the delivery of dental care either as participants or observers.

The Admissions Committee begins conducting formal interviews in August for entrance into the School of Dental Medicine the following July or August.

Academic Requirements
Matriculation at the School of Dental Medicine requires a minimum of 60 semester hours, or the equivalent, of collegiate courses, exclusive of physical education and military training. All requirements must be completed before enrollment. Applicants are strongly encouraged to earn their baccalaureate degree prior to enrollment in dental school.

The prerequisite course work includes a minimum of 12 semester hours of chemistry, of which 6 semester hours must be in organic chemistry; 6 semester hours of biology; 6 semester hours of physics, and 6 semester hours of English. The science courses must include laboratory instruction.

Primary consideration is given to applicants with a superior grade point average in both overall course work and prerequisite pre-dental courses. Students likely to be given first priority are those who have achieved superior grades in the basic sciences and who have taken an adequate sampling of courses in the social sciences and humanities to give them a broad background. Candidates who majored in non-science fields are given equal consideration with those who majored in the basic sciences.

Pre-dental electives suggested by the Admissions Committee include comparative anatomy, cell biology, genetics, biochemistry, microbiology and physiology. These courses are helpful in providing a foundation for the basic science courses to be taken in dental school.

Notification of Acceptance and Deposit
The American Dental Education Association stipulates that applicants not be advised of acceptance prior to December 1 of the year preceding enrollment. Acceptance is provisional and contingent on the applicant maintaining an acceptable level of achievement throughout the remainder of the college program. Upon notification of acceptance, the applicant is required to make a deposit of $1,000, which is applied to tuition costs. This deposit is non-refundable and nontransferable.

Advanced Standing
A graduate of a foreign dental school may be considered for advanced standing at the School of Dental Medicine. Applications for advanced standing are accepted beginning on August 1 of each year; those completed by November 1 are reviewed by the Admissions Committee. The committee may not accept applicants each year, depending on space availability.

In addition to the completed application form and $55 application fee, the applicant must submit all undergraduate and dental school transcripts, Part 1 National Board scores and a letter of recommendation from the dean or faculty of the school attended stating that the student was graduated and at what rank. In order to apply candidates must have earned a minimum of 85 or better on Part 1.

If the committee decides that the candidate is competitive, the applicant will be required to come to the school for a “bench test” examination. All travel and lodging costs are borne by the candidate and an additional fee for the bench test is required. Acceptance is based on the review of credentials, personal interview, bench testing and English language testing as applicable.
ACADEMIC REGULATIONS

D.M.D. Program

REGISTRATION
The act of registration includes the payment of the first semester tuition and the completion of the simplified registration form provided by the School of Dental Medicine. First-year students who do not register on the opening day of school and who have failed to provide satisfactory reasons in advance for the delay forfeit their right to admission. Vacancies which arise from such circumstances are filled from the list of alternate candidates at the discretion of the Committee on Admissions.

Registration must be completed by all upper-level students within 10 days after the opening day of school. Under unusual circumstances, special arrangements may be made with permission of the dean. The Social Security numbers of students are used for all records and documents and must be provided at the time of registration. Foreign students will be issued a number for this purpose if they have not obtained a Social Security number prior to registration.

TERMS AND COURSE LENGTH
The school year consists of 34 weeks of five days each, exclusive of vacations, and is divided into two semesters of two terms each. The final week of each semester is reserved for examinations. There are mandatory summer clinic and class sessions for all students at the end of the second and third years. A fee is charged for these summer sessions.

ATTENDANCE
Students enrolled at the School of Dental Medicine are expected to pursue their course of study according to a systematic plan as determined by the Faculty. It is the policy of the school that student attendance for clinic and clinic duty assignments is mandatory. Attendance requirements for lectures, laboratories and seminars are at the discretion of the course director. The course director is free to determine the extent to which absences affect the final grade. The student should realize that lack of regular attendance is extremely disruptive of academic progress and every attempt to attend all classes is strongly encouraged. The student should also be aware that the Committee on Student Standing and Promotion will consider faculty notation of poor attendance in its deliberations.

The Office of Student Services serves as a clearinghouse to notify faculty and staff of a student’s absence. Students who are not able to attend classes, laboratories or clinic are to call 216-368-6136 and advise the office of the period and expected duration of an absence and the reason that you will not be able to attend classes. The office will notify appropriate faculty and staff.

Note that the above action does not represent an approved absence. The clearinghouse function provided by the Student Service Office is a notification service. Individual faculty may express their own policy concerning absence as stated in the course syllabus.

There are situations where an approved absence that excuses the individual from classes et. al. is appropriate. An approved absence requires the approval and signature of the director of student services.

GRADING POLICY
Beginning with the class entering in the fall of 2006, the grading system of the School of Dental Medicine will be Pass/NoPass for all course work. The faculty will specify the mastery level in each course or module that is equivalent with passing. Students must pass each course/educational module. In each course or educational module students will receive formative feedback from the instructor as well as summative assessments which will contribute to the determination of their academic status in each respective course. At the end of each semester in the first two years of the program, students will be required to complete the Comprehensive Assessment battery of examinations.

PROMOTION
Ongoing review of student progress will be conducted by faculty mentors. Student progress will be formally reviewed at the end of each semester or sooner in each year of the program by the Committee on Student Standing and Promotion. Students will receive written notification of their status at the end of each semester or sooner. Students must pass each course or educational module and the Comprehensive Assessment battery of examinations. Passing of courses and educational modules involves satisfactory accomplishment in both course content and/or small group learning processes, for which students receive ongoing evaluation. Students may not be promoted with one or more failing or incomplete grades unless they have entered a remedial program to remove those grades by a deadline set by the course director or committee. In the usual case students will be provided 30 days after the end of the semester to complete all incomplete or failing course work unless an instructor or the committee specifies an alternative time for remediation and/or completion of course work.

Students must sit for the National Board Dental Examination Part I (NDBE I) by April 1 of the second year. Students who do not pass NDBE I prior to the beginning of the fall semester of the third year will not be permitted to begin the semester. Additionally, students must successfully complete all course work and pass the National Board Examination Parts I and II in order to be considered for graduation from the School of Dental Medicine.

ATTENDANCE
Students entering the School of Dental Medicine as of fall 2006 are expected to pursue their course of study according to a systematic plan as determined by the faculty. All students are required to attend class, be prepared for small and large group learning sessions, and attend all laboratory and clinic sessions. Because students work in teams during components of the curriculum, absences negatively impact the functioning and learning within a group. Students are evaluated in an ongoing manner on knowledge of content as well as small group learning processes and by clinical competency examinations.

The Following Information Applies to All Pre-Doctoral Students of the School of Dental Medicine

ABSENCE FROM EXAMINATIONS
The student is expected to be present at all examinations or provide, when possible, advance notice to the Office of Student Services when absence from an examination is anticipated. If a student fails to provide advanced notice, the student must provide an appropriate excuse. Failing to provide an acceptable excuse, the student will meet with the director of student services and the course director to discuss the absence. Following such consultation, the student will be informed of the consequences. The course director may permit the student to be re-tested (with or without penalty), be assigned a grade of zero for the examination, or receive a failing grade for the course.

LEAVE OF ABSENCE
A student may request a Leave of Absence for personal reasons or reasons of health when anticipated or actual absence is in excess of three weeks. Such requests must be submitted in
writing to the director of student services who will forward the request to the Committee on Student Standing and Promotion. The request must be submitted by letter and state the reason for the request, the length of leave requested and the date of return. The committee will ordinarily grant such requests if the student is currently enrolled and has been in regular attendance prior to the time or circumstances that necessitated the request. The request may be submitted by a parent, spouse or authorized agent of the student if the student is unable to file the request. The maximum length of leave is one year. Students must resume registration at the expiration of the leave unless formally granted an extension. Re-entry into the dental program is determined by the Committee on Student Standing and Promotion and may not necessarily be at the same level attained at the time the leave was granted. The committee also reserves the right to place a student on Leave of Absence when it has determined that the circumstances warrant that action, even in the absence of a formal request.

DEGREES CONFERRED

The degree Doctor of Dental Medicine (D.M.D.) is awarded to students successfully completing the four-year professional program offered by the school. The Master of Science in Dentistry (M.S.D.) degree is awarded to graduate students who successfully complete a graduate program of advanced study. Degrees are granted by the university on the recommendation of the faculty subject to the satisfactory completion of all curricular requirements and the discharge of all financial obligations to the university. The recommendation for a degree is discretionary with the faculty, and there is no contract stated or implied, between the university and the student that a degree will be conferred at any stated time, or at all.

WITHDRAWALS AND REFUNDS

To officially withdraw from the School of Dental Medicine, a written notice must be submitted to the dean for approval. Failure to attend class or merely giving notice to an instructor will not be regarded as an official notice of withdrawal. A student who withdraws after the start of a semester must pay a portion of the usual tuition. The student is charged in accordance with the university policy on withdrawals. If the withdrawal occurs during the time that the student is enrolled in summer clinic, the student is charged at a rate of 12.5 percent per week of usual fee for summer clinic.

The university will refund any tuition paid for a semester by any student in good standing who is inducted, or called to active duty, by the Armed Forces of the United States prior to completing that semester, and who does not receive credit for the work completed during that semester.

APPROPRIATE ATTIRE

All students are expected to dress appropriately. The dental student is obliged to follow the dress code developed by the Dental Student Council and approved by the faculty. Graduate students and residents are expected to dress in a manner acceptable to their department.

PERSONAL PROPERTY INSURANCE

Students are responsible for their personal property while on campus. The university assumes no responsibility for loss of or damage to a student’s personal property and the university insurance program does not cover such losses. Many families have homeowner or renter insurance policies which provide coverage for such perils as fire, water and theft. If this coverage does not exist, the student may wish to consider a separate renters insurance policy.

STUDENT SERVICES

The School of Dental Medicine’s Office of Student Services acts as a resource for individual dental students and for classes as a whole, providing services and administering programs that supplement the regular curriculum and enrich the quality of student life. Programs under the direction of this office include:

STUDENT ACTIVITIES

The School of Dental Medicine encourages its students to avail themselves of cultural opportunities within the university and the community.

Each class has its own student organization, which is governed by the students, with advice from the school’s Office of Student Services and other teaching staff, when such advice is requested.

The Student Council is an organization representing the entire student body whose purpose is to advance the interests of the students of the School of Dental Medicine and the university. Students of the School of Dental Medicine share in university athletics, participating in interclass, interdepartmental, and intercollegiate contests in various activities.

The School of Dental Medicine has chapters of two of the national dental student fraternities: Delta Sigma Delta and Psi Omega. Students of all classes are eligible for student membership in the American Dental Association, and the American Dental Education Association.

American Student Dental Association

The American Student Dental Association (ASDA) is a student organization of approximately 20,000 individual predoctoral and postdoctoral members organized into chapters, one at each of the U.S. dental schools. The ASDA is committed to the following:

1. Developing and training future leaders of the dental profession
2. Improving the quality of dental education
3. Disseminating information of value to dental students
4. Promoting the social, moral, and ethical obligations of the profession
5. Ensuring due process for all dental students
6. Representing dental students before legislative bodies and organizations
7. Providing opportunities for students and recent graduates to deliver health care to people in areas of need

The local chapter at Case Western Reserve University, representing all of the dental students, provides benefits that include:

1. Five professional publications
2. Reprints of released national dental board examinations
3. Insurance at low group rates (disability/medical, equipment, professional liability, term life insurance)
4. Reduced ADA dues upon graduation.

The American Dental Education Association (ADEA); The Voice of Dental Education

ADEA is the premier association serving the allied, predoctoral, and postdoctoral dental education community. ADEA provides advocacy, professional development, and a wealth of expert information and resources. We address contemporary issues influencing education, research, and the delivery of oral health care for the improvement of public health.

First-Year Orientation

Incoming students are introduced to the school, the university, and the Cleveland area in a four-day program presented by the Office of Student Services, faculty members, and upper-class students.
Faculty Mentors
All students are assigned to faculty mentors during freshman orientation. The advisors are volunteers from the faculty who offer the students guidance and fellowship during their educational program.

Student Monitoring
The director of student services monitors student grades on a regular basis and works individually with students. Students are assisted in defining problems, identifying available resources, and choosing specific steps to be taken toward improvement.

Tutoring
The Office of Student Services provides tutoring for students who need to improve their academic performance. The tutors are usually upperclassmen or graduate students. Students may seek tutoring on their own or be recommended for tutoring by course instructors. Tutors emphasize study techniques, time allotment, problem solving, and communication in addition to comprehension of content.

HONORS, PRIZES AND AWARDS
Recognition, both honorary and monetary, is given to students who achieve excellence in different facets of their dental education. A complete description of each award is available in the Office of the Dean.

Scholastic Achievement
• Alpha Omega Fraternity Award for Scholarship
• Omicron Kappa Upsilon
• Callahan Prize
• American Academy of Oral Medicine
• American Association of Women Dentists

Doctor Paul P. Sherwood/Hrutkay Award
American Association of Endodontists
American Association of Oral and Maxillofacial Surgeons
American Dental Society of Anesthesiology, Incorporated
Orthodontics
American Society of Orthodontists
Pediatric Dentistry
American Society of Dentistry for Children
Academy of Dentistry for the Handicapped
Periodontics
American Academy of Periodontology
Prosthodontics
Dentsply International Merit Award in Prosthodontics
Practice Management
• Richard A. Collier Prize

RESEARCH AND SCIENTIFIC PAPERS
• Alpha Omega Prize
• Block Drug Award

STUDENT AFFAIRS
The University Office of Student Affairs serves as an ombudsman focusing attention on the rights and responsibilities of students within the university community. In addition, it serves as a central source of information about university policies and procedures that affect student life and extracurricular programs and services. Students may contact the University Office of Student Affairs for resolution of specific problems and for referral to other university offices or campus agencies.

ACADEMIC PROGRAMS
Beginning with the fall 2006 entering class, the School of Dental Medicine will begin a three-year implementation plan for a new curriculum. Students who entered the program prior to fall 2006 will continue until graduation with the conventional curriculum, which includes traditional forms of instruction organized in discipline-based units. Updates about the curriculum implementation and current schedules are available at http://dental.case.edu/insidecase/.

DOCTOR OF DENTAL MEDICINE DEGREE PROGRAM

SCHOOL OF DENTAL MEDICINE

Entering Class, Fall 2006
The new curriculum will be accomplished through an integrated approach to instruction. The program will accomplish its goals through academic work in four themes and two threads, which are woven throughout the four years of the program. The program includes a variety of educational formats to deliver the curriculum, including problem-based learning sessions, team-based learning, independent study, seminars, experiential learning opportunities, traditional lectures, virtual reality clinical simulation, laboratories, standardized patient experiences, and patient-based comprehensive care. The goal of the new curriculum is to help students become better prepared in independent learning, critical thinking skills, and the use of evidence. The new curriculum is a program of study that includes traditional and newly organized integrated educational modules in the following themes and threads.

Themes

HEALTH AND WELL-BEING
This theme contains all curricula -- both didactic and clinical -- that apply to health and the normal structure and functioning of the body and of the oral complex. The traditional content areas of physiology, biochemistry, anatomy, histology, among other dental science classes, are integrated through cases to form a better bridge between the basic sciences and the clinical sciences.

DISEASE PROCESSES
The Disease Processes theme includes content related to general and oral diseases. These topics are often melded with healthy structure and function content to provide students with a global perspective of the implications of disease on usual functioning.

RESTORATION OF HEALTH
This theme contains content related to therapies necessary for treatment of medical disease and dental disease. A focus on restoring oral health is accomplished through virtual reality clinical skills training, training on models and progression to comprehensive dental care in conjunction with didactic knowledge.

MAINTENANCE OF HEALTH
The Maintenance of Health theme focuses on curriculum which explores strategies for preserving health through general and oral health therapies, patient education, disease risk assessment, and disease prevention. This theme
They participate in practice management activities of their preceptor group, developing critical skills for general practice dentistry.

**Combined Degree Programs**

By arrangement with the College of Arts and Sciences of Case Western Reserve University and other cooperating institutions of higher education, an in absence privilege is accorded undergraduates in their senior year, whereby the first year of professional study may be substituted for the last year of liberal arts education. The student may be granted a baccalaureate degree by the liberal arts college upon completion of the first year in the School of Dental Medicine. Arrangements for this in absence privilege must be made by the student with the liberal arts college before entering the School of Dental Medicine. This option must be exercised at completion of the first year of study in the School of Dental Medicine unless permission is granted by the undergraduate college and dental school by prior arrangement.

**Joint Degree Programs**

[Note: The D.M.D./M.D. Program described below is an exception to these policies. For details, please see the D.M.D./M.D. program description details.] Students enrolled full time in the School of Dental Medicine desiring to enter a joint degree program must apply and be admitted to a non-dental degree program of another school of the university through the usual process followed for admission at that school. If accepted, the student must notify the associate dean for education in writing at least four weeks prior to the start of the semester they wish to initiate non-dental course work in the joint degree program. A dental student must be in the top one-half of the class to be eligible to enter a joint degree program and may not begin earlier than the second semester of the first year.

If the student appears eligible for the initiation of a joint degree program, a dental faculty member will be assigned as an advisor to the student. The faculty advisor will be responsible for routine matters such as assisting in registration (e.g. add slips) in addition to the advisory function. Students should be assigned, or request, an advisor on the faculty of the second school in which non-dental course work is taken.

Eligible students must meet with the advisors and program coordinators of both schools. Following this meeting, the student will be provided with a written agreement and guidelines specifying the program which will have priority in all future considerations, a curriculum plan and projected timetable for the completion of course work, and other conditions or stipulations in effect that will govern the student’s tenure in both programs. The student will acknowledge the agreement with their signature.

First year students are limited to one course (3 credit hours) in the first semester (spring) of a joint program. Upper-level students (years two through four) in good standing (defined as top one-half for this purpose) may enroll for up to two courses (six credit hours) in each of the fall or spring semesters. Course work undertaken in the non-dental program should not ordinarily be scheduled during the regular school hours at the School of Dental Medicine unless approval is granted by the associate dean for education. Course work taken as a part of the non-dental program cannot be used to meet the requirements of the dental program.

Tuition charges for course work taken in the non-dental program are the responsibility of the School of Dental Medicine to the extent outlined in the agreement and to a maximum of six credit hours per semester (fall and spring semesters only) if the student fulfills all eligibility requirements, is enrolled full time and in good standing at the School of Dental Medicine, and is current in the payment of tuition to the School of Dental Medicine. Tuition charges for non-dental courses taken during the summer semester are the responsibility of the student. Enrollment in a joint degree program does not constitute a guarantee that a degree will be granted for either program at any given time or at all.

Permission to continue in the joint program may be withdrawn by either school for a variety of reasons including, but not limited to, poor or failing grades or grade point averages, incompleteness or tardiness in completing program requirements, delinquency in payment of tuition, nonacademic or academic probation, suspension or dismissal.

Problems that might arise will be resolved on a case-by-case basis by the associate dean for education and the faculty advisor in consultation with the student. The student may appeal any unfavorable decision to the Committee on Student Standing and Promotion for final resolution.

**D.M.D./M.D. Program**
The joint degree D.M.D./M.D. program of the Case Western Reserve University School of Dental Medicine and School of Medicine is poised as an innovative approach to satisfy the need for creation of a cadre of uniquely trained individuals who will integrate aspects of primary care into the practice of general dentistry. Students will obtain training in both the fields of medicine and dentistry in a five-year integrated training program that will lead to the D.M.D. and M.D. degrees. This new joint degree program will address the emerging requirement for health professions students to be broadly trained with an extensive perspective of health and disease. As the associations between oral health and systemic health become clearer, the role of these new health care practitioners of tomorrow will emerge to provide health promotion and disease prevention care in a new framework.

Prospective students of this new innovative program are interested in the health professions using a more broadly defined context, are independent thinkers, and have excelled in baccalaureate programs in the sciences. A pioneering spirit will characterize their motivation. Students will be prepared to sit for the clinical licensure examination leading to the practice of dentistry and for post-graduate, year-one residencies in medicine which are required prior to medical licensure.

**Special Programs for Undergraduates**

The College of Arts and Sciences and the School of Dental Medicine jointly offer two programs for exceptionally able and well qualified high school seniors who plan to pursue careers in dentistry. Students admitted to these programs will be provided with advisors from both the College of Arts and Sciences and the School of Dental Medicine. Prior to enrollment in the School of Dental Medicine, all students are required to achieve an acceptable performance on the Dental Admission Test given by the American Dental Association.

**SIX-YEAR DENTAL PROGRAM**

The Six-Year Dental Program is designed to enable the especially mature student who is determined to pursue a career in dentistry to accelerate his or her undergraduate and professional education.

The first two years of the program are spent in the College of Arts and Sciences. Students are required to follow a specific curriculum. In order to secure the place reserved for them in the first class year at the School of Dental Medicine, students must earn the current minimum grade-point average and current minimum grade in each course.

After successful performance in the pre-dental part of the program and on the Dental Admission Test, students in the Six-Year program move into the first year of dental school. The D.M.D. is awarded upon completion of the six-year program.

**Up to 10 students can be admitted to the Six-Year Dental Program each year.**

**PRE-PROFESSIONAL SCHOLARS PROGRAM IN DENTISTRY**

The Pre-Professional Scholars Program in Dentistry is designed for those who desire careers in dentistry but wish to broaden and enrich themselves with a full undergraduate program before embarking on study in a professional school. Such students matriculate in the College of Arts and Sciences with a conditional commitment for admission to the School of Dental Medicine to be honored upon completion of the bachelor’s degree.

Students are free to develop and follow a course of study that reflects their educational interests and needs rather than concentrating solely on activities that enhance their chances for admission to professional study. Participants will be expected to take the courses required of pre-dental students and to maintain the current minimum grade-point average or higher both for their work in the sciences and overall.

**EXPANDED FUNCTION DENTAL AUXILIARY PROGRAM**

The School of Dental Medicine offers a non-degree certificate course in expanded dental functions to dental auxiliaries with requisite training and experience. This continuing education program prepares the student to take an examination administered by the Ohio Commission on Dental Testing for Advanced Qualified Personnel.

The Expanded Function Dental Auxiliary course is a part-time program and includes didactic, pre-clinical laboratory, and clinical training. It is affiliated with several hospitals and health agencies in the Cleveland metropolitan area, where a portion of the clinical training takes place. Students are selected for admission on the basis of their performance on an entrance examination administered by the program faculty.

**BASIC SCIENCE PROGRAMS**

The most direct route toward a career in research is through the Doctor of Philosophy degree programs offered by the departments that are basic to health education: anatomy, biochemistry, microbiology, pathology, pharmacology, and physiology. Inquiries about these non-dental school programs should be addressed to the dean of graduate studies, who provides specific information about these programs. Fellowships may be available to qualified students to assist them during their period of study and research leading to an advanced degree. The curricula of the School of Dental Medicine are designed to provide general education in dentistry or in areas of clinical specialization. However, recognizing the need within dentistry for individuals qualified for teaching and research, the School of Dental Medicine may provide the use of its facilities and faculty as part of a cooperative program in the training of such individuals.

**ADMISSION TO ADVANCED EDUCATION PROGRAMS**

**Programs Offered**

The School of Dental Medicine, in cooperation with other institutions, offers programs of study in advanced education in general dentistry, endodontics, pediatric dentistry, periodontics, orthodontics, and oral and maxillofacial surgery. Entry requirements vary and are determined by the program director and faculty of each program who select applicants for admission. Program length, stipends offered and program requirements vary by program. Requests for application materials should be directed to the Office of Graduate Studies of the School of Dental Medicine Application materials are also available online at http://dental.case.edu/admissions/gradstudies/how-toapply.htm/.

All advanced education programs are accredited by the Commission on Dental Accreditation of the American Dental Association and are board-eligible programs for the respective specialty boards. The programs in endodontics, orthodontics, and periodontics are master’s degree programs with a certificate granted upon completion of the degree requirements. The programs in advanced education in general dentistry and pediatric dentistry are certificate-only programs. There is an optional master’s degree program offered in pediatric dentistry. The program in oral and maxillofacial surgery is a joint program with the School of Medicine leading to the M.D. degree and certificate in oral and maxillofacial surgery. A
Entry Requirements

All programs are highly structured and require a commitment to full-time study. Time for employment is limited; enrolled students are not permitted to engage in outside dental practice without the approval of their program director.

In order to be considered for admission, the applicant must submit several items: a completed application form (PASS or MATCH applications are accepted for some programs), all requested supporting documents such as transcripts, letters of recommendation, etc., and an application fee by the deadline published for each program. Incomplete or late applications will not be considered unless all other qualified applicants have been offered admission and a vacancy remains.

The selection of individuals for entry into a program of study is made by the program director (faculty) from the pool of applicants. The general criteria of the most qualified applicants for admission are as follows:

The applicant must be a graduate of a dental school accredited by the American or Canadian Dental Association or have been graduated from an institution considered by the School of Dental Medicine as one of acceptable academic caliber. (Applicants who are currently enrolled as dental students must submit a final transcript and verification of graduation from a dental school prior to entry if selected.)

The applicant should have earned a 3.0 (B) average or its equivalent and/or been graduated in the highest one-third of their graduating dental class.

The applicant must have passed Part I of the National Dental Board and should have an average score of at least 85 and have taken or applied for Part II (to be completed with a score of 85 or higher prior to entry if selected). If the applicant is a graduate of a foreign dental school and has not taken the National Dental Board, recent GRE examination results may be substituted (general test and one subject test in biochemistry, biology or chemistry). GRE scores should be at the fiftieth percentile or higher.

The applicant should have a documented interest in their field of study and must meet additional criteria set by the department to which they are applying. Applicants graduated from a non-English speaking dental school, and for whom English is not their first language, must take the TOEFL test with a minimum score of 550 (paper-based score), 213 (computer-based score), or 79 (internet-based score).

These criteria are considered minimums and a higher level of performance (where applicable) enhances the likelihood of acceptance. Applicants who paid an application fee but were not accepted, can be considered, at no additional fee, for entry the following year. In order for the application to be considered for the following year, a request for reactivation of the application must be made in writing and received by the deadline for applications for the following year. Those not selected for the second year must submit a new application and pay the application fee for further consideration.

Applicants selected for programs in advanced education in general dentistry, oral and maxillofacial surgery, or pediatric dentistry must be eligible for licensure or intern certificate issued by the State of Ohio, and must be a graduate of a dental school accredited by the Commission on Dental Accreditation. International applicants are accepted into the programs offered by the Departments of Endodontics, Orthodontics, and Periodontics.

ADMISSION OF STUDENTS FROM OTHER COUNTRIES

See "Students from Other Countries" in the Student Affairs section of this Bulletin.

M.S.D. DEGREE AND RESIDENCY PROGRAMS

Registration

Advanced education programs operate on a twelve-month basis, from July 1 of one year to June 30 of the next. The year is divided into two, six-month semesters (fall: July 1 to December 31; spring: January 1 to June 30). The act of registration includes submission of a course schedule approved by the department, the payment of semester tuition and the completion of online registration form. Each semester, registration must be completed as scheduled. Students enrolled in fall and spring semesters may arrange to pay bills for tuition and fees in two installments. At least half of the total bill must be paid at registration, the remainder must be paid in accordance with university policy. Fees may be charged for late registration or late payment. Students who fail to register within 30 days after the published dates will be considered to have withdrawn from the program. In the School of Dental Medicine, students who are not registered are not considered students of record, lose the protections of the university in matters of liability and therefore, may not treat patients. They can no longer attend class or receive grades and will have to formally reestablish their matriculation. In any circumstance, all lost course and/or clinical time will be added to the end of the program’s original completion date.

Under unusual circumstances, special arrangements for registration may be made with permission of the department chair and the associate dean for graduate studies. Social Security numbers are used for all records and documents and must be provided at the time of registration. Foreign students will be issued a number for this purpose if they have not obtained a Social Security number prior to registration. New students and new residents who do not register as specified and who have failed to provide satisfactory reasons for the delay in advance, forfeit their right to admission. Vacancies which arise from such circumstances are filled from a list of alternate candidates at the discretion of the department.

Grading

The responsibility for assigning grades rests exclusively with the course director, who must announce the general method of grading at the beginning of the course. Course grades are reported to the Registrar of the School of Dental Medicine at the end of the course or when a final grade has been determined if prior to the scheduled completion time for the course. Incomplete or conditional grades can be changed only by the course director (see grading policies of the university). The following grading system is used at the School of Dental Medicine for advanced education courses:

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<th>Letter</th>
<th>Quality Points</th>
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<td>A-</td>
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Research Project
For master's degree programs, each student must carry out an original and meaningful research project acceptable to the department chair and the advisory committee. A written thesis, similarly acceptable, is to be prepared and must conform to the standard format determined by the Office of Graduate Studies of the School of Dental Medicine. The thesis must be submitted before the prescribed deadline. An oral examination (defense) of the thesis is required. This examination is administered by the student's advisory committee before a standard date set by the Office of Graduate Studies of the School of Dental Medicine. Unanimous agreement of the committee is required to pass the thesis examination. A student must be registered for thesis credit or continuing graduate work during the semester in which the thesis examination is conducted. The thesis defense is ordinarily open to all members of the university faculty, student body, and guests.

Extra Courses
Individual students enrolled in an advanced education program, whether or not a master's degree is involved, may be required to take courses beyond the general requirements set forth by the department in order to complete the program. In such instances, the student must be notified in writing by the department chair, with a copy filed in the Office of Graduate Studies of the School of Dental Medicine.

Time Limits
Each student is expected to maintain continuous registration and all requirements must be completed within five consecutive calendar years immediately following matriculation as an advanced education student, including approved periods of leave of absence. A student who fails to complete the requirements within five years must be formally readmitted with full standing in order to continue study, subject to terms of readmission, future time limits, and revised requirements for the award of the degree. Prior status in the program is no guarantee of readmission and should not be assumed.

Leave of Absence
A student may request a leave of absence for personal reasons or reasons of health when anticipated or actual absence is in excess of three weeks. A written request for a leave of absence must include the reason for the request and the length of time requested. A leave of absence cannot exceed one calendar year. It must be submitted to the program director and to the associate dean of graduate studies of the School of Dental Medicine. The program director will forward the request with his/her response to the Committee on Graduate Studies. In order to be eligible for such requests, the student must be currently enrolled and in regular attendance prior to the time or circumstances that necessitated the request. At the expiration of the leave, the student must resume registration unless formally granted an extension. A leave of absence does not extend the maximum time permitted for the completion of degree requirements. A student who fails to obtain an approved leave, or who fails to resume registration at the time expected, may be separated from the program. During the period of leave, it is expected that the student will not avail himself or herself of the teaching and research resources of the School of Dental Medicine or the university. At the end of an approved leave, reentry into the program is reviewed by the program director in concert with the Committee on Graduate Studies, and may not be at the same level attained at the time the leave was granted. Programs with a high patient case component may require that the clinical portion of the program be repeated in its entirety. Finally, the committee also reserves the right to place a student on leave of absence where it has been determined that the circumstances warrant, even in the absence of a formal request.

Maintenance of Good Standing
A minimum cumulative grade point average of 2.75 is required for good standing in a graduate program for all courses taken for graduate credit (excluding those graded Satisfactory/Unsatisfactory or Pass/No Pass).

The associate dean for graduate studies reviews student performance and may recommend a course of action to the Committee on Graduate Studies. The committee may require remedial work, place a student on academic review or probation, set conditions for continuation in the student's course of study or program, and may require withdrawal for failure to meet the academic standards set by the department or school. A student who receives a grade deemed unsatisfactory in any course is placed on probation and must remove himself or herself from probation within a time period specified by the committee. It is expected that removal from probation will ordinarily require repetition of the course with an acceptable grade or the successful completion of work deemed equivalent by the student's advisory committee and the departmental chair.
In this regard, a student may be separated from the university for any one of the following reasons:

1. Failure to correct probationary status within the specified time period.
2. Failure to achieve a minimum grade point average of 2.50 or above upon completion of 12 semester hours or a grade point average of 2.75 or higher upon completion of 21 semester hours of graduate study.
3. Failure to complete all requirements for the master's degree within five consecutive calendar years from the term of matriculation, unless granted an extension of a maximum of one year upon recommendation of the advisor and chair and approved by the associate dean for graduate studies.

In calculating the grade point average, all courses for which quality points are given are counted, including courses which may be required to be repeated. In addition, on the recommendation of the student's department, and with due process, the School of Dental Medicine may suspend or separate a student from the university for failure to maintain appropriate standards of conduct and integrity in discharging their responsibilities. Academic failure, moral delinquency, gross misconduct, or failure to meet the specific conditions of probation or academic review is sufficient reason for requiring withdrawal from the school.

Graduation

The minimum requirements for the master's degree in the School of Dental Medicine are 54 semester hours of course work, including six or more semester hours of thesis/equivalent registration, and the submission of an accepted thesis. Individual departments may require additional semester hours of specific course work and/or thesis. Not less than 48 semester hours may be at the 500 level or higher.

A candidate for a Master of Science in Dentistry degree must make application for the degree to the Office of Graduate Studies of the School of Dental Medicine no later than three months before the commencement at which the degree is expected.

The awarding of the degree is dependent upon the satisfactory completion of all requirements, and the recommendations of department chair, Committee on Graduate Studies, and faculty of the School of Dental Medicine. The student must complete all requirements for both the master's degree and certificate in order to receive either.

Degrees will not be awarded to candidates with delinquent financial accounts that include, but are not limited to, tuition payments, fees, and library fines.

DELAYED GRADUATION

A candidate who has successfully defended his or her thesis, but who fails to meet the deadline for thesis submission for graduation in one semester, will be permitted to receive his or her degree at the next scheduled graduation, without further registration or payment of tuition if the completed thesis is submitted within fourteen days of the date originally scheduled for graduation. If all requirements are not met within this grace period, the candidate must register for the subsequent semester.

COURSE DESCRIPTIONS (COMP)

COMP 358. Clinical Oral Surgery I (1)

COMP 387. General Practice Dentistry A (1.5)

COMP 389. General Practice Dentistry B (1.5)

COMP 390. General Practice Dentistry A (1.5)

COMP 394. General Practice Dentistry B (1.5)

COMP 458. Clinical Oral Surgery II (1)

COMP 495. Directed Clinical Studies (1)

This course is intended to provide students with the opportunity to advance their dental clinical patient skills in the comprehensive care clinics of the school while also providing advanced opportunities for students who are so inclined to focus in individual areas of clinical skills development.

COURSE DESCRIPTIONS (DENC)

DENC 322. Surgical Periodontics (1.5)

DENC 328. Oral Diagnosis and Treatment Planning (1)

DENC 334. Operative Dentistry Clinic (2)

DENC 336. Operative Dentistry Clinic II (2)

DENC 338. Pediatric Dentistry Clinic (1.5)

DENC 339. General Dentistry Clinical Qualifying (5)

DENC 342. Periodontics (5)

DENC 348. Endodontics Clinic (1.5)

DENC 349. Endodontics Clinic II (1.5)

DENC 352. Surgical Periodontics (1.5)

DENC 358. Clinical Oral Surgery I (1)

DENC 364. Operative Dentistry Clinic (2)

DENC 366. Operative Dentistry Clinic II (2)

DENC 368. Endodontics Clinic (1.5)

DENC 372. Oral Diagnosis and Treatment Planning (1)

DENC 378. Pediatric Dentistry Clinic (1.5)

DENC 382. Surgical Periodontics (1.5)

DENC 386. Operative Dentistry Clinic (2)

DENC 388. Operative Dentistry Clinic II (2)

DENC 389. General Practice Dentistry B (1.5)

DENC 390. General Practice Dentistry A (1.5)

DENC 392. General Dentistry Clinical Qualifying (5)

DENC 393. General Dentistry Clinical Qualifying II (5)

DENC 394. Endodontics Clinic (1.5)

DENC 395. Directed Clinical Studies (1)

DENC 397. Quality Assurance (1)

DENC 398. Endodontics Clinic II (1.5)

DENC 399. General Dentistry Clinical Qualifying II (5)

DENC 400. General Dentistry Clinical Qualifying III (5)

DENC 402. Periodontics (5)

DENC 404. General Dentistry Clinical Qualifying IV (5)

DENC 406. General Dentistry Clinical Qualifying V (5)
DENC 428. Oral Diagnosis and Radiology (.5)
Clinical experience in the admitting and radiology service.

DENC 448. Endodontics (1)
Clinical application of the principles of endodontics therapy. Diagnosis and treatment planning. Management of endodontic emergencies and prognosis of endodontic treatment.

DENC 464. Operative Dentistry (1.5)
Clinical application of the principles of operative dentistry.

DENC 468. Prosthodontics (1.5)
Clinical application of the principles of prosthodontic dentistry.

DENC 474. Fixed Prosthodontics (1.5)
Treatment of patients requiring simple and advanced fixed prostheses as an integrated part of total patient care.

DENC 478. Pediatric Dentistry (1)
Emphasizes comprehensive oral health care of the well child to provide experience in examining, diagnosing, treatment planning, and completing treatment of a selected number of children. Preventive aspects of pediatric dentistry emphasized. Additional voluntary experiences in clinical practice of pediatric dentistry available.

DENC 482. Clinical Orthodontics (1)
Clinical application of the principles of orthodontics.

DENC 487. General Practice Dentistry B (2.5)
Comprehensive dental care. Each student is assigned for clinical training to a preceptor group led by a practicing general dentist. The preceptor guides the students in diagnosis, treatment planning, and actual patient treatment with consultation in various specialties as required. Experiences in the provision of emergency dental care. The preceptor directs the total dental health care of the patients of each of his students. Biweekly seminars are provided for each preceptor group. Special topics, students cases, techniques, and journal articles are discussed. Recommended preparation: Concurrent enrollment in DENC 489.

DENC 489. General Practice Dentistry B (2.5)
Comprehensive dental care. Each student is assigned for clinical training to a preceptor group led by a practicing general dentist. The preceptor guides the students in diagnosis, treatment planning, and actual patient treatment with consultation in various specialties as required. Experiences in the provision of emergency dental care. The preceptor directs the total dental health care of the patients of each of his students. Biweekly seminars are provided for each preceptor group. Special topics, students cases, techniques, and journal articles are discussed. Recommended preparation: Concurrent enrollment in DENC 487.

DENC 490. General Practice Dentistry A (2.5)
Clinical application of the principles of general practice dentistry. Recommended preparation: Concurrent enrollment in DENC 494.

DENC 492. General Dentistry Clinical Competency (.5)
This course consists of the successful completion of the recall, emergency, diagnosis and treatment planning, and patient outcomes clinical competencies. It is also necessary for the student to successfully fulfill the recall needs of their assigned clinic patients in order to pass this course. Recommended preparation: Completion of Basic Core Program.

DENC 494. General Practice Dentistry B (2.5)
Clinical application of the principles of general practice dentistry. Recommended preparation: Concurrent enrollment in DENC 490.

DENC 498. Quality Assurance (1)
This course reinforces quality assurance skills and knowledge provided in the prerequisite course including, but not limited to: providing students with the working knowledge of dental record keeping, as it relates to diagnosis and treatment of pathology; recognition and management of medical illness and disabilities; treatment planning; documentation of pre-existing conditions, current and past treatment; established laboratory protocols; evaluation of reasons for remakes and re-done; post-treatment evaluation of care. Recommended preparation: DEND 394.

COURSE DESCRIPTIONS (DEND)
DEND 315. Practice Management I (1)
This course is designed to develop practical knowledge and skills in dental practice management. It is organized around initial topics that will lay the foundation for adequate planning for practice success after graduation. The subsequent courses build upon this foundation knowledge so that students will have a general perspective of where to begin their strategies for success in the future. This course discusses topics that include analysis of practice configurations, choosing the appropriate consultants, basic tools for fiscal management and evaluation, and identifying opportunities that match the student’s life goals.

DEND 415. Practice Management II (2)
Students deal with entrepreneurship applications and experiences specific to dentistry and are introduced to the process of formulating a business plan. Personal finance and investment strategies are covered in this course, particularly as they pertain to developing a business plan for the students’ careers. Each student constructs a business plan specific to the goals and situation of that student.

DEND 416. Practice Management III (1.5)
This course is designed to develop practical knowledge and skills in dental practice management. As the student prepares for clinical practice, topics surrounding negotiation of working contracts, insurance contract evaluation, policies, compliance, and marketing are among some of the most important issues to be familiar with. Skills acquired in the preceding course are applied to the student’s “practice” (panel of patients) for evaluation of practice productivity and growth.

DEND 420. Jurisprudence and Professional Ethical Responsibility (.5)

SCHOOL OF DENTAL MEDICINE

Ethical and legal issues, civil and criminal law, contracts, malpractice and current ethical and legal dilemmas encountered in practice.

DEND 421. Periodontal Medicine and Cases (1)
Further application of the knowledge and skills learned in prior periodontal courses. Focus is on how selective periodontal treatment can be integrated into a treatment plan considering the parameters presented by a special situation. Some examples are treatment related to endodontics, prosthodontics, geriatrics, esthetics, orthodontics and implantology.

DEND 426. Oral Diagnosis Seminar (1)
Case-based review of oral diagnosis, radiology, and medicine.

DEND 455. Oral Surgery IV-A (.5)

DEND 482. Orthodontics (1)
Instruction through lectures and audio-visual programs enabling the student to gain judgment, knowledge, and skills to select and treat uncomplicated tooth irregularities in children and adults. Advanced topics in comprehensive orthodontics, such as surgical orthodontics and clef; palate treatment.

DEND 488. Case Presentations (2.5)
Selected cases presented by students and instructors emphasizing diagnosis, treatment planning, and complete patient care. Topics of special interest covering the concepts of total patient care and recent advances in dental treatment presented by guest lecturers and faculty.

COURSE DESCRIPTIONS (DENF)
DENF 422. Comprehensive Periodontics (3)
This course is available only to dental school faculty who have earned dental degrees from foreign institutions and who have approval of their chair and the dean to register. Successful completion of the course is accomplished by fulfilling the unit requirements, competency exams and any other written or practical requirements set forward by the Dental Education Committee and approved by the general faculty of the School of Dental Medicine in order to assure competency in the periodontic procedures associated with general dentistry.

DENF 428. Comprehensive Oral Medicine (3)
This course is available only to dental school faculty who have earned dental degrees from foreign institutions and who have the approval of their department chair and the dean to register. Successful completion of the course is accomplished by fulfilling the unit requirements, competency exams and any other written or practical requirements set forward by the Dental Education Committee and approved by the general faculty of the School of Dental Medicine in order to assure competency in the radiologic and oral diagnostic procedures associated with general dentistry.

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DENF 448. Comprehensive Endodontics (3)  This course is available only to dental school faculty who have earned dental degrees from foreign institutions and who have the approval of their department chair and the dean to register. Successful completion of the course is accomplished by fulfilling the unit requirements, competency exams and any other written or practical requirements set forward by the Dental Education Committee and approved by the general faculty of the School of Dental Medicine in order to assure competency in the endodontic procedures associated with general dentistry.

DENF 455. Comprehensive Oral Surgery (3)  This course is available only to dental school faculty who have earned dental degrees from foreign institutions and who have the approval of their department chair and the dean to register. Successful completion of the course is accomplished by fulfilling the unit requirements, competency exams and any other written or practical requirements set forward by the Dental Education Committee and approved by the general faculty of the School of Dental Medicine in order to assure competency in the oral surgery procedures associated with general dentistry.

DENF 464. Comprehensive Operative Dentistry (3)  This course is available only to dental school faculty who have earned dental degrees from foreign institutions and who have the approval of their department chair and the dean to register. Successful completion of the course is accomplished by fulfilling the unit requirements, competency exams and any other written or practical requirements set forward by the Dental Education Committee and approved by the general faculty of the School of Dental Medicine in order to assure competency in the operative procedures associated with general dentistry.

DENF 468. Comprehensive Removable Prostodontics (3)  This course is available only to dental school faculty who have earned dental degrees from foreign institutions and who have the approval of their department chair and the dean to register. Successful completion of the course is accomplished by fulfilling the unit requirements, competency exams and any other written or practical requirements set forward by the Dental Education Committee and approved by the general faculty of the School of Dental Medicine in order to assure competency in the removable prosthodontics procedures associated with general dentistry.

DENF 474. Comprehensive Fixed Prosthodontics (3)  This course is available only to dental school faculty who have earned dental degrees from foreign institutions and who have the approval of their department chair and the dean to register. Successful completion of the course is accomplished by fulfilling the unit requirements, competency exams and any other written or practical requirements set forward by the Dental Education Committee and approved by the general faculty of the School of Dental Medicine in order to assure competency in the fixed prosthodontic procedures associated with general dentistry.

DENF 478. Comprehensive Pedodontics and Orthodontics (3)  This course is available only to dental school faculty who have earned dental degrees from foreign institutions and who have the approval of their department chair and the dean to register. Successful completion of the course is accomplished by fulfilling the unit requirements, competency exams and any other written or practical requirements set forward by the Dental Education Committee and approved by the general faculty of the School of Dental Medicine in order to assure competency in the pediatric and orthodontic procedures associated with general dentistry.

**COURSE DESCRIPTIONS (DENT)**

DENF 501. Biological Aspects of the Stomatological System (2)  This course is a review of biochemistry, molecular and cellular biology, histology, and oral anatomy and an expansion of oral biological topics that underlie the disciplines of endodontics, orthodontics, periodontics, and pediatric dentistry.

DENF 502. Correlative Medical Science (2)  Case-based discussion of selected systemic disease commonly encountered by the dentist.

DENF 503. Facial Growth and Development (1)  Emphasis on the qualitative, quantitative, and integrative changes during postnatal craniofacial growth and development.

DENF 504. Advanced Facial Growth (1)  Student participation in seminar evaluation series dealing with problems and controversies apparent in the literature in regard to theories of growth, development, and aging. Emphasis on the craniofacial literature, but not exclusively.

DENF 505. Dentofacial Anomalies (1)  This course is designed to provide students with the practical experience regarding the multidisciplinary aspects of diagnosis and treatment of patients with craniofacial anomalies. Observation of team sessions and active participation in patient examinations, diagnosis, and treatment planning.

DENF 506. Concepts of Occlusion (Orthodontics) (1)  Course given in a continuing education format dealing with the spectrum of gnathology. Subjects include the physiology of occlusion, record-taking and mounting of cases, laboratory and clinical exercises in occlusal equilibration, splint construction, set-ups, positioner construction, and the examination, diagnosis, and treatment of various TMJ disorder. Instruction is carried out by the use of lectures and laboratory and clinical exercises.

DENF 507. Master’s Thesis Hypothesis (1)  The requirements for the degree of Master of Science in Dentistry include the successful completion of a suitable research experience, demonstration of scholarly attainment, and the ability to conduct directed research. This course will be directed toward initiating the student’s research component of their Master of Science in Dentistry degree by culminating in the development of the thesis protocol. Research topics covered may include human subjects protection, sample size calculation and power applied to student’s area of research interest, study design, and statistical approach. Students will complete the CITI certification process.

DENF 508. Master’s Thesis Protocol (2)  The requirements for the degree of Master of Science in Dentistry include the successful completion of a suitable research experience, demonstration of scholarly attainment, and the ability to conduct directed research.

DENF 509. Advanced Dental Studies (1 - 10)  A course for non-degree-seeking students who wish to pursue special post-doctoral studies in the School of Dental Medicine. Arrangement made through the department and the associate dean for graduate studies.

DENF 510. Epidemiology and Biostatistics (3)  A detailed presentation of epidemiological and biostatistical techniques designed to acquaint the student with a broad spectrum of scientific approaches and to prepare for a research project. Topics include design of observational and experimental studies, common biostatistical techniques encountered in the dental literature such as t-test, ANOVA, chi-square, correlation and regression, and assessing the validity of diagnostic tests. Instruction includes lectures, critique of selected literature and computer analysis of data.

DENF 512. Advanced Oral Pathology (3)  Lectures and seminars on the clinical and histopathologic characteristics of many of the common oral diseases. Special emphasis on developing a logical approach to clinical and histopathologic diagnosis. Participation is expected for in-class discussion of the clinical and histopathologic material presented.

DENF 513. Anatomy of the Head and Neck (3)  This course deals with the structural, functional, and clinical relationships of the many organs and organ systems which comprise the head, neck, and pharyngeal regions of the human body.

DENF 514. Research Methods: Preparation (1.5)  The goal of this course is to facilitate a formal statement of the student’s research idea as preparation for working with a thesis committee or undertaking independent research.

DENF 515. Interdisciplinary Seminar (.5)  A weekly seminar in which faculty research is presented and discussed. Included are dental, medical, engineering and social sciences faculty who are collaborating in an interdisciplinary fashion on basic and/or applied research topics of interest to the dental profession. When appropriate, M.S.D. candidates present their research to the seminar group.

DENF 516. Microbiology, Immunology, and Immune Systems (1)  This course reviews bacterial structure and classification, provides insight into oral bacterial pathogenesis, Principles of antibiotic use and mechanisms of
resistance are reviewed. Microbial diagnostic methodologies are discussed. Integration of periodontics, endodontics, and pediatric dentistry is stressed as it relates to the inflammatory process in the human host.

DENT 518. Behavioral Considerations in Oral Health Care (3)
This course focuses on the behavioral knowledge and skills the oral health practitioner must possess in order to deliver effective, patient-centered care. Specifically, the course is designed to enhance graduate students’ existing knowledge and skills in relation to dentist-patient communication, management of diverse patient populations, and patient education and facilitation of health behavior change.

DENT 523. Clinical Specialty Seminar I - Orthodontics (2)
This course is a companion to clinical training in orthodontics and involves faculty and student evaluation of past and present literature. Sessions are used to evaluate current timely literature, and lectures and seminars complement the clinical experiences with topics including patient management, treatment of various aged populations and malocclusions, orthopedic appliances, treatment of patients with special needs, and various aspects of fixed and removable mechanotherapy. First in a series of four courses.

DENT 524. Clinical Specialty Seminar II - Orthodontics (2)
Second in a series of four courses. (See DENT 523.)

DENT 527. Clinical Specialty Seminar III - Orthodontics (2)
Third in a series of four courses. (See DENT 523.)

DENT 528. Clinical Specialty Seminar IV - Orthodontics (2)
Fourth in a series of four courses. (See DENT 523.)

DENT 529. Endodontology I (3)
Scientific rationale for endodontic practice. Endodontic anatomy, physiology, pathology, and microbiology. All treatments and techniques studied and substantiated by current and classical research. First in a series of four courses.

DENT 530. Endodontology II (3)
Second in a series of four courses. (See DENT 529.)

DENT 531. Endodontology III (3)
Third in a series of four courses. (See DENT 529.)

DENT 532. Endodontology IV (3)
Fourth in a series of four courses. (See DENT 529.)

DENT 533. Pediatric Dentistry Literature Review I (2)
Review of the literature in preparation for the specialty board examination in pediatric dentistry. Includes articles on various topics including growth and development, special needs patients, oral pathology and oral medicine, and clinical and hospital practice.

DENT 534. Pediatric Dentistry Literature Review II (2)
Second in a series of four courses. See DENT 533 Pediatric Literature Review I.

DENT 535. Fundamentals in Pediatric Dentistry I (3)
Students present selected chapters from major pediatric dentistry review books for critique and discussion. Major strengths and weaknesses are emphasized. The course director then presents the most current information on the subject.

DENT 536. Fundamentals in Pediatric Dentistry II (3)
Second in a series of two courses. See DENT 535 Fundamentals in Pediatric Dentistry I.

DENT 537. Advanced Clinical Pediatric Dentistry I (3)
Students develop skills in diagnosis, radiographic technique, treatment planning, preventive and restorative dentistry, space management, trauma management, and nonpharmacologic behavior management. There is an opportunity to attend hospital grand rounds and physician conferences.

DENT 538. Advanced Clinical Pediatric Dentistry II (3)
Students develop skills in diagnosis, radiographic technique, treatment planning, preventive and restorative dentistry, space management, trauma management, and nonpharmacologic behavior management. There is an opportunity to attend hospital grand rounds and physician conferences.

DENT 539. Endodontic Literature Review I (3)
Provides scientific basis for present and future treatment. Instructs students in critically evaluating literature. Provides format for lifelong self-education. Specific journal assignments summarized, evaluated, and presented for group discussion weekly. First in a series of four courses.

DENT 540. Endodontic Literature Review II (3)
Second in a series of four courses. (See DENT 539.)

DENT 541. Endodontic Literature Review III (3)
Third in a series of four courses. (See DENT 539.)

DENT 542. Endodontic Literature Review IV (3)
Fourth in a series of four courses. (See DENT 539.)

DENT 550. Clinical Pharmacology (1)
This course is designed to enable residents to obtain an understanding of the pharmacology of the most commonly prescribed medications: pharmacotherapeutic concepts in relationship to disease pathophysiology; rational drug therapy in the treatment of disease; drug-drug interactions and drug-disease interactions; adverse drug events. Residents will be expected to apply information on disease pathophysiology and pharmacotherapy to clinical cases. The ultimate goal is to provide relevant information to assist clinicians in practice.

DENT 551. Clinical Endodontic Specialty I (3)
Students present case histories as they encounter them in clinic. Cases discussed in detail and critically evaluated by colleagues and graduate endodontic faculty. Past endodontic literature discussed in detail as each student presents a topic assigned by faculty. Problems in clinic discussed. Several guest endodontists present various techniques and perform them. First in a series of four courses.

DENT 552. Clinical Endodontic Specialty II (3)
Second in a series of four courses. (See DENT 551.)

DENT 553. Clinical Endodontic Specialty III (3)
Third in a series of four courses. (See DENT 551.)

DENT 554. Clinical Endodontic Specialty IV (3)
Fourth in a series of four courses. (See DENT 551.)

DENT 555 Management of Medical Emergencies (1)
This course covers the diagnosis and management of common medical emergencies, with special emphasis on patient evaluation and history taking to prevent such emergencies in the dental office. Venipuncture technique and the use of emergency equipment are demonstrated. Also included is a basic course in cardiopulmonary resuscitation, with practical demonstrations and examinations that lead to certification in basic CPR.

DENT 557 Periodontal Conference I (1)
Presentation of treated patients with advanced periodontal disease. Discussion of the clinical findings, etiology, diagnosis, and treatment plan. Critical review of the different surgical procedures used in therapy and evaluation of postoperative results. First in a series of four courses.

DENT 558. Periodontal Conference II (1)
Second in a series of four courses. (See DENT 557.)

DENT 559. Periodontal Conference III (1)
Third in a series of four courses. (See DENT 557.)

DENT 560. Periodontal Conference IV (1)
Fourth in a series of four courses. (See DENT 557.)

DENT 561. Orthodontics for Pediatric Dentists I (1)
The course is designed to familiarize the pediatric dentistry residents with (1) the clinical evaluation of patients to determine appropriateness of orthodontic intervention, (2) record taking, (3) diagnosis, (4) treatment planning of cases in the mixed and permanent dentition, (5) treatment administration and (6) retention strategies. The primary focus will be on interceptive orthodontics including growth modification and corrective orthodontics in the permanent dentition. First in a series of four courses.

DENT 562. Orthodontics for Pediatric Dentists II (1)
Second in a series of four courses. See DENT 561 Orthodontics for Pediatric Dentists.

DENT 564. Advanced Principles of Occlusion (1)
This course is designed to provide in-depth knowledge of the structure and function of all anatomic components involved in occlusion, biomechanics of articulation and mastication; recording of mastication patterns; diagnosis of occlusal dysfunction; relationship to neuromuscular and temporomandibular joint anatomy and pathology; evidence based therapy used in the management of occlusal and temporomandibular disorders and its significance to inflammatory periodontal disease.

DENT 565. Practice Management I (Ortho) (1)
Seminar and demonstration course designed to prepare the student for all phases of the “business” of orthodontics as well as the responsibility of being a “professional.” Management of the department clinic, private practice management, office visitation, and the business community, and ethics through the use of guest speakers on jurisprudence, personal and professional insurance, accounting, estate planning, risk management, informed consent, banking, office design, organized dentistry and investments. First in a series of four courses.

DENT 566. Practice Management II (Ortho) (1)
Second in a series of four courses. (See DENT 565.)

DENT 567. Practice Management III (Ortho) (1)
Third in a series of four courses. (See DENT 565.)

DENT 568. Practice Management IV (Ortho) (1)
Fourth in a series of four courses. (See DENT 565.)

DENT 569. Orthodontic Literature Review I (1)
The course will focus on contemporary and classic literature selected to cover a wide range of orthodontic topics. The selected literature includes the reading list suggested by the American Board of Orthodontics in preparation for the Part II of the ABO examination. Students will be required to discuss the articles and answer questions pertaining to the reviewed material.

DENT 570. Orthodontic Literature Review II (1)
The course will focus on contemporary and classic literature selected to cover a wide range of orthodontic topics. The selected literature includes the reading list suggested by the American Board of Orthodontics in preparation for the Part II of the ABO examination. Students will be required to discuss the articles and answer questions pertaining to the reviewed material.

DENT 572. Pre-Clinical Principles in Orthodontics (1)
This course is comprised of a series of seminars presented by orthodontic faculty covering topics that will prepare the first orthodontic resident for the initial phases of clinical training.

DENT 573. Advanced Specialty Principles: Clinical I (2)
Full fixed orthodontic appliance treatment of patients in an educational setting. First in a series of four courses.

DENT 574. Advanced Specialty Principles: Clinical II (2)
Second in a series of four courses. (See DENT 573.)

DENT 575. Advanced Specialty Principles: Clinical III (2)
Third in a series of four courses. (See DENT 573.)

DENT 576. Advanced Specialty Principles: Clinical IV (1)
Fourth in a series of four courses. (See DENT 573.)

DENT 577. Clinical Periodontics I (3)
Clinical practice of periodontics supplemented by case evaluation and treatment planning. A comprehensive study of normal and diseased periodontal tissues including etiology and diagnosis. Current modes of therapy-rationale technique, and prognosis. First in a series of four courses.

DENT 578. Clinical Periodontics II (3)
Second in a series of four courses. (See DENT 577.)

DENT 579. Clinical Periodontics III (3)
Third in a series of four courses. (See DENT 577.)

DENT 580. Orthodontics-Oral Surgery Conference (1)
A seminar series involving a multidisciplinary approach to the treatment of patients with severe craniofacial deformities. Begins in the fall of each year (continuing for four semesters) with a series of lectures, followed by assignment of patients supervised jointly by the departments of orthodontics and oral surgery. Meetings held bimonthly to review patient progress, plan treatment, and present cases for discussion. Each student involved in all phases of treatment: presurgical orthodontics, the surgical procedure, finishing orthodontics, and retention.

DENT 581. Clinical Periodontics III (3)
Third in a series of four courses. (See DENT 577.)

DENT 582. Clinical Periodontics IV (3)
Fourth in a series of four courses. (See DENT 577.)

DENT 583. Orthodontic Diagnostic Seminar I (1)
Series of lectures and seminars covering the science of orthodontic diagnosis. Course consists of lectures on techniques of diagnosis, treatment planning, and critique of cases from the department or from faculty private practices. Content also includes long-term follow-up of post retention cases. First in a series of three courses.

DENT 584. Orthodontic Diagnostic Seminar II (1)
Second in a series of three courses. (See DENT 583.)

DENT 585. Orthodontic Diagnostic Seminar III (1)
Third in a series of three courses. (See DENT 583.)

DENT 586. Limited Tooth Movement for the Dental Specialist (1)
A review of the rationale for orthodontic treatment in periodontally diseased patients and in pre-restorative dentitions. Lectures, audio-visual programs, and technique sessions. Diagnosis, treatment planning, and various methods of tooth movement.

DENT 587. Periodontal Prosthesis (1)
This course examines and defines the periodontal prosthesis interrelationships beginning with treatment planning and continuing with discussing the utilization of the combined treatment modalities. It focuses on provisionalization, fi xation treatment, occlusion, aesthetics, removable appliances, and special advanced treatment problems.

DENT 588. Hospital Rotation (2)
Students are assigned full time to anesthesia service and perform such duties as directed by anesthesiology staff: preoperative evaluation of patients, indications and contraindications for specific methods of anesthesia, relationship of medical problems to anesthesia risks, assisting in preparation of patients for anesthesia, intubation and anesthesia management, assisting in the management of complications, and post-anesthetic recovery management including monitoring of vital signs, blood gases, EKG, etc., and participation in post-anesthesia rounds and conferences.

DENT 591. Orthodontics for Pediatric Dentists I (1)
Third in a series of four courses. See DENT 561 Orthodontics for Pediatric Dentists.

DENT 592. Orthodontics for Pediatric Dentists IV (1)
Fourth in a series of four courses. See DENT 561 Orthodontics for Pediatric Dentists.

DENT 595. Advanced Periodontal Seminar I (1.5)
Series of seminars covering clinical, histological, and physiological aspects of the periodontium in health and disease, etiology, diagnosis, prognosis, prevention, and treatment of periodontal disease, as well as the relationship of periodontics to other phases of dentistry. First in a series of four courses.

DENT 596. Advanced Periodontal Seminar II (1.5)
Second in a series of four courses. (See DENT 595.)

DENT 597. Advanced Periodontal Seminar III (1.5)
Third in a series of four courses. (See DENT 595.)

DENT 598. Advanced Periodontal Seminar IV (1.5)
Fourth in a series of four courses. (See DENT 595.)

DENT 631. Pediatric Dentistry Literature Review III (2)
Third in a series of four courses. See DENT 533 Pediatric Dentistry Literature Review I.

DENT 632. Pediatric Dentistry Literature
Review IV (2)
Fourth in a series of four courses. See DENT 533 Pediatric Dentistry Review I.

DENT 637. Advanced Clinical Pediatric Dentistry III (3)
Third in a series of four courses. See DENT 537 Advanced Clinical Pediatric Dentistry I. Additionally, residents learn to manage children with complex special health care needs, including inpatients. Residents interact and coordinate with other medical departments within the hospital, and with outside clinics and practitioners.

DENT 638. Advanced Clinical Pediatric Dentistry IV (3)
Fourth in a series of four courses. See DENT 637 Advanced Clinical Pediatric Dentistry III.

DENT 639. Advanced Seminar in Pediatric Dentistry I (3)
Students present patient cases for in-depth discussion of specific clinical problems.

DENT 640. Advanced Seminar in Pediatric Dentistry II (3)
Second in a series of two courses. See DENT 637 Pediatric Dental Seminar I.

DENT 651. Thesis M.S.D. (1 - 9)
Subsections for each program area of study: endodontics, orthodontics, periodontics, or pediatric dentistry.

DENT 661. Conscious IV Sedation I (2)
Didactic portion covers physical evaluation, physiology, pharmacology, emergencies, and techniques. Cardiac monitoring, basic life support, and advanced cardiac life support.

DENT 662. Conscious IV Sedation II (1)
(See DENT 661.) Supervised clinical experience in conscious IV sedation.

DENT 663. Implant Dentistry I Periodontics (1)
Designed to enhance the understanding of current concepts and their role in the multidisciplinary treatment of the patient.

DENT 664. Implant Dentistry II Periodontics (1)
(See DENT 663.) Clinical demonstration, participation, and case presentation in implant dentistry.

DENT 682. Cephalometrics (1)
A lecture and laboratory course in cephalometric roentgenography leading to a thorough understanding of craniofacial radiographic techniques. Use of x-rays and radiation hygiene, and technical and interpretive proficiency.

DENT 683. Imaging and IT in the Orthodontic Office (1)
This course is designed to give some basic computer knowledge and prepare the resident for the use of computers in the orthodontic office.

DENT 684. Radiology and Cephalometrics (1)
Fundamentally related to cephalometric radiography, skeletal morphology, and cephalogram interpretations of historic analyses via the Krogman-Sassouni Syllabus. Also, clinical evaluations of hard and soft tissue relationships of the airway and skeletal maturation are presented. The use of Bolton Standards in craniofacial analysis is stressed.

DENT 685. Literature Review in Periodontics I (1)
Comprehensive discussion of selected articles related to clinical periodontology and basic sciences of significance to periodontal research and therapy.

DENT 686. Literature Review in Periodontics II (1)
(See DENT 685.)

DENT 687. Literature Review in Periodontics III (1)
Third in a series of four courses. See DENT 685.

DENT 688. Literature Review in Periodontics IV (1)
Fourth in a series of four courses. See DENT 685.

DENT 690. Pediatric Dental Residency (1 - 10)
Allows registration for non-degree-seeking students in graduate level courses at the direction of the department.

DENT 692. Restorative Fellowship (6)
Provides for 12 months of clinical and didactic training in all phases of general dentistry beyond the scope of predoctoral dental education. Areas of emphasis include advanced restorative techniques, proper selection of restorative materials, restoration of implants, fixed and removable prosthodontics, and esthetic dentistry. At the discretion of the course director, students may register for an additional 12 months, during which time the student will build on knowledge attained during the first year, continue with advanced didactic instruction, expand their clinical experience through continued patient care, participate in clinical research, and have teaching opportunities.

DENT 694. Fellowship in Dentistry (6)
The Fellowship in Dentistry provides for advanced clinical, didactic and research training beyond the scope of the pre-doctoral dental education.

DENT 695. Oral Surgery Residency (1 - 10)
Allows registration for non-degree-seeking students in graduate level courses at the direction of the department.

COURSES DESCRIPTIONS (DSPR)

DSPR 232. Periodontics (1)
A comprehensive course in periodontology including etiology, diagnosis, radiographic, interpretations and prognosis.

DSPR 234. Oral Pathology (3)
Diseases and abnormalities of the teeth and adjacent hard and soft tissues. Includes periodontal, pulpal, and periapical diseases as well as cysts, tumors, developmental anomalies, and oral aspects of systemic disease.

DSPR 236. Cariology (1)
Etiology, clinical and radiologic features, risk assessment, and prevention of caries.

DSPR 239. Neoplasia (.5)
Topics covered in this educational module include tumor nomenclature, features of benign versus malignant tumors, cytologic characteristics of cancer cells, pathogenesis and prognosis.

DSPR 333. Management of Medical Emergencies (1)
Patient evaluation, diagnosis and treatment of life-threatening emergencies that may arise in the course of dental treatment. Includes instruction in basic life support and cardiopulmonary resuscitation.

DSPR 341. Oral Diagnosis and Radiology (2)
This course helps the beginning clinician develop and understand the diagnostic process. It is designed to present to the student a method by which the common oral problems facing the dental practitioner can be recognized, diagnosed, evaluated and managed.

DSPR 342. Oral Cancer Diagnosis (1)

DSPR 352. Dental Management of Medical Disease (1)
Hospital procedures and protocol and the management of surgical complications and emergencies. General principles of surgery as applied to selected topics.

COURSE DESCRIPTIONS (DSRE)

DSRE 335. Clinical Pharmacology (2)
This course is designed to review common pharmacologic agents encountered in the general population. Emphasis is placed on the prescription, action, and interaction of dental pharmacologic agents as well as the implication of medical prescriptions on dental therapy. The course culminates in the evaluation of case studies and problem solving in drug therapy.

DSRE 354. Oral Surgery IV (1)

DSRE 374. Fixed Prosthodontics (1.5)
Diagnosis and treatment planning in fixed prosthodontics and construction of simple crowns and bridges. Lecture series concerning the discussions and demonstration of elementary and advanced methods of restoring occlusion, esthetics, and speech using fixed prosthesis.

DSRE 391. Endodontics (1)
Recognition of endodontic pulpal health and the changes that occur in the transition from health to
and death, cell signaling, differentiation and gene expression. The cell cycle, mechanisms for cell damage, repair and death, cell signaling, differentiation and gene expression. This course serves as a foundation for the modules in Health and Wellbeing and Disease Processes.

HEWB 123. Facial Growth (1)
Introduction to the normal growth and development of the human face from embryology to adult.

HEWB 124. Masticatory Dynamics (2)
Descriptive anatomy of masticatory structures with emphasis on deciduous and permanent teeth and the temporomandibular-mandibular movements, and the fundamental concepts of the functional relationships between the dentition and the temporomandibular joint. Lectures on comparative anatomy and variations in tooth morphology.

HEWB 126. Masticatory Dynamics Lab (1.5)
Companion pre-clinical component to HEWB 124. Laboratory exercises and assignments include drawings, waxups and tooth identification, and use of semi-adjustible articulator.

HEWB 128. Body as Host (2.5)
This educational module focuses on the role of bacteria, viruses, and fungi in immune function that preserves and maintains health and discusses host changes that occur during oral and systemic disease processes.

HEWB 130. Oral Histology (1.5)
Development of teeth and supporting tissues. Histology and ultrastructure cytology of the oral region with emphasis on the calcified tissues.

HEWB 134. Head and Neck Structure and Function (2)
This course explores the developmental, cellular, physiologic, anatomic and biochemistry components of the head and neck region. The focus is both healthy functioning and disease of the head and neck area.

HEWB 249. DentoFacial Morphology (1)
Provides the dental student with an introduction to the assessment of dynamic faces and the relatively static dentition. The course details the etiologies and characteristics of various malocclusions including developmental disharmonies observed during the growth and development of a child. Primary emphasis is on empowering the student in the diagnosis of malocclusions employing study casts, intra and extra-oral photographs and cephalograms.

**COURSE DESCRIPTIONS (HEWB)**

**HEWB 121. Foundations of Life Science (4.5)**
This course includes an introduction to basic elements of cell structure and function. This includes the characteristics and role of different types of cells, the cell cycle, mechanisms for cell damage, repair and death, cell signaling, differentiation and gene expression. This course serves as a foundation for understanding the health and well-being of the body.

**HEWB 131. Heart and Lungs in Disease and Health (2)**
This course provides students with the understanding of the structural and functional relationships of the cardiovascular and respiratory systems. This integrated approach serves as a foundation for understanding the health and well-being of the systems. This education module also facilitates student recognition of cardiovascular and respiratory dysfunction that may be present in their patients and helps students understand how such conditions may affect their patients’ general and oral health.

**HEWB 232. Health and Disease: Renal and Hematologic Systems (2)**
This educational module focuses on the understanding of the structural and functional relationships of the renal and hematologic systems. This integrated approach serves as a foundation for understanding the maintenance of health and well-being as well as disease processes within the body.

**HEWD 241. Gastrointestinal System in Health and Disease (2)**
This educational module focuses on the understanding of the structural and functional relationships of the gastrointestinal system in health and disease.

**HEWD 243. Endocrine and Reproductive Systems in Health and Disease (1.5)**
This educational module focuses on the understanding of the structural and functional relationships of the many components of the endocrine and reproductive systems in health and disease.

**HEWD 245. Musculoskeletal System in Health and Disease (1.5)**
This educational module focuses on the understanding of the structural and functional relationships of the many components of the musculoskeletal system in health and disease.

**HEWD 246. Neuroscience in Health and Disease (2)**
An integrated approach to the anatomy and physiology of the human nervous system. Analyzes neural phenomena at both cellular and systems levels.

**COURSE DESCRIPTIONS (INQU)**

**INQU 101. Orientation to Small Group Learning (.5)**
This module provides a framework for small group learning and independent study emphasizing the use of evidence and academic resources.

**INQU 102. ACE: Knowing the Patient (2)**
This ACE introduces the student to professional patient interaction and evaluation in a simulated environment. Students will develop interview techniques, learn patient appraisal skills, and techniques for communicating effectively in a health care environment. Students will experience patient interviews and assessment in a simulated environment with live patients.

**INQU 103. Integration Conference (.5)**
This bi-weekly conference integrates basic science principles and clinical principles to further define the role that science plays in clinical practice. Examples from basic science and clinical research will be related to functional applications in dental care.

**INQU 104. Integration Conference (1)**
This bi-weekly conference integrates basic science principles and clinical principles to further define the role that science plays in dental practice. Examples from basic science and clinical science research will be related to functional applications in dental care.

**COURSE DESCRIPTIONS (LDRS)**

**LDRS 111. Health, Science and Society (2.5)**
This intensive sequence concerning health and society provides a context for students to view their professional education based on the mission of the profession: “to protect and improve the health of individuals and the society.” This course introduces students to epidemiology, biostatistics, creation and evaluation of scientific evidence, and evidence-based practice. This course also gives students an introduction to small group learning.

**LDRS 212. Dental Auxiliary Management (1)**
Lectures in the principles of auxiliary management. Overview of organization management, communication skills, duty delegation, and organization of work. Information is provided about the dental allied health fields, duties, responsibilities, training, and testing.

**LDRS 310. Professional Development II (1)**
Major issues and trends that affect oral health and the mission of dentistry in the United States. Behavioral knowledge and skills essential to the oral health practitioner’s ability to deliver effective patient-centered care.

**LDRS 313. Dental Patient Management/Risk Management (1)**
Principles of patient management and risk management are reviewed. The primary focus is directed toward the skills associated with communication. A variety of examples of malpractice are reviewed and discussed. Other areas of risk are discussed such as infection and occupational hazards related to EPA and OSHA standards.
COURSE DESCRIPTIONS (MAHE)

MAHE 141. Preventive Periodontics (1)

MAHE 144. Preventive Periodontics Clinic (1)
Companion clinical component to MAHE 143. Clinical application of methods for the prevention and maintenance of periodontal health in patients. The importance of patient education, motivation, and cooperation in present methods of prevention and plaque control.

MAHE 145. ACE: Outreach Preventive Dentistry (1.5)
This ACE introduces the student to professional patient interaction and evaluation in a simulated environment. Students will develop interview techniques, learn patient appraisal skills, and techniques for communicating effectively in a health care environment. Students will experience patient interviews and assessment in a simulated environment with live patients.

MAHE 242. Periodontics (1)
Companion clinical component for DSPR 232. Students observe and assist at periodontal surgical procedures on moderately advanced periodontal diseases. Treatment includes root planing, curettage, occlusal adjustment, minor tooth movement and case maintenance.

MAHE 340. Nutrition for Dentistry (1)
General nutrition concepts are presented in addition to aspects pertinent to the practice of dentistry.

COURSE DESCRIPTIONS (REHE)

REHE 151. Dental Anatomy (3)
Descriptive anatomy of masticatory structures with emphasis on deciduous and permanent teeth and the temporomandibular-mandibular movements, and the fundamental concepts of the functional relationships between the dentition and the temporomandibular joint. Lectures on comparative anatomy and variations in tooth morphology.

REHE 152. Basic Procedures in Fixed Prosthetics (2)
To introduce and familiarize the dental student to basic principles related to fixed prostodontics. The introduction will emphasize principles of engineering and preparation designs, full coverage retains for both metal and ceramic restorations.

REHE 153. Dental Anatomy Laboratory (5)
Companion preclinical component to REHE 151. Laboratory exercises and assignments include drawings, waxes, tooth identification, and use of semi-adjustable articulator.

REHE 154. Basic Procedures in Fixed Prosthetics Lab (1.5)
Laboratory component of REHE 152.

REHE 155. DentSim Laboratory (1)
This course covers the criteria, techniques and practice of preparing 'ideal/standard' operative preparations. The restorative procedures will be performed on typodont teeth mounted in a computer assisted simulator (DentSim).

REHE 156. DentSim Laboratory (1)
This course covers the criteria, techniques and practice of preparing 'ideal/standard' operative preparations. The restorative procedures will be performed on typodont teeth mounted in a computer assisted simulator (DentSim).

REHE 158. Dental Materials (5)
The primary goal is to introduce basic material science concepts needed to evaluate, compare and select materials for a specific application. Knowledge of properties, indications and limitations of different clinical and laboratory materials will be presented. The effect of manipulation variables on material properties will be emphasized.

REHE 229. Introduction to Radiography (1.5)
Initial course consisting of lecture and laboratory covering basic principles of radiography. Included are: instructions on taking intraoral radiographs, radiation physics involved in x-ray generation and the parts and function of the x-ray unit, radiation biology of x-ray interaction with tissue, head and neck anatomy and pathology with regards to radiographic interpretation. Each student will have a clinic rotation.

REHE 251. Surgical Techniques I (1.5)
This educational module introduces basic surgical techniques in the field of oral and maxillofacial surgery, with special emphasis on the simple and surgical extraction of teeth. Topics will include wound healing, suture technique, principles of surgery, instrumentation, surgical exodontia, prescription writing, and introductory pain management.

REHE 252. Pain Control (1)
Anatomy pertaining to local anesthesia. Drugs used in local anesthesia and technique of administration. Management of complications. Slides and clinical demonstrations.

REHE 253. Basic Procedures in Esthetics (1)

REHE 254. Pharmacology (4)
This course introduces students to the principles of pharmacology and to the mechanisms of drug action in the context of common disease states.

REHE 256. Advanced Principles of Radiography (5)
This is a continuation of REHE 229. This course will explore alternative intraoral radiographic techniques, extraoral radiography techniques, their uses and limitations. Included is a discussion of radiation safety in the dental office and film processing. Each student will have an opportunity to gain "hands-on" experience in patient alignment for a panoramic radiograph and alternative tools for taking quality films. Each student will have a clinic rotation.

REHE 257. Prosthodontic Technology (2)
A lecture-demonstration-laboratory approach to complete denture prosthesis construction. Emphasis on certain fundamental biological considerations of the edentulous patient, such as the oral membranes, muscles, bones, and phonetics and how they relate to the technical aspects of denture constructions.

REHE 258. Treatment Planning (1)
This course provides lecture presentations to help prepare the student to develop skills in patient diagnosis and treatment planning. The lectures will guide the students through the thought processes necessary in the development of workable treatment plans. The emphasis will be on exposing the students to the approach used in our clinic of providing the patients with options of optimal, alternative and emergency diagnostic or recall treatment plans using decisional analysis.

REHE 259. Basic Procedures in Fixed Prosthodontics II (2)
This course builds upon those core elements covered in REHE 152/154. Emphasis on principles of engineering for fixed partial dentures, preparation and design of fixed partial dentures, considerations for the restoration of endodontically involved teeth, and definitive and provisional fixed partial denture restorations. Introduces dental material topics related to fabrication of a fixed partial denture restoration, including: chemomechanical soft tissue retraction, die spacers, investments, casting and casting alloys, ceramics, soldering, provisional materials, prefabricated and custom post and core systems. Emphasis on principles of engineering for fixed partial dentures, preparation and design of fixed partial dentures, considerations for the restoration of endodontically involved teeth, and definitive and provisional fixed partial denture restorations. Introduces dental material topics related to fabrication of a fixed partial denture restoration, including: chemomechanical soft tissue retraction, die spacers, investments, casting and casting alloys, ceramics, soldering, provisional materials, prefabricated and custom post and core systems.

REHE 260. Basic Procedure Fixed Prosthodontics Lab (2)
Laboratory component of REHE 259.

REHE 262. Basic Procedures in Operative Dentistry (2)
This course, together with REHE 253, covers the criteria, techniques, and practice of preparing "ideal/standard" operative preparations and placement of operative restorations. The emphasis is on posterior amalgam preparations and restorations, as well as an introduction to cast gold inlay and onlays. Students will be introduced to basic cariology and radiology as it relates to operative dentistry. In addition, the composition and properties of amalgam, liners and bases, investment material, and gold will be reviewed. Students will work on typodont and extracted teeth.

REHE 263. Basic Procedure in Esthetics Lab (5)

REHE 264. Endodontics (1.5)
Introduction to methods and materials necessary for successful root canal therapy.

REHE 266. Partial Denture Design (2)
Recognition of clinical situations that require partial denture therapy are developed. Introduction to the terms used in removable partial prosthodontics. Partially edentulous casts diagnosed, designed, surveyed, contoured for path of insertion, prepared for rest seat areas, and finally tripoded for further orientation by each student on his or her own casts. Thus the design, surveying, and clinical applications for removable partial service are presented in order to maintain optimal oral health conditions and to provide a sound basis for the prosthesis.

REHE 267. Prosthodontic Technology (2)
Companion preclinical component to REHE 257. Each student constructs a complete set of dentures using laboratory manikin as patient. Although REHE 267 was conceived as a technique course, one of its principal objectives is to prepare the student for the clinical aspect of dental education.

REHE 268. BP Competency Lab (1.5)
REHE 272. Basic Procedure Operative (1)
Laboratory component of REHE 262.

REHE 274. Endodontics (5)
Companion laboratory component to REHE 264. Complete endodontic treatment performed by each student on extracted teeth using gutta percha.

REHE 276. Partial Denture Design Lab (1.5)
Theories of removable partial denture construction which enable the student to perform exercises that are associated with the techniques used to achieve a successful result. Students will be evaluated by various testing methods.

REHE 351. Surgical Periodontics (1)
Case analysis and treatment planning for various conditions of periodontal disease. Case presentation to patients. Basic surgical technique and advanced types of periodontal surgery demonstrated. Occlusal analysis and occlusal adjustment considered.

REHE 352. Oral Rehabilitation (1)
The didactic curriculum provides a series of lectures that emphasize the importance of evaluation of the entire stomatognathic system for treatment planning. Causal relationships influenced by misdirected forces and hyperfunction are discussed.

REHE 353. Treatment Planning II (0.5)
This course provides formal instruction designed to prepare the students for patient management, practice management, and treatment planning. Emphasis on devising optimal, alternative and emergency diagnostic treatment plans.

REHE 355. Esthetic Dentistry (1)
Lectures and demonstrations. The indications, contraindications, limitations, and use of modern techniques and materials in esthetic dentistry.

REHE 360. Implant Dentistry (1)
Didactic and laboratory instruction that introduces the concepts used in implantology. These include the scientific basis of implant tissue reactions, and the surgical and restorative protocols. Emphasis is placed on slide presentation of actual cases. An opportunity is given to students to place an implant in an artificial mandible and to manipulate implant components on a typodont.

COURSE DESCRIPTIONS (REMA)
REMA 332. Dental Care for the Aging Population (1)
The didactic curriculum provides a general background on the changing demographics of our population as well as knowledge about the medical, social, psychological, and dental problems many older Americans face today. Dental problems common to the elderly, approaches to treatment planning and the provision of care for this unique group in traditional and non-traditional settings are explored.

REMA 341. Oral Health and Dentofacial Mechanics in the Child Patient (2)
SCHOOL OF LAW
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Cleveland, OH 44106-7148

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Robert H. Rawson Jr., J.D., Interim Dean

Founded in 1892, the School of Law is a charter member of the Association of American Law Schools and of the national law honorary society, the Order of the Coif. It was among the first law schools accredited by the American Bar Association.

The school has a student body of about 700 and a full-time faculty of about fifty. In the school’s early years, most students came from Ohio and remained in Ohio after graduation. Today, students come from all parts of the country, and there are Case law graduates in virtually every state (and in several foreign countries), and certainly in every major U.S. city. An active and aggressive Career Services Office works with students, graduates, and prospective employers from all over the nation to maximize job opportunities.

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Associate Director for Budget and Library Finance
Dan Ujcz J.D (Case Western Reserve University)
Managing Director of the Canada-United States Law Institute

SCHOOL OF LAW FACULTY

Jonathan H. Adler, J.D. (George Mason University)
Professor of Law and Director of the Center for Business Law and Regulation
Arthur D. Austin II, J.D. (Tulane University)
Edgar A. Hahn Professor of Law in Jurisprudence
Jessica Wilen Berg, J.D. (Cornell University)
Richard Gordon, J.D. (Harvard University)  
Associate Professor of Law

Jon Groetzinger Jr., J.D. (Cornell University)  
Associate Professor of Law; United States Director of the Canada-United States Law Institute.

Jessie Hill J.D. (Harvard University)  
Associate Professor; Associate Director, Center for Social Justice

Sharon Hoffman, J.D. (Harvard University), LL.M. (University of Houston)  
Professor of Law and Bioethics, and Co-Director of the Law-Medicine Center

Daniel Jaffe, J.D. (Columbia University)  
Assistant Professor of Law

Erik M. Jensen, M.A. (University of Chicago), J.D. (Cornell University)  
David L. Brennan Professor of Law

Lewis R. Katz, J.D. (Indiana University)  
John C. Hutchins Professor of Law and Director of the LL.M. in United States and Global Legal Studies

Maureen Sheridan Kenny, J.D. (Cleveland Marshall)  
Associate Professor of Law

Henry T. King Jr., LL.B. (Yale University)  
Professor of Law and U.S. Chairman of the Canada-United States Law Institute

Juliet P. Kostritsky, J.D. (University of Wisconsin)  
John Homer Kapp Professor of Law

Raymond Shih Ray Ku, J.D. (New York University)  
Professor of Law and Co-Director of the Center for Law, Technology, and the Arts

Wilbur C. Leatherberry, J.D. (Case Western Reserve University)  
Professor of Law and Director of Skills Program and Externships

Kenneth F. Ledford, J.D. (North Carolina University)  
Associate Professor of History and Law

Jacqueline D. Lipton, Ph.D. (Griffith University), LL.B. (University of Melbourne), LL.M. (Cambridge University), LL.M. (Monash University)  
Professor of Law, Co-Director of the Center for Law, Technology and the Arts, and Associate Director of the Frederick K. Cox International Law Center

Judith P. Lipton, M.S.S.W. (University of Wisconsin), J.D. (University of Connecticut)  
Professor of Law and Co-Director of the Milton A. Kramer Law Clinic Center

Kenneth R. Margolis, J.D. (Case Western Reserve University)  
Professor of Law and Co-Director of the Milton A. Kramer Law Clinic Center

Louise W. McKinney, J.D. (Case Western Reserve University)  
Professor of Law, Milton A. Kramer Law Clinic Center

Kevin C. McMunigal, J.D. (University of California, Berkeley)  
Judge Ben C. Green Professor of Law

Laura McNally, J.D. (Syracuse University)  
Associate Professor of Law

Maxwell J. Mehlman, J.D. (Yale University)  
Arthur E. Petersilge Professor of Law, Professor of Bioethics, and Director of the Law-Medicine Center

Kathryn Sords Mercer, M.S.S.W., J.D., Ph.D. (Case Western Reserve University)  
Associate Professor of Law, Lawyering Skills

Dale A. Nance, M.A. (University of California, Berkeley), J.D. (Stanford University)  
Professor of Law

Craig Allen Nard, J.D. (Capital University), J.S.D., LL.M. (Columbia University)  
Tom J.E. and Bette Lou Walker Professor of Law and Director of the Center for Law, Technology and the Arts

Cassandra Burke Robertson, J.D. (University of Texas)  
Assistant Professor of Law

Matthew Rossman, J.D. (New York University)  
Associate Professor of Law, Milton A. Kramer Law Clinic Center

Michael P. Scharf, J.D. (Duke University)  
Professor of Law and Director of the Frederick K. Cox International Law Center

Carolyn Seymour, J.D. (Michigan University)  
Associate Professor of Law

Morris G. Shanker, M.B.A., J.D. (University of Michigan)  
Professor of Law

Calvin William Sharpe, J.D. (Northwestern University), M.A. (Chicago Theological Seminary)  
John Deaver Drisko-Baker & Hostetler Professor of Law and Director of Center for the Interdisciplinary Study of Conflict and Dispute Resolution

Gary J. Simson, J.D. (Yale University)  
Joseph C. Hostetler-Baker & Hostetler Professor of Law

Rosalind Simson, B.A., Ph.D., (Yale University)  
Associate Professor of Law

Ann Southworth, J.D. (Stanford University)  
Professor of Law

Ted Steinberg, B.A., (Tufts University)  
Ph.D., (Brandeis University)  
Professor of History and Law

Robert N. Strassfeld, J.D. (Virginia)  
Professor, Director of the Institute for Global Security Law and Policy; Associate Director of the Frederick K. Cox International Law Center

SECONDARY FACULTY

Scott Fine, M.B.A. (Stanford University)  
Professor for the Practice of Banking & Finance and Law

Brian Gran, Ph.D. (Northwestern University)  
Assistant Professor of Sociology and Law

Ted Steinberg, Ph.D. (Brandeis University)  
Professor of History and Law

Martha A. Woodmansee, M.A., Ph.D. (Stanford University)  
Professor of English and Law

ADMISSION

This section relates to the J.D. programs; see below for information regarding admission to LL.M. programs. For complete information about admission policies and procedures, and about the law program generally, see the law school’s current admissions bulletin, which the school’s Office of Admissions will mail on request.

Admission Procedures

Since the School of Law receives many more applications than there are places in the first-year class, the admissions process is selective. Each application receives full file review. When we review files, our principal question is this: Is a candidate ready to meet the intellectual challenges of our program? The admissions committee evaluates each applicant’s credentials, looking carefully at the candidate’s undergraduate grade-point average and LSAT score as well as other, non-quantitative factors, such as level and difficulty of undergraduate
SCHOOL OF LAW

course work, writing ability, and work experience. The school receives applications as early as September for admission in the following fall. Beginning in January, the admissions office takes action on the applications; as decisions are made, applicants are notified. Most decisions are made between January 1 and May 1. At that point the class is filled, and the office starts a waiting list of candidates. As vacancies occur up to the date of registration, candidates are drawn from the list.

Admission Requirements

ADMISSION TO REGULAR STANDING

In order to enroll as a candidate for the Juris Doctor (J.D.) degree, a student must have a bachelor's degree from an accredited institution. Every applicant must have taken the Law School Admission Test (LSAT) and must have registered with the Law School Data Assembly Service (LSDAS) before the application deadline.

ADMISSION TO ADVANCED STANDING

Students currently enrolled in accredited law schools may apply for admission with advanced standing. They must complete four semesters in residence at Case Western Reserve to receive the J.D. degree.

ADMISSION AS A VISITOR

We accept students enrolled at other law schools who wish to take courses at Case Western Reserve for credit toward their own school's degree requirements. Such students must submit with their application a letter from their dean indicating that they are in good standing and that the other law school will accept the academic credits from Case Western Reserve.

FINANCIAL INFORMATION

See "Financial Information" section of this bulletin.

ACADEMIC PROGRAMS

Juris Doctor (J.D.) Degree

The School of Law offers the Juris Doctor (J.D.) degree as well as dual-degree programs (see below). The J.D. degree requires successful completion of 88 credit hours, of which 38 hours are in required courses and 50 hours are elective courses. For students in dual-degree programs, 12 hours of elective credits are waived in consideration of completion of the dual-degree (9 hours for the J.D./CNM program). The first year program for the J.D. degree consists mainly of the required basic courses. In addition, in the spring semester students select a 2-credit elective "perspectives" course; the menu of first-year "perspectives" courses varies from year to year.

FALL SEMESTER REQUIRED COURSES

- LAWS 101, Introduction to Lawyering (1)
- LAWS 122, Torts (4)
- LAWS 123, Contracts (4)
- LAWS 131, Criminal Law (4)
- LAWS 144, Property (4)
- LAWS 201, CORE Lawyering Skills I (2)

SPRING SEMESTER REQUIRED COURSES

- LAWS 104, Civil Procedure (4)
- LAWS 131, Criminal Law (4)
- LAWS 144, Property (4)
- LAWS 202, CORE Lawyering Skills II (2)
- Choice of one "perspectives" course (2)

In the second year, every student must take LAWS 375, Professional Responsibility (3) and the remaining CaseArc requirements (two courses of 2 credits each). Otherwise, the curriculum is elective after the first year. As a requirement for graduation, every student must complete a substantial research paper.

CURRICULAR CONCENTRATIONS

We offer a number of curricular concentrations for both the Juris Doctor and US & Global Legal Studies degrees. These optional concentrations allow students to provide a concentrated focus for some of their elective coursework. For complete information about the optional concentration program, see the law school's website or contact the Academic Services Office at the School of Law. The current available curricular concentrations are:

J.D. Program

- Business Organizations
- Criminal Law
- Litigation
- Health law
- International Law
- Law, Technology, and the Arts – Law & Technology track or Law & the Arts track
- Public Law – Public and Regulatory Institutions track or Individual Rights and Social Reform track
- US Legal Studies Program
- Alternative Dispute Resolution/Mediation
- Health Law
- International Business Law
- Intellectual Property
- Public International Law

INTERDISCIPLINARY PROGRAMS

For complete information about dual-degree programs, see the law school's website or contact the Academic Services Office at the School of Law.

J.D./M.B.A.

A dual-degree program between the School of Law and the Weatherhead School of Management allows students to earn two degrees in four years. Students spend the first year in one school and the second year in the other. Once the required courses are behind them, they spend the third and fourth years taking electives at both schools. Five areas of law-management specialization have been approved by the two schools: international business, health systems management, corporate finance, banking and investment, and labor and industrial relations.

J.D./M.A./M.S.

Enrolling in both the law school and the School of Graduate Studies, a student can study law and a Master of Arts or Master of Science program and earn the two degrees in seven regular semesters or six semesters plus two summers. Current options for this dual-degree are:

- M.A.–Legal History
- M.A.–Bioethics
- M.S.–Biochemistry

J.D./M.S.S.A. (Master of Science in Social Administration)

Together, the School of Law and the Mandel School of Applied Social Sciences offer a four year program in law and social work. Students take the basic required courses in both schools and then have considerable flexibility in pursuing their particular interests and preparing themselves for different careers. Besides their time in the classroom, students gain practical experience in internships.

J.D./M.N.O. (Master of Nonprofit Organizations)

This program combines the Master of Nonprofit Organizations (M.N.O.) degree with the Juris Doctor degree (J.D.). It provides preparation for students interested in, for example, practicing law within a nonprofit organizational setting; working as a program
officer in a foundation; serving as a leader or manager of a nonprofit organization; working in the area of nonprofit public policy and advocacy; or working in the field of planned giving.

Students must apply and be accepted for each degree program to qualify. New students can apply to both programs simultaneously or at separate times. Students who choose to begin their studies in the J.D. program must apply to the M.N.O. program prior to completing their first year at the School of Law.

- Dual-degree students must receive the M.N.O. and J.D. degrees simultaneously to be granted credit for specific courses taken in the other program.
- J.D./M.N.O. students continue to register at their initial school of enrollment throughout the dual program.

For more detailed information, contact:

**Director of Recruitment**
Mandel Center for Nonprofit Organizations
Case Western Reserve University
10900 Euclid Avenue
11402 Bellflower Road (visitors)
Cleveland, Ohio 44106-7167
(216) 368-6025
mcnoadmissions@case.edu

**J.D./M.N.O. Advisor**
School of Law
Case Western Reserve University
10900 Euclid Avenue
Cleveland, Ohio 44106-7148
(216) 368-3600

**J.D./M.D.**
The School of Law and the School of Medicine offer a dual-degree program that allows a student to complete both degrees in six years. A student who begins at the law school spends two years studying law, then four years studying medicine. Alternatively, a student may spend the first two years and the last two years at the medical school, and the middle years at the law school.

**J.D./M.P.H. (Public Health)**
The M.P.H. degree will generally add a year of additional course work to the J.D. degree, creating a four-year program. Law students enrolled in the dual J.D./M.P.H. degree program may earn up to 12 credits toward the J.D. in graduate level M.P.H. courses. The law school offers several health law courses that meet the M.P.H. elective requirements.

**J.D./C.N.M. (CERTIFICATE IN NONPROFIT MANAGEMENT)**
The J.D./C.N.M. combines the Juris Doctor degree (J.D.) with the Certificate in Nonprofit Management (C.N.M.). It provides preparation for students interested in, for example, practicing law within a nonprofit organizational setting; working as a program officer in a foundation; serving as a leader or manager of a nonprofit organization; working in the area of nonprofit public policy and advocacy; or working in the field of planned giving.

The program consists of five courses. Law of Nonprofit Organizations (LAWS 234) is required and the remaining four courses are chosen in consultation with the J.D./C.N.M. faculty advisor.

Students should apply to the degree/certificate program no later than the end of the second year at the School of Law. J.D./C.N.M. students must be admitted to each program separately and receive both credentials simultaneously to be granted credit for specific courses taken in the other program.

For more information, contact the Director of Recruitment, Mandel Center for Nonprofit Organizations, at 216-368-6025 or by e-mail at mcnoadmissions@case.edu.

**Graduate School Option**
Students in the School of Law who are not enrolled in a dual-degree program may take up to nine hours of approved courses in the other graduate and professional schools of Case Western Reserve University and have such courses counted for credit toward the J.D. degree.

**LL.M. in United States and Global Legal Studies**
The LL.M. in United States and Global Legal Studies is designed for graduates of foreign law schools who wish to spend an intensive year immersed in American legal education. LL.M. candidates take most courses with American J.D. candidates and have seminars with American lawyers. Degree requirements include 24 course credits (including LAWS 570, Foreign Graduate Seminar). Students from civil law countries must take LAWS 595, American Contract Law, and students whose command of English is deficient will be required to take an English language course. LAWS 263, Doing Business in the U.S., is an elective available only to LL.M. students.

Each student’s courses will be determined by the program director in consultation with the student and will be based on the student’s prior legal education and interests. After completion of the degree requirements, students may elect to spend a summer internship with a law firm or corporate legal department in the United States. Further information and admission materials may be requested from Professor Lewis R. Katz, director of the LL.M. in United States and Global Legal Studies program or Ms. Adria J. Sankovic, assistant director of the LL.M. in United States and Global Legal Studies program.

**THE LAW LIBRARY**
The law library’s holdings include more than 390,000 books and volume-equivalents, complete collections of federal and state law, law reviews, current law services, an extensive British and Commonwealth collection, and special collections in taxation, labor law, foreign investments, international law, and environmental law. The law library is building strong collections in law and medicine, intellectual property, and law of the European Union. It is a selective depository for both U.S. and Canadian government documents. The law school itself has computer workstations on every floor of the library, providing access to hundreds of electronic services and library catalogs, and a wide range of software services. The university boasts a fast and powerful network and wireless access, and the university network links the law school to the vast resources of the Internet. The law library is a member of OhioLINK, which is a consortium of Ohio’s college and university libraries and the State Library of Ohio. OhioLINK offers access to more than 31 million library items from 79 institutions. These materials include items from law, medical, and special collections.

The law library offers its users access to an ever-expanding list of electronic research databases as well as e-books. Electronic resources are accessible through the library catalog and the Law Library Services page on our website. Web-based databases offered include Lexis/Nexis and Westlaw as well as over 100 OhioLINK databases (including Index to Legal Periodicals and Medline). Many of these OhioLINK databases contain the full text of journal articles. Housed within the law library is a computer laboratory and a computer training laboratory.

**SPECIAL PROGRAMS**

**MILTON A. KRAMER LAW CLINIC CENTER**
The Supreme Court of Ohio authorizes student practice under attorney supervision in the final year of law school. Through the clinic, students provide legal representation to indigent clients and community groups and receive academic credit. The supervising attorneys are full-time members of the law faculty. The clinical program is the capstone of the skills curriculum and offers specialized practice experiences in Criminal Justice, Community Development, Civil Litigation Practice, focused on consumer matters, predatory lending, social security disability, and other public benefit issues, Immigration, Health Law, and Family Law.

CENTER FOR BUSINESS LAW AND REGULATION
To better prepare its students and future leaders with a thorough understanding of the business issues facing entrepreneurs, entities, and other clients, the School of Law created the Center for Business Law and Regulation. The center focuses on expanding curricular offerings and programs as well as engaging in opportunities for legal, empirical, and interdisciplinary research, assessing the role and impact of government in the regulation of business. The center will also host special lectures and symposia to highlight topics in business law and foster public debate and inquiry regarding business regulation.

CENTER FOR THE INTERDISCIPLINARY STUDY OF CONFLICT AND DISPUTE RESOLUTION (CICSDR)
During this age of globalization, our world has begun to steadfastly look toward negotiation, mediation, arbitration and other forms of dispute resolution as alternative methods of solving conflict. Since the 1970s, the Alternative Dispute Resolution (ADR) movement has gained momentum in judicial and academic circles and is currently reflected in courses in most law schools, while the number of established mediation and arbitration practices continues to rise. To best prepare students for meeting these societal and legal changes, Case School of Law has established the Center for the Interdisciplinary Study of Conflict and Dispute Resolution (CICSDR). CICSDR’s core mission is to encourage greater sensitivity to appropriate dispute resolution and skill development, preparing Case School of Law students for the multiple roles they will perform as lawyers in a global economy.

THE ARTS
The Center for Law, Technology, and the Arts was established as an internationally recognized forum for the interdisciplinary study of law, technology, and the arts. The Center focuses on teaching, research, and programs pertaining to intellectual property, technological innovation and technology transfer, the intersection of science, economics, philosophy, and the law, legal issues concerning biotechnology and computer technologies, and laws and cultural issues relating to the creative arts. Through the Center, the law school is able to offer students opportunities to address important, topical issues relating to law and technology and law and the arts through a variety of courses, lectures, events, and symposia.

FREDERICK K. COX INTERNATIONAL LAW CENTER
The International Law Center serves as the stimulus for enhancing programs in international, comparative, and transnational law at the law school. It supports visiting scholars and visiting faculty at the law school to enrich the curriculum and research capacity of the resident faculty. It also supports the development of international information resources. Through a series of sister law school relationships, it seeks to attract foreign students to the law school and provide opportunities for Case Western Reserve law students to study abroad; it also provides opportunities for faculty to study and teach abroad.

INSTITUTE FOR GLOBAL SECURITY LAW AND POLICY
The events and aftermath of 9/11 have made security and counter-terrorism fundamental, if not defining, concerns for the world community, nations, companies, the legal system, and individuals. The institute for Global Security Law and Policy was created in 2005 to provide a uniquely comprehensive hub for addressing the legal, financial, political, social, religious and cultural ramifications of counter-terrorism, using an innovative multifaceted approach that integrates theory with practical application. The Institute develops and integrates the best learning from the academic and the real world and draws on numerous disciplines and experiences to provide innovative and world class programs, research, teaching, and service on the issues of security and counter-terrorism. The work of the Institute serves as an invaluable resource to governments, businesses, organizations, the legal profession, and the general community.

LAW-MEDICINE CENTER
The Law-Medicine Center at Case Western Reserve University has been in operation for over 50 years. It began with a focus on forensic medicine, but has broadened to include the whole range of legal, social, economic, scientific, and ethical issues in which law and medicine are interrelated. Besides the regular course offerings, the center frequently presents lectures, symposia, and workshops, and sponsors major conferences. It publishes a student-edited journal, Health Matrix: Journal of Law-Medicine. Participants in the center’s activities include not only university personnel, but also professionals from such institutions as University Hospitals of Cleveland and the Cleveland Clinic.

CENTER FOR SOCIAL JUSTICE
The School of Law has a proud but little-known history of providing a welcoming atmosphere that attracted African American students in the years before desegregation. Many of those graduates went on to distinguished careers. The purpose of the Center for Social Justice is to honor those graduates and the School of Law’s historic commitment to racial equality, as well as to promote social justice now and in the future for various groups that experience discriminatory treatment today. Its activities include holding conferences and speaker programs, hosting scholars from academia and practice, expanding curricular coverage, and providing financial support to students working in the area of social justice full-time after graduation or during summers while in law school.

CANADA-UNITED STATES LAW INSTITUTE
The Canada-U.S. Law Institute, established in 1976, is jointly sponsored by the law schools of Case Western Reserve University and the University of Western Ontario. Its primary educational purpose is to give students of both schools a comparative perspective on their own country’s legal system. Each semester, up to six students from each school spend the term in residence at the other school. The school in which the student is a degree candidate gives full credit for the semester’s work. The two schools also exchange faculty, usually for periods of one or a few days, but occasionally to teach one or more courses for a full semester.

A second purpose of the institute is to provide
a framework for the exploration of transnational and international legal issues affecting the relationship between Canada and the United States. In addition to the regularly scheduled courses on Canadian-U.S. topics, the institute sponsors workshops and conferences, including annual conferences in Cleveland, which, in recent years, have dealt with Canadian-U.S. economic ties.

The institute also sponsors a regular publication, the Canada-U.S. Law Journal; the annual Niagara Moot Court Competition, in which students from U.S. and Canadian law schools participate; and special research projects, often with funding support.

LITIGATION PROGRAM
Since the mid-1970s, the School of Law has invested heavily in its litigation program. Students practice the basic skills of trial advocacy in such courses as LAWS 397, Trial Tactics (4), and in the co-curricular moot court and mock trial programs.

STUDENT ACTIVITIES

PUBLICATIONS
The School of Law publishes three scholarly journals, all student-edited. The oldest is the Case Western Reserve Law Review, published quarterly. The Journal of International Law is published two to three times a year; the JIL editorial board also has responsibility for the Canada-U.S. Law Journal (sponsored by the Canada-U.S. Law Institute), published once a year. Health Matrix: Journal of Law-Medicine began as a joint undertaking of all six of the university’s professional schools but since 1990, has been sponsored solely by the law school and its Law-Medicine Center.

Competitions

MOCK TRIAL
A student board administers the Dean Dunmore Competition, a year long program in which second-year (and a very few third-year) students participate. It culminates in a round-robin tournament involving 16 finalists. From those finalists, the board selects teams who will compete the following year in the National Moot Court Competition, the Craven Competition in constitutional law, and the Niagara Competition (sponsored by the Canada-U.S. Law Institute). Case Western Reserve also enters the Jessup International Competition; that team is selected by another student group, the Society of International Law Students.

MOCK TRIAL
The Jonathan M. Ault Mock Trial Board sponsors an intramural competition from which emerge the members of interscholastic teams. Currently, the law school sends student representatives to the National Trial Competition, the National Student Trial Competition of the Association of Trial Lawyers of America, and a competition sponsored by the Academy of Trial Lawyers of Allegheny County, Pennsylvania.

REGULATIONS AND RULES OF CONDUCT
The Academic Regulations of the School of Law are provided to each student upon matriculation through the law school’s website.

In addition to the university’s rules of conduct, law students are expected to comply with the American Bar Association’s Model Code of Professional Responsibility and Model Rules of Professional Conduct, to the extent that these are applicable, and with the law school’s own Code of Conduct. The Model Code and Model Rules are available in the law library. The school’s Code of Conduct, like the Academic Regulations, is provided to each student upon matriculation through the law school’s website.

COURSE DESCRIPTIONS (LAWS)

LAWS 002. Education Law (3)
This course surveys the legal and social policy challenges related to public education settings. Students will study relevant constitutional issues, legislative mandates, school vouchers to supplement tuitions in private schools, charter schools, and more recent attempts under state constitutions to provide a quality education for all children. Beyond analyzing the legal frameworks that shape public education, the course will also cover the difficulties confronting public education from a sociological perspective.

LAWS 004. Settlement Law Seminar (2 - 3)
This seminar will examine the theory and practice of settlement of disputes. Matters to be considered include: the practical issues of how one negotiates the settlement and drafts settlement documents; the theoretical issues of why some cases settle and why some do not; the appropriate role of judges and mediators in facilitating settlements; and the procedural and substantive law affecting the settlement of law suits. Grade is based on a presentation and a paper. Enrollment is limited to 12.

LAWS 006. Legal History of European Union Seminar (3)
The seminar introduces students to the history, development, and present structure of the legal system of the European Union from the ECSC in 1951, through the Treaty of Rome in 1957, to the Treaty of Amsterdam in 1997. The seminar will examine the “constitutional” structures and institutions of the European Union, including the emergence of a binding jurisprudence from the European Court of Justice; will look at general interpretive principles emanating from the European civil law tradition, such as the doctrines of subsidiarity and proportionality; will explore the public law of the European Union, the “four freedoms,” human rights, and equal treatment of women and men; and will briefly treat private law rights emergent not only from treaty and parliamentary enactment but from Union jurisprudence. The seminar will concentrate on the historical and economic context, but legal doctrine and practice will also be considered.

LAWS 008. Famous American Trials Seminar (3)
This seminar is in part a course of American legal history and in part advanced evidence course. We will consider in some detail several (probably five) famous trials in American history, starting with the Salem witchcraft trials and ending (probably) with the trial of Charles Manson. For each trial considered, except the first, students will be expected to read an assigned book that concerns the trial and to address various issues for class discussion. Each student will also write a paper about a famous trial not covered in the assigned readings and make a presentation to the class regarding that case at the end of the semester. This seminar will be limited to 12 students and may be used to satisfy the writing requirement.

LAWS 010. African-American Lawyers Seminar (3)
This seminar takes an interdisciplinary approach to the study of African-American lawyers. It examines aspects of the history of black lawyers in America, as well as topics relating to black lawyers in contemporary America. The course will situate these experiences in the context of both the history of the legal profession and the history of race relations and the struggle for civil rights in the United States. Students will prepare a substantial research paper and make an oral presentation of their research to the class. Limited to 12.

LAWS 011. Firearms Regulation (3)
This class examines the constitutional and policy questions surrounding firearms regulation. The course will cover historical issues, modern statutory controls, and legal and policy questions surrounding firearms regulation. Perea or Corey: LAWS 202.

LAWS 013. Current Controversies in Environmental Law (3)
This seminar will explore current legal and policy controversies in environmental law. Special attention will be paid to recent Supreme Court decisions and forthcoming environmental protection, federal courts, including current constitutional challenges to environmental programs and regulations. Issues likely to be discussed include the impact of recent federalism decisions on environmental protection, federal preemption of state regulation, environmental standing, the non-delegation doctrine, and cost-benefit analysis, among other topics. Students
LAWS 017. Scientific Evidence and Advanced Research (2)
Students must be concurrently enrolled in LAWS 214 (no exceptions). Enrollment limited to six students.

LAWS 018. Professional Responsibility Advanced Research (3)
This seminar will allow students concurrently enrolled in Professional Responsibility (LAWS 375) to satisfy the upper-level writing requirement. Students will receive advanced instruction in legal research in Professional Responsibility and will be required to complete a series of written exercises, including drafting a rule and writing a brief and a judicial opinion. The exercise will include a series of planning questions to help students structure their work. Each exercise will require the students to develop expertise in an area of Professional Responsibility through performance in simulated professional roles. At least one oral presentation will be required.

LAWS 019. Commercial Information and the Law (3)
This seminar focuses on defining 'commercial information' from a lawyer's perspective and analyzing ways in which laws in different jurisdictions are developing to protect owners and developers of such information from unauthorized access, interference, disclosure and/or use of their information products and services. The subject will be taught from a comparative/international perspective because of the increasingly global nature of many of the issues for discussion. Class discussion topics will include: the nature of commercial information and its relationship to the legal concept of property; the relationship between commercial information and intellectual property law (specifically copyright, patent, and trade secret law); case studies involving Internet business methods, computer software and electronic databases and the way in which intellectual property laws have developed in relation to these information products; the use of contract law and technological protection measures to protect the value of information stored and accessed electronically; and problems of financing businesses, and generally valuing business assets, where the main valuable assets are commercial information products.

LAWS 020. Civil Rights (3)
This course will examine the enforcement of federal civil rights laws against government, government officials, and private individuals. The course will focus partly on the unique issues and challenges involved in litigating civil rights cases, and approximately the first half of the semester will be spent on 42 U.S.C. § 1983, the "all-purpose" civil rights statute. We will discuss the mechanics of litigating federal civil rights cases, such as the state action requirement, absolute and qualified immunities, liability of municipalities, limitations on injunctive relief, and attorney's fees. Much of the second half of the semester will be devoted to other civil rights statutes, such as the Fair Housing Act, the Voting Rights Act, Title IX, and Title VI. The course will not cover statutes dealing with discrimination in the workplace, however, so those topics are treated fully in the Employment Discrimination course.

LAWS 021. Animal Law (3)
This seminar will review selected federal and state laws that pertain to animals focusing on the Animal Welfare Act, wildlife statutes, and criminal anti-cruelty laws. Students will review recent cases and laws which address the larger questions posed by the animal rights movement, distinguishing between regulations designed for animals and those designed for humans involved with animals. After gaining familiarity with the landscape of animal law, students will examine the animal rights movement as an example of a social justice/reform movement. Topics will include: the conflicts and intersections between law and science; methods and tactics used in legal reform advocacy; the validity and efficacy of using philosophical justifications for legal arguments or change; definitions of property; the historical and geographic context of this movement within the spectrum of other reform movements. Students can choose to write one paper to satisfy the upper-level writing requirement or write two smaller papers which will not satisfy the writing requirement.

LAWS 022. Religion, Ethics, and the Law (3)
This is a paper seminar, limited to 12 students. The course will explore the intersection between religion, ethics, and the law in the American legal system. We will begin with a series of general questions: To what extent do we have true separation of church and state in American jurisprudence? Why should religious beliefs be given more deference than political opinions or other personal expressions? Does the law set the standard for public morality or reflect it? In order to establish a successful legal system, does society need to reach a consensus as to its moral and ethical values? When is the government ethically justified in punishing individuals for their misconduct, and what theories justify punishment within the criminal justice systems? In the second part of the course we will focus on a variety of issues that raise legal, ethical, and religious questions. Topics may include capital punishment euthanasia, genetic testing war crimes, and others.

LAWS 023. Religion, Ethics, and the Law (3)
This is a paper seminar, limited to 12 students. The course will explore the intersection between religion, ethics, and the law in the American legal system. We will begin with a series of general questions: To what extent do we have true separation of church and state in American jurisprudence? Why should religious beliefs be given more deference than political opinions or other personal expressions? Does the law set the standard for public morality or reflect it? In order to establish a successful legal system, does society need to reach a consensus as to its moral and ethical values? When is the government ethically justified in punishing individuals for their misconduct, and what theories justify punishment within the criminal justice systems? In the second part of the course we will focus on a variety of issues that raise legal, ethical, and religious questions. Topics may include capital punishment euthanasia, genetic testing war crimes, and others.

LAWS 024. ePayment Systems Seminar (1)
This seminar builds on the foundation established during the first-year curriculum and focuses on the law and technology of payment systems. Such topics will include the contractual relationship amongst and between the various organizations transacting to enable a b2c payment; the various elements of such agreements; the various impacts of a payment system (criminal, civil, and administrative); the implications for legal structure and policy; and the practical considerations of a lawyer advising clients within this domain. Grade is based on a paper, a presentation, and class attendance and participation.

LAWS 025. Animal Law (3)
This seminar will review selected federal and state laws that pertain to animals focusing on the Animal Welfare Act, wildlife statutes, and criminal anti-cruelty laws. Students will review recent cases and laws which address the larger questions posed by the animal rights movement, distinguishing between regulations designed for animals and those designed for humans involved with animals. After gaining familiarity with the landscape of animal law, students will examine the animal rights movement as an example of a social justice/reform movement. Topics will include: the conflicts and intersections between law and science; methods and tactics used in legal reform advocacy; the validity and efficacy of using philosophical justifications for legal arguments or change; definitions of property; the historical and geographic context of this movement within the spectrum of other reform movements. Students can choose to write one paper to satisfy the upper-level writing requirement or write two smaller papers which will not satisfy the writing requirement.

LAWS 026. Religion, Ethics, and the Law (3)
This is a paper seminar, limited to 12 students. The course will explore the intersection between religion, ethics, and the law in the American legal system. We will begin with a series of general questions: To what extent do we have true separation of church and state in American jurisprudence? Why should religious beliefs be given more deference than political opinions or other personal expressions? Does the law set the standard for public morality or reflect it? In order to establish a successful legal system, does society need to reach a consensus as to its moral and ethical values? When is the government ethically justified in punishing individuals for their misconduct, and what theories justify punishment within the criminal justice systems? In the second part of the course we will focus on a variety of issues that raise legal, ethical, and religious questions. Topics may include capital punishment euthanasia, genetic testing war crimes, and others.

LAWS 027. Religion, Ethics, and the Law (3)
This is a paper seminar, limited to 12 students. The course will explore the intersection between religion, ethics, and the law in the American legal system. We will begin with a series of general questions: To what extent do we have true separation of church and state in American jurisprudence? Why should religious beliefs be given more deference than political opinions or other personal expressions? Does the law set the standard for public morality or reflect it? In order to establish a successful legal system, does society need to reach a consensus as to its moral and ethical values? When is the government ethically justified in punishing individuals for their misconduct, and what theories justify punishment within the criminal justice systems? In the second part of the course we will focus on a variety of issues that raise legal, ethical, and religious questions. Topics may include capital punishment euthanasia, genetic testing war crimes, and others.

LAWS 028. Advanced Criminal Law Seminar (3)
This seminar focuses on substantive criminal law rather than criminal procedure. It uses the first-year
protection of technological works ranging from chemical formulae, to software, to biotechnology; and trademark law, which relates to the goodwill associated with corporate identity and product recognition. We will also devote time to the study of the philosophy and economics of intellectual property keeping in mind, throughout the course, the need to strike an optimal balance between incentives to create and commercialize intellectual creations on the one hand and public access to these creations on the other hand. Prereq: LAWS 229 or LAWS 235.

LAWS 034 International Tax Policy Seminar (3)
This survey seminar will examine the broad policies underlying income taxation in the international arena with a focus on residence- and source-based justifications for income taxation, the ways that these bases of taxation come into conflict, and the various methods that countries use to mitigate the potential damage from competing tax claims. The seminar will explore these concepts by focusing on a variety of specific international tax problems including harmful tax competition, negotiation of bilateral tax treaties, and the effect of e-commerce on source rules. Other topics that may be covered include offshore financial centers, tax havens; tax treaties and treaty tax shelters. Limit 12. Recommended preparation: LAWS 211.

LAWS 035. Religion Clauses of First Amendment Seminar (3)
This seminar will explore the constitutional doctrines relating to the Free Exercise Clause and the Establishment Clause of the First Amendment. The readings will include key Supreme Court cases demonstrating the evolution of free exercise and Establishment Clause doctrines, as well as some historical materials, but we will also maintain a focus on current First Amendment controversies, such as school vouchers, faith-based government funding initiatives, and religious symbols on public property. Grade is based on class participation, final presentation, and a paper. Limited to 12.

LAWS 036 Appellate Practice (3)
This course is designed to teach students the rules and formalities of appellate practice and help students develop the skills necessary to write an effective appellate brief and present a persuasive oral argument. During the first semester students research and write an appellate brief and engage in short in-class oral arguments. During the second semester students receive instruction on the organization and presentation of longer oral arguments, engage in a practice oral round and receive an individualized critique of their performance. They complete the course by competing in the Dunmore Moot Court Tournament, which culminates in a final round oral argument before sitting judges in the spring. Prereq: LAWS 801 and LAWS 802.

LAWS 037. Copyright in the Digital Millennium Seminar (3)
Copyright in the Digital Millennium is a seminar that explores the challenges to traditional copyright law presented by the advent of digital technology and the Internet. Beginning with the current litigation involving Internet file-sharing, we explore the legal and doctrinal issues raised by efforts to apply copyright and other legal and technological measures to digital works. In order to evaluate the competing arguments in this debate, students will examine the doctrinal, historical, and theoretical underpinnings of copyright law from multiple perspectives.

LAWS 038. Labor and Employment Law Issues in the Global Economy (3)
This seminar will consider the impact of globalization on workers and labor law.

LAWS 039. Environmental Law Research Seminar (2)
We will explore and ask several questions from a philosophical and historical perspective, including: Should one’s intellectual product be entitled to protection? What are the reasons for granting or denying protection? What form, if any, should this protection take? What are the costs and benefits to society of protecting one’s intellectual product?

LAWS 040 Contexts of Invention Seminar (3)
This seminar will explore the social and cultural construction of invention, the diverse ways in which invention has been conceptualized, from an interdisciplinary perspective—from the perspective, that is, not only of the law but of the arts and sciences in the broadest sense, including literature, the fine arts, entertainment, economics, medicine, engineering, education, and business. Emphasis will be on the cultures, rhetorics, and histories of invention across these fields. As such, this seminar represents an extension of the inquiry initiated at a conference held at Case Law School on “Intellectual Property and the Construction of Authorship.” This seminar will help prepare students to participate in a conference to be held in the Spring 2006 entitled (Con)texts of Invention.

LAWS 043. Biotechnology Law and Policy (2)
This course is designed to expose the law student and graduate student in science or business to the legal, business, and policy issues relevant to the biotechnology industry. We will cover issues related to patents, corporate organization and financing, particularly venture capital as it relates to the Start-Up Biotech Company), licensing and other transactions, regulatory issues relevant to the Food and Drug Administration, university technology transfer, and academic conflicts of interest. Prereq: LAWS 229.

LAWS 044. Arbitration Law and Practice Seminar (2)
This seminar will cover arbitration as a form of adjudication focusing on the law, processes, uses, and practice of arbitration. The seminar begins with a conceptual exploration of adjudication and arbitration and proceeds with discussions of the uses of arbitration to resolve commercial, international, labor, and consumer disputes. The seminar will next explore the relationship between arbitration and the courts examining the Federal Arbitration Act and State Law which includes preemption and choice of law issues, the agreement to arbitrate focusing on contract formation and arbitrability issues, and judicial supervision and review. Finally, the seminar will cover the arbitration proceeding itself with detailed looks at the selection and impartiality of the arbitrator as well as the role of lawyers, evidence, discovery, and interim measures in the conduct of the proceeding. Both trial and appellate simulations will be a feature of this seminar experience.

LAWS 045. Copyright Litigation (2)
This course will begin with an overview of a copyright litigation case and then proceed to discuss issues relating to pre-litigation strategy, infringement, and defenses to infringement. The seminar will explore the drafting of a complaint and the answer thereto, including counterclaims; drafting discovery documents; preparing witnesses; and taking and defending a deposition, which will take place in the context of a mock trial, many of the issues that pertain to a trial, including the roles of judge and jury, jury instructions, direct and cross-examination, jury selection, and post-trial motions. Prereq: LAWS 235.

LAWS 046. Strategic Management of Intellectual Property (2)
The course will focus on real-world issues encountered by intellectual property attorneys (in-house and outside counsel). Issues and relevant case law relating to due diligence, licensing, procurement, licensing, enforcement, and defense will be discussed. Specific areas will include: (1) How to identify and classify IP as well as develop a corporate framework for fostering creation of IP, extracting it, documenting it, securing internal rights (e.g., forbidding employees to search others patents to mitigate willful infringement liability), or searching in only non-patent literature. There are numerous issues that will be presented and discussed during the course.

LAWS 047 Law of the Music Industry (2)
This course will cover the major components of the music industry, including recording agreements (major label and independent labels), record producer deals, songwriting and music publishing concepts, group issues, personal appearances, and music in cyberspace. There will be an extensive discussion of fundamental copyright, trademark, and cyberlaw concepts, as well as advanced copyright concepts specifically related to the recording and publishing industry. Special attention will be paid to the topic of musical copyright infringement litigation. Course materials will include selected cases, forms of the above agreements, and selected handouts. Guest speakers will include a variety of industry professionals, including personal managers, recording artists, record company executives, and concert promoters. Students will be invited to participate in a variety of special events, including attending a music industry seminar at The Rock and Roll Hall of Fame sponsored by Cleveland’s volunteer Lawyers for the Arts and attending the annual Mountain Dew High School Rock-Off held at the Odeon. Prereq: LAWS 235.

LAWS 048. International Humanitarian Law (1)
This course is designed to prepare the student members of the Jean Pictet Competition team, but is open to all students with an interest in international humanitarian law. The course will be taught in two all-day Friday-Saturday sessions in January and February by international humanitarian law
LAWS 056. Selected Topics in Business and Law (1)
This course will focus on the key principles of business operations and the financial tools necessary to measure business performance and the roles that lawyers play in advising business clients in today's environment, as well as the intersection of law and business in our economy. Coverage and emphasis will vary from year to year. The course will use case studies, real time filings by corporations, and 2-3 books written about well-known business transactions and is co-taught by a visiting practitioner or business leader and a member of the regular faculty.

LAWS 057. Issues in Election Law (2)
This course will examine recent and current issues and controversies related to U.S. election law. The course will focus on careful readings of relevant statutes, court decisions, and academic commentary on various election law questions, including ballot access, voter fraud, disenfranchisement, redistricting and gerrymandering, campaign finance, campaign speech, and election contests. The course will explore some of the legal questions that inevitably arise in the context of conducting democratic elections and how well courts and other legal institutions address these issues. Grades will be based exclusively upon short weekly writing assignments (1-3 pages) based upon the assigned reading and class participation. There will be no final exam.

LAWS 060. Cyberlaw (3)
This subject deals with how the law regulates and otherwise applies to activities taking place in 'cyberspace.' It considers how existing legal principles are being modified and extended in the digital information age to meet the needs of society, particularly in relation to electronic commerce. As the nature of dealings in cyberspace develops and new legal problems emerge over time, the focus of the course may change to reflect current legal issues. However, topics for discussion will be drawn from the following: the nature of the Internet, legal regulation of cyberspace vs. self-regulation, the relevance of international law/international regulation, e-commerce contracting, 'property' in cyberspace with particular reference to intellectual property, trademarks and domain names, defamation on the Internet, online crime (e.g., fraud, pornography, etc.), information privacy and security, online dispute resolution and associated conflicts of law issues.

LAWS 062. ERISA II - Advanced Employee Benefits (3)
Continuation of Employee Benefits (ERISA): defined benefit plans, including in-depth consideration of defined benefit plan documents; VEBAs, their use and regulation; group life, Accidental Death & Dismemberment, and Long Term Disability plans and related insurance documents; insured and non-insured medical benefit plans; reporting and disclosure requirements of ERISA, including summary plan descriptions, summary of material modifications, Form 5500, and "top hat" elections; and requests for favorable determinations of qualified plans, including Form 5500 and Notices to Interested Parties.

LAWS 063. Selected Topics in Family Law (3)
This course explores in depth the theory, doctrine and practical application of various topics within family law. The topics explored may include marriage, divorce, property division, spousal support, parent-child relations, child custody, visitation, child support, domestic violence, rights of unmarried partners, etc. Approximately half of the course will be devoted to exploration of the principles and doctrine of the topics covered (multi-jurisdictional approach will be utilized) and the other half will be devoted to litigation or alternative methods of resolving disputes concerning the issues in the topics covered. The grade will be based on an examination of the substantive material covered and participation during class.

LAWS 064. International Environmental Law (3)
This course examines selected issues and current problems in international environmental law, with a particular focus on transboundary environmental problems, global "commons," and the development, implementation and enforcement of international environmental agreements. Requirements for the class will include several short writing assignments and weekly simulations and role-play exercises. There will be no final exam. Limited enrollment of 20 students.

LAWS 065. Adoption Law (2)
This course surveys adoption law in the United States, including public and private adoptions, international adoptions, and the legal issues involving reproductive law and surrogacy.

LAWS 066. Leadership and Communication Skills for Lawyers (2)
This 13-week interactive course will provide students with the tools and techniques needed to be more capable speakers and communicators. While the course will include some training for persuasive public speaking in a courtroom, most of the focus will be on developing effective communication skills so that students will have the requisite confidence, focus, and control to speak in a variety of settings. A section of the class will also concentrate on handling the media including how to control a message and advice for clients who may be in the public spotlight. The program will be interactive so that students have numerous opportunities to participate and speak. Role-playing exercises will be utilized as well as video-taped playback. Grading is based on participation and improvement and there will not be a final exam.

LAWS 067. Intervention Law: Iraq and Vietnam (3)
Using the examples of American intervention in Vietnam and Iraq, this course examines some of the international and domestic legal issues raised by war and military intervention. Among the topics covered will be the legal justifications for intervention and the arguments for the illegality of the two wars; constitutional limits on executive war making powers; the justiciability of issues of war and peace under U.S. law; the draft, the volunteer army, and conscientious objection; GI rights and GI dissent; the law of war and international humanitarian law and the recurring problems of massacre, murder, and torture.

LAWS 068. Islamic Law (2)
This course will cover major aspects of the Islamic
Law. It will provide students with a better understanding of Islam and its adherents. Many topics related to Islam and its basic beliefs, including some contemporary issues, will be covered in this course.

**LAWS 071. The Intersection of Unfair Competition and Intellectual Property (2)**

Traces the role of tort, contract, and property in filling the gaps between copyright, trademark, and patent. The trace implicates federal and state systems and a cluster of rights such as trade secrets, ideas, industrial design, common law copyright, and moral rights.

**LAWS 072. Federal Taxation of Corporations and Shareholders (3)**

This course provides a comprehensive background in the taxation of corporations and shareholders, including the tax treatment of transfers of property to a corporation; distributions from a corporation to its shareholders: redemptions; liquidations; and the simpler forms of corporate reorganizations.

**LAWS 073. Disability Law (3)**

Disability Law provides a comprehensive overview of the federal laws relating to individuals with disabilities. The course focuses on issues of nondiscrimination and affirmative rights in the areas of employment, government programs and services, places of public accommodation and education. Beyond analyzing the legal framework that shapes disability rights, the course will also discuss issues related to disability rights from a social policy perspective.

**LAWS 075. Business Associations for LL.M. Students (3)**

This course is an introduction to the law of business associations including general and limited partnerships, limited liability companies, and corporations tailored to their specific needs.

**LAWS 076. Sex, Gender, and the Law (3)**

This course will critically examine the ways in which law in the U.S. treats sex and gender in a variety of contexts, most notably, the workplace, the family, the reproductive sphere, and in several arenas of sexual exploitation. Among the topics discussed will be parenthood, abortion, pornography, prostitution, and rape. Moreover, the course will explore various, often competing, theories about how law should approach issues of these sorts. For example, should it focus on notions of equality, autonomy, or non-subordination? Included among the issues addressed will be problems raised by the intersections of gender with race, class, and ethnicity.

**LAWS 078. Counter-Terrorism Law (3)**

This course will take an in-depth look at counter-terrorism in the United States, Israel, and other countries. The course will examine the competing conceptions and definitions of terrorism at the national and international level and the institutions and processes designed to execute the "war on terrorism." This will include study of the balance between security and liberty policies in the U.S. Patriot Act, the use of military tribunals or civil courts, the use of assassination or targeted killings, and the emerging law on enemy combatants and their detention, and the arguable need for new self-defense doctrines at the global level. Prereq or Coreq: LAWS 327.

**LAWS 079. Terrorism Prosecution Lab (3)**

This lab will involve students in an integrated experience of academic research and public service. Students will work on research projects in counter-terrorism law in the United States, Israel and other countries. The course will engage students in projects for a variety of organizations that are trying to develop expertise in counter-terrorism law, including U.S. attorney offices, thinktanks, defense attorneys, international governmental and non-governmental organizations. Students will study and research various aspects of counter-terrorism in the U.S., foreign countries, and at the international level, including the balance between security and liberty policies in the U.S. Patriot Act, the use of military tribunals or civil courts, the use of assassination or targeted killings, and the emerging law on enemy combatants and their detention, and the arguable need for new self-defense doctrines at the global level. Prereq or Coreq: LAWS 78.

**LAWS 080. I.T. Principles for Lawyers (1)**

This course is designed to allow students to achieve an overview of information technology terms and concepts.

**LAWS 082. International Business Organizations (3)**

This course offers a combined classroom and field experience designed to help students understand why U.S. multinational corporations engage in transactions through offshore financial centers or "tax havens." To this end, the course will provide an introduction to and address the tax and other policy implications of various international business structures and strategies including captive insurance arrangements, asset securitizations, hedge funds and offshore banking. The course will consist of four Friday afternoon sessions in the early part of the spring semester, followed by a week-long visit to the Cayman Islands during spring break, when students will meet and hear from academics, private-sector professionals and government officials based in the Cayman.

**LAWS 084. Capital Markets, Venture Capital, and Mgmt., Principles for Lawyers (1)**

This course is designed as an introductory course for second- and third-year law students who want to understand the way in which businesses are managed and financed, the various roles that capital markets play in their development, and the methods for measuring business success. Intensive case studies will be used as a framework for looking at real world situations. The course will integrate guest lectures from visiting business leaders. CFOs will explain how they measure the success of their business and what financial information is required to do their job. Finally, a part of each class will evaluate real time business issues, applying the lessons learned from the case studies and modeling the expected outcomes. James Bildner, CWRU alumus and CEO of Tier Technologies, will teach the course. Students will write a paper based on a case study. This course will count toward the nine-credit limit on non-law school courses. Prereq: LAWS 261.

**LAWS 085. Intellectual Property Transactions (3)**

Students will explore how companies develop business and legal strategies to protect their intellectual property assets through agreements with strategic business partners, content providers, vendors, and licensees. As part of the course, students will select a company name and protect it, draft and negotiate agreements, and hold a mock negotiation at the end of the semester. One prior course in patent, trademark, or copyright is required. Grade is based on a final examination.

**LAWS 086. International Intellectual Property (3)**

This course surveys selected issues and current problems involving the criminal aspects of international law and the international aspects of criminal law. The course begins with an introduction to the origins and purposes of international criminal law. We will then explore the contours of the duty to prosecute those who commit international crimes. Next, we will focus on application of domestic and international law to the question of jurisdiction over international criminal activities. This is followed by three units examining substantive international criminal law as contained in multilateral treaties concerning terrorism, war crimes and crimes against humanity. Next, we will explore the procedural aspects of international cooperation in criminal matters, with particular attention to extradition and problems associated with obtaining evidence from abroad. We will also analyze the reach of U.S. constitutional protections to U.S. investigative and law enforcement activities overseas. Finally, we will study the new Yugoslavia and Rwanda War Crimes Tribunals and the permanent International Criminal Court. The class will be seminar-format, with short writing assignments, weekly simulations, and role-play exercises designed to bring the materials to life. There will be no final exam.

**LAWS 087. International Criminal Law (2)**

This course surveys selected issues and current problems involving the criminal aspects of international law and the international aspects of criminal law. The course begins with an introduction to the origins and purposes of international criminal law. We will then explore the contours of the duty to prosecute those who commit international crimes. Next, we will focus on application of domestic and international law to the question of jurisdiction over international criminal activities. This is followed by three units examining substantive international criminal law as contained in multilateral treaties concerning terrorism, war crimes and crimes against humanity. Next, we will explore the procedural aspects of international cooperation in criminal matters, with particular attention to extradition and problems associated with obtaining evidence from abroad. We will also analyze the reach of U.S. constitutional protections to U.S. investigative and law enforcement activities overseas. Finally, we will study the new Yugoslavia and Rwanda War Crimes Tribunals and the permanent International Criminal Court. The class will be seminar-format, with short writing assignments, weekly simulations, and role-play exercises designed to bring the materials to life. There will be no final exam.

**LAWS 089. Homeland Security/USCG Lab (3)**

This course will provide students with the opportunity to conduct research and prepare legal memoranda addressing issues submitted by the US Department of Homeland Security and the United States Coast Guard. Students will meet for lecture sessions that provide a background into the issues presented, including border security, Great Lakes laws, immigration, administrative law, and the environment. The student's work product will be submitted to, and utilized by, DHS/USCG.

**LAWS 090. Canon Law (2)**

This course examines the legal system of the Roman Catholic Church. In addition to an historical overview of the science of canon law, lectures address specific canons of the Code of Canon Law and selected canonical issues. Subjects to be considered include marital law, ecclesiastical sanctions (i.e., criminal law) and procedures, trial procedures.

**LAWS 092. International Criminal Law (2)**

This course surveys selected issues and current problems involving the criminal aspects of international law and the international aspects of criminal law. The course begins with an introduction to the origins and purposes of international criminal law. We will then explore the contours of the duty to prosecute those who commit international crimes. Next, we will focus on application of domestic and international law to the question of jurisdiction over international criminal activities. This is followed by three units examining substantive international criminal law as contained in multilateral treaties concerning terrorism, war crimes and crimes against humanity. Next, we will explore the procedural aspects of international cooperation in criminal matters, with particular attention to extradition and problems associated with obtaining evidence from abroad. We will also analyze the reach of U.S. constitutional protections to U.S. investigative and law enforcement activities overseas. Finally, we will study the new Yugoslavia and Rwanda War Crimes Tribunals and the permanent International Criminal Court. The class will be seminar-format, with short writing assignments, weekly simulations, and role-play exercises designed to bring the materials to life. There will be no final exam.

**LAWS 094. Jewish Law (2)**

This is an externship program in which students approved by the City attorneys will work at the City of
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Cleveland Law Department for 12 hours per week, with and under the direct supervision of Law Dept attorneys on civil cases, or under the supervision of the Cleveland City Prosecutor, on criminal cases. Students will research substantive and procedural legal issues, draft memoranda, analyze information obtained through discovery and through research, and assist with preparation of cases. Students with legal intern certificates may appear in court. Students will also attend periodic meetings in which they will review and reflect upon the work engaged in on the cases assigned, learn about other law department cases, and discuss various topics relating to the law department's mission and jurisdiction. Topics in these discussions may include substantive law dealt with in the various sections of the law department, discovery and pre-trial practice, professionalism, negotiation and settlement. Students will interact with the law school faculty liaison through journals and periodic meetings to discuss and further reflect upon the externship experience. Students must be approved following a security clearance application. For more information about the City of Cleveland Law Department, students are encouraged to visit http://www.city.cleveland.oh.us/government/departments/law/lawind.html

LAWS 096. NAFTA and Bilateral Trading Agreements (1)
Since the World Trade Organization Doha Negotiations have stalled, countries increasingly look to bilateral and regional trading arrangements as a viable alternative to multilateral negotiations. This course is a four day, one credit course examining the legal and policy considerations with respect to bilateral and regional trading arrangements, using the Canada-U.S. FTA, NAFTA, U.S-Chile FTA, Canada-Chile FTA, and various United States, Australian and Asian bilateral trading arrangements. The faculty will cover both the legal aspects considered in the negotiations and the actual considerations of negotiators.

LAWS 099. Bar Preparation Course (1)
This skills course will begin with an overview of bar exam structures and requirements. Students will receive instruction in strategies and tactics for learning bar-tested material and presenting it effectively in bar-exam conditions. The course will include several practice exam opportunities as well as self-evaluation along with professor feedback. It will conclude with a preview-length exposure to a commercial bar-preparation course, which will include external evaluation of practice essays written that context. Students will complete a series of practice exams and essays; there will be no traditional final exam.

LAWS 100. Introduction to Lawyering (1)
This course is the first component of the CaseArc Integrated Lawyering Skills Program. It is an introduction and orientation to the study of law and lawyering skills. The course introduces students to issues of professionalism, interviewing skills, the trial and appellate processes as well as legal analysis, writing and argumentation. It also introduces students to skills for preparation and participation in the law school classroom and to comparative analysis of different legal systems. The course is required for all entering students and is scheduled each day of the week prior to the beginning of regular classes in the fall semester.

LAWS 103. Constitutional Law I (4)
The constitutional system of the United States: judicial function in constitutional cases; the division of powers between the national and the states and within the national government; the powers of the president; national and state citizenship; and constitutional limitations on the powers of the states and nation for the protection of individual liberties. Required.

LAWS 104. Civil Procedure (4)
A broad survey of the procedural development of a lawsuit is undertaken, tracing the various steps from pleading and discovery to trials and judgments. Modern procedural issues involved in jurisdiction of the courts, venue, choice of law, and former adjudications are discussed. Throughout the course principal attention is given to the Federal Rules of Civil Procedure. Required.

LAWS 123. Contracts (4)
The formation of a contract; problems of offer and acceptance; consideration: the question of contract breach; damages and remedies for a breach. Required.

LAWS 131. Criminal Law (4)
A basic course in substantive criminal law, dealing with the standards to be used in defining and punishing criminal behavior. The course includes discussion of crimes and criminality; culpable mental states; causation; insanity; attempt and complicity; homicide; and rape. Required.

LAWS 132. Torts (4)
This course covers compensation of an injured party for harm resulting from intentional or unintentional acts and omissions of others. Consideration is given to the rules, rationale, and policy underlying tort liability. The course includes analysis of assault and battery, false imprisonment, negligence, standard of care, duty, risk, causation, liabilities and rights of landowners and land users, liability relating to dangerous activities and defective products, liabilities arising from special relationships or specially recognized legal interests, and defenses. Required.

LAWS 144. Property (4)
The nature of property interests; estates in land and future interests; concurrent ownership; landlord-tenant; transfer of property interests; easements, covenants, and equitable servitudes; nuisance; and zoning. Required.

LAWS 160. Dispute Resolution (2)
This course will examine the characteristic methods by which American courts resolve disputes, and will then compare those methods with those used by alternative institutions of dispute resolution such as administrative agencies, arbitration, and mediation negotiation. In resolving disputed issues of law, American courts are constrained by doctrines of precedent, stare decisis, and the principles of statutory interpretation, all of which will be treated in some depth in the course. Disputed issues of fact in American courts are commonly decided by juries consisting of ordinary citizens, and the course will explore a number of features of the jury as it impacts litigation in courts. The portion of the course devoted to alternative dispute resolution will involve some simulations and role-playing exercises. There will be a single examination at the end of the term which will be the primary basis for grading.

LAWS 200. Patent Litigation (1)
This course will simulate a patent infringement case. Students will be asked to represent a client, and in that capacity will identify issues, provide legal advice, and prepare papers and pleadings as necessary. In particular, students will be asked to conduct a limited number of the following simulations: draft a complaint and an answer to the complaint, including counterclaims; draft discovery documents; perform a mock Markman hearing; prepare witnesses, including expert witnesses; take and defend a deposition; or prepare pre-trial.

LAWS 201. Advanced Civil Procedure (4)
This course will pick up where the 1L Civil Procedure course leaves off, exploring in greater depth topics raised by the Federal Rules of Civil Procedure. Among the planned topics are the following: discovery (ranging from the practical, Pretrial Practice-type approach to a more conceptual, casebook-style approach); sanctions; multi-district litigation; finality (starting off from collateral estoppel/res judicata, through Rule 60, and including issues pertaining to the legislative revival of time-barred claims); appealability; class actions; injunctions.

LAWS 202. Constitutional Law II (3)
This course explores the individual freedoms protected by the First Amendment. Primary attention is devoted to the freedoms of speech, assembly, and association. The course analyzes what is protected, why it is protected, and to what degree it is protected. Topics covered include prior restraint, advocacy of unlawful conduct, the hostile audience defense, defamation, commercial speech, obscenity, offensive speech, expression on public property, and symbolic speech.

LAWS 207. Evidence (3)
This is a comprehensive course in the law of evidence as applied in civil and criminal cases. Subjects include relevance, direct and cross-examination, impeachment, character, expert and lay opinion testimony, and hearsay. A problem-oriented approach is used to highlight both the practical applications and theoretical underpinnings of rules of evidence. Students may not take both LAWS 207 and LAWS 212.

LAWS 210. Family Law (3)
This survey course covers law relating to the creation, functioning, and dissolution of the family as a legal unit. Topics include legitimacy, adoption, procreative rights, cohabitation, marriage, family obligations, division of marital property, divorce and annulment, and child custody. Particular attention is given to the social forces that affect the development of rules and policies.

LAWS 211. Federal Income Tax (4)
An introductory course in federal income taxation of the individual taxpayer, including a consider-
ation of the nature of income, specific statutory exclusions, business and nonbusiness deductions, the treatment of capital gains and losses, and elementary tax accounting.

LAWS 212. Evidence (4)
A comprehensive course in the law of evidence as applied in civil and criminal cases. Subjects include relevance, hearsay, judicial notice, privileges, examination of witnesses, expert and lay opinion testimony, and real, demonstrative, and scientific evidence. This course deals with both the practical applications and theoretical underpinnings of the Federal Rules of Evidence and common law precedents. Students may not take both LAWS 207 and LAWS 212.

LAWS 214. Scientific Evidence in Criminal Litigation (2)
The legal issues associated with the use of scientific evidence at trial. It examines the admissibility of scientific evidence, expert testimony, and related issues. In addition, it considers specific techniques such as forensic pathology, fingerprint comparison, firearms identification, bite mark comparisons, questioned document examinations, and polygraph and DNA evidence testing. Outside experts are used to present many of the topics. May satisfy the writing requirement.

LAWS 216. International Tax (3)
This course examines the U.S. taxation of transactions undertaken by foreign individuals or entities in the U.S. as well as the U.S. taxation of transactions undertaken by U.S. individuals or entities abroad. Major topics that will be covered include determination of the source of income, the taxation of income derived from a U.S. trade or business, the withholding tax regime, taxation of various entities, controlled foreign corporations, the U.S. anti-deferral rules, the U.S. foreign tax credit, taxation of foreign currency transactions and the role of tax treaties. Recommended preparation: LAWS 072, LAWS 343, or permission of the instructor.

LAWS 217. Juvenile Law (2)
The role of the juvenile court in society: its jurisdiction, procedures, and dispositional alternatives. Students study both the quasi-criminal aspects of the juvenile court (jurisdiction over juvenile delinquents and status offenders) and the civil-protective aspects of the court (termination of parental rights and the handling of neglected, dependent, and abused children). In addition, the rights afforded juveniles are compared with the rights afforded adults in comparable circumstances. Many related juvenile justice issues, such as the right of a minor female to have an abortion without parental notice and the constitutionality of capital punishment for juvenile offenders, are also examined.

LAWS 218. Advanced Family Law (2)
This is a simulation course in advanced family law. Students will conduct the preparation, strategy, and execution of a civil family law hearing in selected areas, e.g., domestic violence. The student will study a major statute (e.g., Domestic Violence Statute, Ohio Code Section 3113.31), and simultaneously master the techniques of hearing, including opening statement, direct examination, cross examination, closing argument, and learn the use of evidentiary objections and the handling of documents at trial. The choice of topic may change from year to year. Prereq: LAWS 63 or LAWS 210.

LAWS 219. Workers’ Compensation (2)
Workers’ Compensation law and theory continue to evolve through statutory change and judicial decisions. The statutes deal with benefits for work-connected injury and disability. Course material is national in scope with an emphasis on corresponding Ohio cases. The course also touches on related areas of law, such as torts.

LAWS 220. Civil Law and Psychiatry (2)
The interaction between law and psychiatry in the rights of persons with mental disabilities in the community and in treatment settings. Topics include involuntary commitment, suicide, guardianship, psychiatric malpractice, psychic damages, special education, confidentiality and child abuse and custody. Students will test the analysis of legal issues against actual experience (videotaped interviews, visit to a state mental hospital). The course is jointly taught by a psychiatrist and an attorney specializing in mental health law.

LAWS 222. Health Care Professions (2)
This course examines the legal and ethical issues that arise in the health care setting, with a focus on health care delivery systems. Students will engage in case studies and role-playing exercises to analyze legal and ethical issues in the delivery of health care services. Prereq or Coreq: LAWS 227. The course is not open to bioethics Master’s degree candidates. (BETH)

LAWS 224. International Law (2)
An introduction to basic comparative, transnational, and international law disciplines. Using areas of substantive and procedural law familiar to first-year students, the course examines issues arising from cross-national activity. Students are exposed to the choice of law, comparative law, international law, and international institutions.

LAWS 225. Criminal Law and Psychiatry (2)
The interaction between criminal law and psychiatry: psychiatric diagnosis and treatment, competence to stand trial, the insanity defense, malingered mental illness, infanticide, stalking, violence, sexual predator laws, and direct and cross-examination of mental health experts. Videotaped examples serve as a basis for discussion. A visit to the Justice Center Court Psychiatric Clinic is included. The course is taught jointly by a psychiatrist and an attorney specializing in mental health law.

LAWS 227. Health Law (3)
The course examines the nature and structure of the health care system; the relationship between patient, provider, and payer; private legal controls on health care delivery such as malpractice and informed consent law; and public controls in the form of government regulatory and payment programs. Offered as HSMC 427 and LAWS 227.

LAWS 229. Patent Law (2 - 3)
Basic concepts of patent law as property considered primarily in its substantive aspects, including the relationship to other forms of protection and intellectual property, infringement, and statutory requirements for patents.

LAWS 232. Wills, Trusts, and Future Interests (4)
A survey of the law of intestate and testate succession, will substitutes, private and charitable trusts, fiduciary administration, and future interests (including the Rule Against Perpetuities).

LAWS 234. Nonprofit Organizations (3)
explores the rationale for the existence of the nonprofit sector and the allocation of certain functions to it. The focus is on the legal framework for the structure and operation of nonprofit organizations under state nonprofit corporation statutes and the policy and practice of preferred tax treatment for selected organizations and gifts to them under the Internal Revenue Code.

LAWS 235. Copyright Law (3)
Copyright law is the in-depth study of the legal doctrine and policy relating to the protection of one’s artistic, literary, musical, and computer-related expression. We will focus primarily on the 1976 Copyright Act and amendments thereto, such as the Digital Millennium Copyright Act of 1998.

LAWS 236. Natural Resources (3)
An introduction to the law of natural resources with emphasis on private rights rather than resources in the public domain. Major themes will include: how the common law deals with rights in another’s land; problems of common pool resources, their ownership and regulation; different legal treatment of renewable and nonrenewable resources; legal structures available for the exploitation of natural resources. Primary focus will be on water, oil, and gas, but the legal issues of other extractive industries will also be considered.

LAWS 238. Mergers and Acquisitions (3)
Topics include the corporate and securities laws governing various forms of mergers and acquisitions; business motivations for mergers; concerns of acquiring and acquired companies in friendly mergers; bidders’ techniques and targets’ defenses in hostile tender offers and proxy contests; valuation of businesses and investments, portfolio theory, and capital markets; concerns of companies and investors in negotiating corporate financing. Prereq: LAWS 261.

LAWS 243. Food And Drug Law (2)
This course examines the federal Food, Drug and Cosmetic Act. It will entail a detailed look at the law, policy statements, and literature related to approving new drugs and devices. The course covers such topics as human subjects research; product labeling and testing; OTC vs. prescription status; compassionate use exceptions; control of biotechnology techniques; differences between food, drugs and devices; and FDA enforcement. We will also explore how law and the legal system anticipate and
also respond to changes in technology in ways that may enhance or inhibit the development of new technologies and new applications of old technologies. Attendance at classes is mandatory. Grade is based on final exam.

**LAWS 244. Poverty, Social Inequality, and the Law (3)**

An overview of the way the law impacts on disadvantaged people, and the law that supports advocacy on their behalf. Students will learn about legal problems that are common to poor people and identify potential solutions. The course will analyze the effectiveness of various legal interventions such as administrative advocacy, and litigation (including individual and class representation) in various contexts. Past and current means of using and changing the law on behalf of low-income people will be studied. Students will analyze the responsibilities of lawyers to represent low-income clients. Many of the concepts will be taught through the use of case studies; a client interview will be conducted, and court observation is required. Grade is based on oral case study presentation, written assignments, and class participation.

**LAWS 245. Complex Litigation (2)**

Analysis of key issues typically encountered in complex civil litigation including substantive implications of seemingly procedural choices. Class actions, multidistrict litigation, joinder and consolidation. Exploration of practical and ethical issues encountered in complex civil litigation.

**LAWS 246. Advanced Contracts (3)**

We will examine the methodology of law and economics and of deontological approaches to contracts, legal realism, the methodology of default rules, gap filling and incomplete contracts, adjustment of long-term contracts, employment contracts and the employment at will doctrine, and contract and class participation.

**LAWS 247. International Human Rights (3)**

This course will cover a variety of issues in the area of international human rights. Issues covered will include the law of treaties and treaty interpretation; international organizations’ and non-governmental organizations’ roles in protecting human rights; the rights of women and minorities; critiques of the law on behalf of low-income people will be studied. Students will analyze the responsibilities of lawyers to represent low-income clients. Many of the concepts will be taught through the use of case studies; a client interview will be conducted, and court observation is required. Grade is based on oral case study presentation, written assignments, and class participation.

**LAWS 248. Criminal Procedure II (2)**

The class will also focus on procedural issues like distribution of child pornography on the Internet and the use of computer technology to commit traditional crimes like embezzlement and terrorism. The class will examine Internet gambling and the distribution of child pornography on the Internet to illustrate issues that arise in connection with the use of computer technology in criminal activity. The class will also focus on procedural issues like jurisdiction and venue that become problematic in the context of computer crime. Limited to 20. Prereq: LAWS 131.

**LAWS 251. Employment Law (3)**

This course examines employer-employee relations in non-union settings. Topics include wrongful discharge, occupational safety and health regulation, minimum wage, and workplace privacy issues. The course emphasizes written work, including advanced legal research training. Minimal overlap with Labor Law (LAWS 359) and Discrimination in Employment (LAWS 328).

**LAWS 253. European Union Law (2 - 3)**

After a brief introduction to the institutions and organs of the European Community, the legal aspects of the internal operations of the Community will be discussed. Special emphasis will be placed on the external impact of Community law, for example, its trading rules, company law, and business competition law, as well as its rules governing the free movement of goods, services, capital, and persons. The concept of European citizenship will also be dealt with.

**LAWS 257. U.S. Legal Writing for Foreign Graduates (3)**

This course is designed to teach English compositional skills and grammar for legal studies. With an English-as-a-second-language focus, this course will seek to teach students the various steps of the writing process, English grammar, and certain aspects of legal composition. The main goal of this course is to enable students to write clearly and correctly within U.S. legal studies and the U.S. legal work place. The course will meet twice a week for one hour. Students will be required to take this course based on a written exam administered at the beginning of the semester. Students must receive a grade of at least a C to pass out of the course.

**LAWS 261. Business Associations (5)**

This course is an introduction to the law of business associations, including general and limited partnership, limited liability companies, and corporations. The functions and relationships of enterprise participants, primarily promoters, equity owners, creditors, and managers are investigated. The course covers pre-organizational problems and then canvases the roles of ownership and management, with emphasis on the special duties (fiduciary and other) imposed on certain participants in publicly and closely-held entities. The regulation of securities fraud, proxy voting and solicitations, and the issuance of securities under the federal securities laws is explored. Fundamental concepts of business financing, including valuation of the concern and claim structure, are investigated. Organic changes, including dissolutions, mergers, and tender offers, are discussed.

**LAWS 263. Patent Prosecution (3)**

This course will expose students to the issues and concepts of drafting a patent application. Topics include defining an invention, drafting a patent application, responding to Office Actions issued by the USPTO. Patent law is a prerequisite. Grade is based on three short papers and a multiple choice final.

**LAWS 264. International Organizations (3)**

Deals with legal issues surrounding some common characteristics of intergovernmental organizations having wide membership, with an emphasis on the United Nations systems. Many of the issues are constitutional or procedural; that is, they have to do with the powers of, and restrictions upon, the organizations or their members as set forth in the constituent instruments of the organizations or as otherwise agreed in practice. Issues such as eligibility for membership and termination thereof, rights and obligations of members, dispute resolution, and legislative procedures will be addressed comparatively. The growth of international law through intergovernmental organizations is also addressed.

**LAWS 266. Sales and Secured Financing (4)**

A concentrated survey of the law relating to the sale and lease of goods and secured financing. (1) Sales. The primary focus will be on the law relating to the sale of goods in commercial setting, i.e., Article 2 of the Uniform Commercial Code. Some attention will be given to the United Nations Convention on the International Sale of Goods. Considerable attention will also be given to consumer sales issues, e.g., the Uniform Consumer Sales Practices Act and similar legislation. There will be some coverage of leasing of goods under Article 2A of the UCC. (2) Secured Financing. Personal property security interests under Article 9 of the UCC will be examined in considerable depth. Real property mortgages will not be covered. Not open to students who are taking or have taken Sales (LAWS 381) or Property Security (LAWS 377). Students taking this course are precluded from subsequently taking either of those courses.

**LAWS 267. Products Liability (2)**

Explores in depth the liability of manufacturers and sellers for physical injury to persons or property caused by defective products. The relevant law includes UCC warranty provisions, Restatement of Torts (Second) section 402A and other tort law, state “tort reform” statutes, and federal and state statutes regulating product safety, such as the FDA and the Consumer Product Safety Act. The course will also examine proposals to “reform” the law of products liability.

**LAWS 268. Death Penalty Law and Process (2)**

The course offers a review of the death penalty process, theory, and law from trial through execution, including examination of state laws and federal habeas corpus law. The course focuses on the legal principles implicated by the death penalty and also examines the social issues it raises including the social/legal arguments against the death penalty, race and gender issues, and the influence of political and other factors on the process. Recommended preparation: LAWS 327.

**LAWS 273. Computers and Crime (1)**

The course will cover both the new kinds of criminal activity made possible by computer technology and the use of computer technology to commit traditional crimes like embezzlement and terrorism. The class will examine Internet gambling and the distribution of child pornography on the Internet to illustrate issues that arise in connection with the use of computer technology in criminal activity. The class will also focus on procedural issues like jurisdiction and venue that become problematic in the context of computer crime. Limited to 20. Prereq: LAWS 131.
LAWS 274. Community Development Law (2)
An examination of the law of economic and land development in underserved and deteriorated areas. Legal issues related to business organization, financing, real estate, governmental programs, and regulation and taxation (among other areas) will be covered. Topics include background of urban deterioration, governmental and private sources of assistance, organizing the developing entity, financing the project, governmental programs, tax policy and programs, land assembly, and administration of developments.

LAWS 276. Contemporary Issues in International and Comparative Law (1)
The objectives of the course will revolve around initiating students to the basic concepts and principles of comparative law reasoning and helping students make sense of the increasing dialogue between jurisdictions practicing constitutionalism in a global context with a focus on human rights issues. The coverage of the proposed course will select from the following themes depending on student interest and availability of materials: (a) Freedom of religion, secularism and culture; (b) Freedom of expression and hate propaganda; (c) Freedom of expression and sexual representation; (d) Equality and same sex unions; (e) Assisted suicide; (f) Death penalty; (g) Implementation of human rights in federal or quasi-federal politics; (h) Socio-economic rights; and/or (i) Cultural rights.

LAWS 277. Immigration Law (2)
The general principles of immigration law and procedure, including federal authority to regulate immigration, removal of aliens (deportation and exclusion), administrative and judicial review, fleeing persecution (refugees, asylees, and others), immigrants and nonimmigrant visas, and consular practice. The course will emphasize practical application of current immigration law.

LAWS 279. Advanced Real Estate Development: Shopping Centers (2)
The course takes the point of view of the attorney for a real estate developer with a strong emphasis on shopping center development, including apartment complexes and office building developments, but provides insights useful to an attorney for the other side: a tenant, financial institution, or major developer in that capacity will identify issues, provide legal advice, and prepare papers and pleadings as necessary. In particular, students will be asked to conduct a limited number of the following simulations: draft a complaint and an answer to the complaint, including counterclaims; draft discovery documents; prepare witnesses, including expert witnesses; take and defend a deposition; or prepare pre-trial motions and exhibits. Trademark law is a prerequisite. Grade is based on the students work in these simulated settings.

LAWS 283. Medical Malpractice (2)
The course will involve liability and quality of care issues in the health care field, with an emphasis on the liability of physicians, hospitals, and to a lesser extent insurers. Topics will include defining the standard of care, theories of liability, defenses to medical malpractice, tort reform, and quality control. Recommended preparation: LAWS 261.

LAWS 285. Courts, Public Policy, and Social Change (3)
Examines the social impact of law and use of social research in the legal process, assesses efforts to use law to effect social reform, and empirical studies of legal processes and institutions. Recommended preparation: Graduate standing or consent of department. Offered as LAWS 285 and POSC 429.

LAWS 289. Secured Transactions (2)
This course deals with Article 9 of the UCC and other legal and equitable rules relating to the use of personal property as security for debts. Topics covered include creation of a security interest (mortgage), rights and obligations of the debtor (mortgagor) and the secured party (mortgagor), priority of interests in the same property, redemption rights of the debtor, and foreclosure of a security interest by the mortgagee. May not be taken by students who have taken or are taking the 4-credit Sales and Secured Transactions course (LAWS 266). Students who have taken or are planning to take the 3-credit Sales (LAWS 381) course may enroll.

LAWS 293. Financial Principles for Lawyers (3)
This course provides an introduction to the use of financial economics that are frequently relevant in many areas of law. Topics to be covered include the time value of money, uncertainty, claim structure (including the characteristics of debt, equity, and hybrid securities, and the benefits and detriments of debt and equity financing), behavior of securities markets, and analysis of financial statements. Use of these concepts in specific areas of legal practice will be discussed.

LAWS 295. Law of Health Care Organization and Finance (2)
This course presents an overview of corporate health care law issues including: public and private reimbursement systems, fraud and abuse, physician self-referrals, corporate practice of medicine/fee splitting, certificate of need, tax-exempt status of health care providers, and antitrust and insurance regulation of health care providers. The course will examine the origins and public behind current corporate health law and regulations and the issues they present for health care providers. Enrollment is limited to 25. Prereq: LAWS 227.

LAWS 296. Complex Federal Criminal Investigation and Prosecution (3)
The course will explore some of the practical, substantive, and ethical issues that arise in complex federal investigations and prosecutions. Students will read cases and articles concerning topics such as the use of electronic surveillance, plea bargaining, and contacts with persons represented by counsel. They will also discuss how the law limits or enhances the powers of federal prosecutors conducting criminal investigations and prosecutions. Grade will be based on class participation and a take-home examination. Prereq: LAWS 131 and LAWS 327.

LAWS 297. Immigration Law II (1)
The course is dedicated to the study of visas for visitors and aliens of extraordinary ability in the sciences, arts, or entertainment. Course materials will be drawn from Legomsky’s Immigration and Refugee Law and Policy, the Immigration and Nationality Act, and Title 8 (CFR). Students will be required to write a paper or prepare a visa petition. The course will likely be offered every other year. Prereq: LAWS 277.

LAWS 298. Health Care Transactions (2)
This course will examine a variety of typical transactions among health care providers and payors. Students will have the opportunity to understand the financial motivation behind these transactions and to identify the unique health care law issues presented by them. Students will learn to develop alternative methods for structuring transactions to minimize or avoid such issues. The types of transactions to be examined include: physician recruitment, physician practice acquisitions, physician practice management companies, joint ventures between hospitals and physicians, mergers and acquisitions of health care providers, and formation of integrated delivery networks. Enrollment is limited to 25. Recommended preparation: LAWS 295.

LAWS 299. Trademark Litigation (2)
This course will simulate a trademark infringement case. Students will be asked to represent a client, and in that capacity will identify issues, provide legal advice, and prepare papers and pleadings as necessary. In particular, students will be asked to conduct a limited number of the following simulations: draft a complaint and an answer to the complaint, including counterclaims; draft discovery documents; prepare witnesses, including expert witnesses; take and defend a deposition; or prepare pre-trial motions and exhibits. Trademark law is a prerequisite. Grade is based on the students work in these simulated settings.

LAWS 301. Administrative Law (3)
This course examines the legal and institutional framework within which agencies administer regulatory statutes, with emphasis on procedural and constitutional issues. Major themes include limiting arbitrary action, controlling agency discretion, and promoting governmental accountability. Examples and problems are drawn from a wide range of substantive areas, including business, communications, consumer protection, education, environmental, health and safety, intellectual property, labor and employment law, and real estate law.

LAWS 303. Admiralty Law (2)
The general principles of admiralty law including jurisdiction, practice, maritime liens, collisions, salvage, limitation of liability, and the rights of injured maritime workers.

LAWS 304. American Legal History (3)
This course surveys the American legal past from the Revolutionary era to the present. It examines the development of a distinct American legal culture by exploring the interrelationships among legal institutions, thought, practice, and education in various historical periods.

LAWS 306. Comparative Commercial Remedies (1)
This intensive mini-course covers a number of issues arising in the context of remedies in commercial litigation. We begin by discussing a number of difficult points of damages which are typically overlooked in the basic contracts and torts courses, such as: defining loss, consideration of claiming losses not immediately measured in year-end accounts, claiming
loss of a chance of making a profit (or avoiding a loss), and rights to a Defendant's profit that is resul-
tant from a wrongdoing. Also, the course will con-
sider other (non-damages) money claims arising out
of commercial relations, some aspects of proprietary
remedies, and protective remedies.

LAWS 307. Securities Regulation (3)
This course explores the policies and techniques of
state and federal investor protection, with empha-
sis on the distribution of securities by issuers and
their affiliates. If an analysis of express general
anti-fraud remedies, the "security" concept, and the
diverse philosophies underlying "value judgment"
and "disclosure" approaches to regulation of busi-
ness fund-raising practices, the course proceeds to a
full consideration of the impact of the Federal Secu-
rities Act of 1933 on primary and secondary distri-
butions. Concurrent as well as independent effects
of state blue sky laws, typified by the Uniform Se-
curities Act, are also treated. To round out the total
pattern of investor protection in the distributional
scene, the course includes limited excursions into
the anti-fraud, periodic reporting, public informa-
tion availability, and broker-dealer aspects of the Se-

LAWS 308. Advanced Securities Regulation (3)
This course will expand on the disclosure and
enforcement themes discussed in the Securities
Regulation (LAWS 307) survey course to engage in
an in-depth examination of selected real-world
securities topics. The focus will be to deepen the
student's understanding of the SEC regulatory re-
gime through consideration of current "hot topics"
in securities law (such as executive compensation,
8-K disclosures, loss contingencies and Manage-
ment's Discussion & Analysis), by reviewing SEC
pronouncements and working with actual hypo-
thetical disclosure and counseling situations.
In addition to analyzing rules, students will par-
ticipate in drafting, analyzing, and commenting on
sample disclosure documents and client advice
memos. The course is designed to further the stu-
dent's understanding of a corporate/securities law
practice as well as deepen the student's substan-
tive knowledge in securities regulation law. Prereq:
LAWS 307.

LAWS 309. Antitrust Law (3)
A study of the implementation of federal trade reg-
ulation statutes with emphasis on the interrelation-
ship of these laws with the competitive tensions of
the contemporary economy.

LAWS 311. Representing the Athlete (3)
The emphasis of this course will be placed various
aspects involved in the providing legal services to
professional athletes, including negotiation tactics
and letter and contract drafting. The class will in-
clude several negotiation and drafting exercises as
well as a simulated representative relationship be-
tween the student and the entertainer/athlete. In
the context of a mock litigation/arbitration, stu-
dents will also be required to draft legal briefs in
support of the contractual positions taken during
the contract drafting exercises.

LAWS 313. Business Planning (3)
Major events in the creation and development of
a business are examined in light of partnership,
corporate, and tax law problems. Students are pre-
sented with a series of hypothetical client-suggested
transactions. Students seek the most appropriate
means of attaining the business ends desired by the
principals. From time to time, brief written mem-
oranda covering issues raised by the problem sce-
narios may be required. Emphasis is placed on the
interaction among partnership, corporate, tax, and
securities concepts and doctrine. The significant
business events that may be covered in the course
include formation of a partnership; incorporation of
a going concern; corporate distributions, recapi-
thalizations, and repurchases of shares; sale of
the corporate business; and corporate combination.
Prereq: LAWS 211 and LAWS 261.

LAWS 315. Commercial Paper (3)
One of the basic courses in commercial law, deal-
ing with the law of negotiable instruments and
bank collections and deposits. These topics are con-
sidered primarily under the Uniform Commercial
Code and, to some extent, recent federal banking
and consumer credit legislation.

LAWS 319. American Indian Law (2)
An introduction to the body of law governing the
relationship among Indian tribes and state and fed-
eral governments. Major themes include tribal
sovereignty; the federal-tribal relationship; crim-
inal, tax, and regulatory jurisdiction on reservations;
and the rights of individual Indians. Does not fulfill
writing requirement.

LAWS 320. Conflict of Laws (2)
Competing approaches to choice of law in cases
having multi-state and/or multi-national contacts.
The course also covers personal jurisdiction, con-
stitutional and international limitations on choice
of law, and enforcement of judgments. Compara-
tive and international perspectives are integrated
throughout. Students develop their own choice of
law theory in a simulated restatement conference.

LAWS 323. Debtor-Creditor Law (3)
The creditor's power to enforce its judgments
through such judicial processes as attachment, exe-
cution, levy, garnishment, and creditors' bills. The
debtors' power to resist creditors' claims through
statutory exemptions or federal bankruptcy dis-
charge, or because the creditor has acted inappro-
priately or in bad faith. Also studied is the creditor's
power to set aside and avoid fraudulent transfers
made by the debtor, a power which has generated
much litigation in recent years. We also study the
special rights of the federal government to enforce
its claims, through the Federal Debt Collection
Act of 1990, the Federal Priority Statute, and the
Federal Tax Lien Statute. Finally, we survey collec-
tive creditors' remedies under state law, including
assignments for the benefit of creditors, creditors'
arrangements, and receiverships.

LAWS 324. Bankruptcy (3)
An introduction to bankruptcy law, with empha-
sis on the current Federal Bankruptcy Code. The
course includes Chapter 7 (liquidation bankruptcy
proceedings), Chapter 11 (business reorganizations),
and Chapter 13 (simplified reorganizations for indi-
viduals and sole proprietorships). Also considered
are various state law debtor-creditor remedies and
the impact of bankruptcy on such remedies. Prior
enrollment in the UCC and debtor-creditor courses
may be helpful but is not mandatory.

LAWS 326. Banking Law & Regulation (3)
This course will provide an overview of basic U.S.
Federal banking law in the context of evolving in-
ternational standards. The course will begin by
examining the roles played by banks in the world
economy and why a specialized set of regulation is
justified. The course will then examine each of the
major U.S. Federal laws and international stan-
dards that govern banking activities against the
background of the various regulatory theories discussed.
Topics will include entry, expansion/merger, capital,
reserves, investments, lending, interest, insolven-
cy, non-banking financial activities, money launder-
ing, and international activities. Close attention will
be given to the role of supervision in both domestic
and international contexts. Extensive use will be
made of international and comparative materials

LAWS 327. Criminal Procedure I (3)
The investigatory stage of the criminal process.
Constitutional limitations on searches and seizures,
interrogation practices, and pretrial identification
procedures are examined. In addition, the exclusion-
ary rule, the principal method for enforcing Fourth,
Fifth, and Sixth Amendment rights, is considered.

LAWS 328. Discrimination in Employment (3)
This course will examine the federal laws concern-
ing discrimination in the workplace. These include
Title VII of the 1964 Civil Rights Act, the Equal Pay
Act, the Age Discrimination in Employment Act,
the Americans with Disabilities Act, the Genetic
Information Nondiscrimination Act. We will study
the regulation of discrimination based on race, sex,
religion, national origin, age, disability, and genetic
status, including policy and ethical question and
strategic considerations in prosecuting and defend-
ing employment-based civil rights actions.

LAWS 329. Master Classes in Health Law, Policy
and Ethics (2)
Leading experts in the fields of health law, health
policy, and bioethics will teach each master class
on a topic of their choice under the coordination of
the instructor. The course will be open to graduate
and professional students. The grade will be based
on class participation and an examination.

LAWS 331. Environmental Law (3)
The course is designed to provide an overview of
both the breadth and depth of environmental regu-
lation in the United States and to consider ways
our environmental regulatory system might be im-
proved. Although all of the major environmental
laws will be surveyed, several statutes will be exam-
ined in greater detail. Students will be expected to
navigate select provisions of statutes and regulations
through in-class problem sets. Guest speakers will
also be invited to speak on topics of current inter-
est.

LAWS 335. Remedies Seminar (3)
This seminar provides students with both a broad

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survey of the law of civil remedies and a chance to focus individual research on a particular area of interest within that broad survey. The law of remedies focuses on what happens after the merit of a case has been decided; how does the court provide remedies to the successful litigant? This seminar examines concepts of corrective justice, the institutional incentives created by different types of remedies, and related policy issues. Topics include "private" remedies (tort, contract, etc.), "public remedies," such as civil rights actions in which plaintiffs seek broad injunctive relief, and specialized areas of public-policy concern such as punitive damages and remedies in class-action suits.

**LAWS 337. National Security Law (3)**

Provides a study of the separation of powers in national security matters, presidential war powers, congressional and presidential emergency powers, the domestic effect of international law, the use of military force in international relations, investigating national security threats, the Freedom of Information and Privacy Acts, access to national security information in the federal courts, and restraints on disclosing and publishing national security information. The course builds upon a strong foundation of constitutional law and addresses the fundamental tension that exists in our foreign and domestic affairs by virtue of the constitutional separation of powers between the respective branches of government. Several classroom hours will be spent dealing with constitutional war powers and how the executive and legislative branches have tried to define their respective measures of expressed and implied power with regard to the Vietnam War, the War Powers Resolution of 1973, and more recent US incursions such as the first Persian Gulf War and the most recent invasion of Iraq.

**LAWS 340. Federal Courts (3)**

This course explores the relationships between the federal courts, Congress, and state courts and governments. Topics include congressional control of federal jurisdiction, justiciability, federal court abstention, suits against state and federal governments and officials, habeas corpus, and federal injunctions on state proceedings.

**LAWS 341. Estate Planning and Taxation (3)**

This course covers the federal law of estate and gift taxation. Topics include the computation of the estate tax, the taxation of gifts, the assets included in the gross estate, deductions from the gross estate to compute the taxable estate, credits against the tax, the generation-skipping transfer tax, and estate planning ideas and techniques, such as the use of trusts. The income taxation of estates and trusts is also covered. Grade is based on class participation and a major written paper on a topic chosen by the student and approved in advance by the instructor. Prereq: LAWS 211 and LAWS 232.

**LAWS 343. Federal Taxation of Partnerships and Partners (3)**

This course will examine the basics of partnership taxation. The topics will include the tax consequences of capital contributions to and distributions from a partnership, the receipt of a partnership interest in exchange for services, the allocation of profits and losses among the partners, the computation of the adjusted basis of a partner's interest, the sale or liquidation of a partner's interest, and the liquidation and termination of the partnership. Prereq: LAWS 211.

**LAWS 346 Insurance (3)**

A comprehensive introduction to the regulation of the insurance industry and to the legal issues arising from relation between the parties to insurance contracts. The course examines statutory regulation of the industry by state and federal agencies and analyzes cases involving aggressive regulation by the judiciary as well. Insurance decisions on the cutting edge of developments in contract, tort, and agency law are studied. Students are required to study the policy forms most frequently encountered in practice: the automobile policy, the homeowner's policy, and the life insurance policy. The course also provides exposure to problems relating to other areas of insurance including commercial general liability coverage, fire insurance, professional liability (malpractice) coverage, and health insurance.

**LAWS 349. International Trade and Development (3)**

The public international and United States law regulating international trade. (The private law of international trade and investment is dealt with in International Business Transactions, LAWS 354.) It includes the economic theory of international trade (although no exposure to a course in economics in secondary or undergraduate education is necessary) as well as a legal examination of issues regulating global and regional (e.g., the Canada-U.S. Free Trade Agreement, EEC) international trade. Primary emphasis is on the General Agreement of Tariffs and Trade (GATT) and the World Trade Organization (WTO) as well as such United States legislation implementing the GATT as antidumping and countervailing duties legislation and escape clause relief. The roles of trade and aid are also explored, as well as U.S. legislation affecting the transfer of resources to less developed countries.

**LAWS 350. International Arbitration (2)**

An advanced course covering the current status of arbitration as a dispute settlement mechanism in international affairs. This course will cover the use of arbitration as a means of resolving international disputes: a) between private parties; b) between private and governmental parties; and c) between governments. It will cover possible forums and rules of arbitral dispute resolution and the problems of the enforcement of foreign arbitral awards. Special aspects of dispute resolution in certain geographical and subject areas will be covered as will be the problem of sovereign immunity. Disputes arising from multinational business transactions will be focused on as will be maritime, environmental, and border disputes.

**LAWS 351. Alternative Dispute Resolution (2)**

Students will examine the processes of alternative dispute resolution (ADR) through reading materials, videotapes, guest lectures, and simulation exercises. Particular emphasis will be given to the interaction of lawyers and clients in business negotiations and in litigation. Negotiation, arbitration, mediation, the summary jury trial, and the mini- trial will be examined. The class will also cover impediments to ADR, such as lack of understanding or hostility on the part of clients or lawyers. Offered as LAWS 351 and LHRP 451.

**LAWS 353. Philosophy of Law (3)**

This is an examination of the general nature of law, the broad concerns of jurisprudence, the study of comparative law, and many of the issues raised in the literature of legal philosophy. Students will examine the principles of legal positivism, mitigated natural law, and rights theory. Selected readings and cases will illustrate these theories, which will also be examined in the context of rule selection by new governments in developing or revolutionary societies. The course also looks at the general nature of legal systems: how politics, morality, and individual views of justice and rights affect particular court cases and the course and development of law generally. Topics will include abortion, obscenity and sin, civil disobedience, affirmative action, sexual gatekeeping, and the death penalty. This is unlike any other of the legal theory or jurisprudence courses, and those who have sampled legal theory elsewhere in a different form are welcome and encouraged to enroll. Recommended preparation: PHIL 101. Offered as LAWS 353, PHIL 335, and PHIL 435.

**LAWS 354. International Business Transactions (3)**

This course examines various types of international business activities from a transactional perspective. It focuses on international sales, international payments, and international licensing transactions and examines the different legal systems (state, federal, international) that may impact on these transactions. It also considers commercial aspects of the interpretation of cross-border contracts, dispute resolution concerning cross-border contracts, and the role of lawyers. Some basic issues relating to private international law/conflicts of law are also addressed. There is also some introductory coverage of international electronic commerce transactions and related legal issues.

**LAWS 357. Sexual Orientation & the Law (3)**

The course will address the development of legislation and case law dealing with LBTQ rights in different practice areas including family law, estate planning, and employment law. Further, the course will deal with possible scenarios for more legislative and judicial activity.

**LAWS 359. Labor Law (3)**

The basic course in the area of union-management relations, designed both for students desiring to pursue the field further and for those whose interest lies in an introduction to legal principles in this area. The course begins with a brief historical study of the evolution of the labor movement and prestatutory law. It then considers federal regulation under the National Labor Relations Act of union organizational efforts, management-union interaction, and the representation process, then proceeds to the collective bargaining process. The collective bargaining process is examined in some depth with special emphasis on the scope and substance of the duty to bargain in good faith, the enforcement of
This two-semester course is to address issues relating to biomedical-related inventions by exposing law students, MBA students, and Ph.D. candidates (in genetics and proteomics) to the challenges and opportunities encountered when attempting to develop biomedical intellectual property from the point of early discovery to the clinic and market. Specifically, this course seeks to provide students with the ability to value a given technological advance or invention holistically, focusing on issues that extend beyond scientific efficacy and include patient and practitioner value propositions, legal and intellectual property protection, business modeling, potential market impacts, market competition, and ethical, social, and healthcare practitioner acceptance. The course will meet over two consecutive semesters—fall and spring—and is six credit hours (three credits each semester). During these two semesters, law students, MBA students, and Ph.D. candidates in genomics and proteomics will work in teams of five (two law students, two MBA students, and one Ph.D. candidate), focusing on issues of commercialization and IP management of biomedical-related inventions. The instructors will be drawn from the law school, business school, medical school, and technology-transfer office. To be eligible for this course, law students must also have a B.S. or equivalent in the life sciences, such as biology, biochemistry, genomics, molecular biology, etc. Offered as MGMT 467, LAWS 367, GENE 467. Prereq: LAWS 229 and LAWS 261.

LAWS 368. Business of Baseball (3)
This course will bring the "business of baseball" to the students, and present them with an interactive "hypothetical" problem-solving dialogue with the instructor, which would deal with the most important issues facing major and minor league baseball today. Prereq: LAWS 261 and LAWS 391.

LAWS 370. Intellectual Property Survey (2)
This course is designed to provide students with an overview of several areas of law traditionally associated with intellectual property or IP, including copyright law, which pertains to the protection of literary, musical, and artistic creations and has issues replete with First Amendment implications; patent law and trade secret law, which focus on the protection of technological works ranging from chemical formulae, to software, to biotechnology; and trademark law, which relates to the goodwill associated with corporate identity and product recognition. We will also devote time to the study of the philosophy and economics of intellectual property keeping in mind, throughout the course, the need to strike an optimal balance between incentives to create and commercialize intellectual creations on the one hand and public access to these creations on the other hand.

LAWS 372. Current Topics in Health Law (2)
The course will cover 13 different current topics that students are likely to confront in the practice of health care law. Each topic will be presented by a leading practitioner in the field, who will provide appropriate reading materials. The presentations will be followed by student discussion led by a visiting faculty member. The grade will be based on class participation and an examination.
treatment for children; genetic screening; hospital ethics committees; access to care and the politics of health care in the 90s; and ethics in the business of medicine. Readings will consist of legal cases and documents, statutes, regulations and articles from the academic and the lay press. Grade is primarily based on an exam. Both an oral class presentation and a short paper are optional to supplement the grade, but not to replace the exam. Attendance and class participation are also considered for grading purposes.

LAWS 385. Real Estate Transactions and Finance (2 - 3)
Covers basic real estate transactions as well as issues involved in complex finance and development. Topics include: brokers, land contracts of sale, deeds and title covenants, the recording system, title insurance, mortgages, shopping center development, cooperatives and condominiums, ground lease financing, construction lending, distressed properties, selected federal income tax issues, and the real estate attorney’s professional responsibilities. Whenever possible, issues will be examined in the context of model transactions.

LAWS 386. Advanced Evidence (3)
This seminar is designed to cover specific issues in evidence, e.g., privilege, toxic torts, computer-generated evidence, expert testimony, syndrome evidence, and profile evidence. A paper and presentation are required. The paper may satisfy the writing requirement.

LAWS 388. International Real Estate Transactions (2)
The course will explore selected topics involved in international real estate transactions, from the perspective of an American counsel representing an American entity doing business abroad. Topics may include structuring, transactional goals, due diligence, letters of intent and documentation, deal implementation, title protection, and others. The course will use traditional learning techniques as well as case studies and simulations, with a major focus on letters of intent/documentation. Students will be graded based on class participation and presentations, written assignments, and a final paper/take home exam. Recommended preparation: LAWS 385 (may be taken concurrently).

LAWS 389. Corporate Real Estate Transactions (2)
Real estate is typically the largest single category of capital investment and the second largest category of repeat expense (after total personnel costs) for most businesses. Major industrial and service sector companies are increasingly focused on the opportunities and challenges inherent in the real estate portfolios that support their core operations. This course will highlight the strategic case for effective corporate real estate management and the role of inside and outside legal counsel in the commercial real estate context. The course will consider advanced transactional situations, including purchase and sale of commercial properties, leasing of business properties, and complex industrial facilities. The course’s emphasis on case studies and commercial transaction scenarios are also designed to act as a capstone course that complements and draws upon the students’ prior coursework in contracts, real estate and commercial transactions, ethics and government regulation. Three parallel case studies will run throughout the course, illustrating the application of each topic to different types of client organizations: a Fortune 500 industrial company, a small family-owned retail business, and a medium-sized not-for-profit organization with several sites. Each client organization will have mock client representatives who will have different business and style preferences, which the class will need to accommodate and will come to anticipate in fashioning and recommending solutions for each client. The final exam will build from these same client scenarios, offering the class participants an opportunity to apply their learning to make recommendations to each client with respect to specific situations and goals.

LAWS 390. Topics in Advanced Labor Law (2)
Covers relations between employers, employees, and unions not covered in the basic Labor Law course (LAWS 359). Among topics included are hot cargo agreements, obligations of successor employers, duty to fair representation, union security, federal preemption of state labor legislation, internal union affairs, and labor law reform. Prereq: LAWS 359.

LAWS 391. Sports Law (3)
Sports and Entertainment Law is the study of legal issues and problems relating to the music, television, and sports industries. This course focuses on the applicability of various legal doctrines to these industries, such as intellectual property law, labor law, and contract law. Also, emphasis will be placed on negotiation tactics and letter and contract drafting by conducting several negotiation and drafting exercises as well as a simulated representative relationship between the student and the entertainment/athlete. In the context of a mock litigation/arbitration, students will also be required to draft legal briefs in support of the contractual positions taken during the contract drafting exercises. Prereq: LAWS 211 and LAWS 261.

LAWS 392. Mass Media Law and Policy (2)
This two-credit course is designed to cover the law and regulation of electronic and print media.

LAWS 393. Trademark Law (3)
Trademark Law is the study of how commercial entities use words and designs to identify the source of their products and services in the minds of consumers and competitors. This course focuses on domestic and international trademark acquisition, retention, transfer, registration, and infringement. In addition to the common law of trademarks and unfair competition, much of this course will be devoted to studying the statutory scheme of federal trademark law.

LAWS 395. Trial Practice (2)
This course provides practical training in jury and nonjury courtroom trial procedure. Students are assigned as lawyers in criminal and civil cases to conduct jury selection, examine and cross-examine witnesses, make objections, and argue motions in a simulated courtroom environment. Students may not take both Trial Practice and Trial Tactics (LAWS 397). Prereq: LAWS 207 or LAWS 212.

LAWS 396. Reproductive Rights Seminar (3)
This seminar will cover the basics of the Supreme Court’s reproductive rights jurisprudence and will look at a series of topics relating to the reproductive rights law and policy, including ‘partial-birth’ abortion and the health exception; minors’ access to abortion, contraception, and sex education; reproductive rights and religion; and assisted reproductive technologies. In addition to various interim writing assignments, you will be required to submit a substantial paper by the end of the semester. Prereq: LAWS 202.

LAWS 397. Trial Tactics (4)
An intensive course in trial tactics, techniques, and advocacy. The emphasis during the first half of the semester is on practice in the separate components of a trial: direct examination, objections, cross-examination, use of rehabilitative devices, examination of expert witnesses, jury selection, opening statements, closing argument, and pretrial preparation. During the second half of the semester each student acts as co-counsel in a full trial. Videotape recording is used for critiquing student performance throughout the semester. Students may not take both LAWS 397 and LAWS 395 (Trial Practice). Prereq: LAWS 207 or LAWS 212.

LAWS 398. Eminent Domain Law: Litigation Techniques and Trial Practice (2)
This course will provide students with a study of the law of eminent domain as it has evolved under the US Constitution and State of Ohio laws, with a special focus on the emerging law that has developed on the last decade. Will provide a special opportunity for students to understand the techniques and strategy of the litigation of modern eminent domain actions, both from the perspective of the acquiring agency as well as the private property owner. Also, provides exposure to the trial of an eminent domain action, both from the perspective of the acquiring agency as well as the private property owner. Also, provides exposure to the trial of an eminent domain action and special techniques, strategies, and practice pointers related to the successful trial of right to take proceedings before a judge and the trial of jury actions on issues of compensations.

LAWS 399. Pretrial Practice: Civil (2)
This course picks up where most first-year legal research and writing courses leave off. We will examine intensively, among other things, the various discovery devices (including depositions, interrogatories, document requests, and requests to admit), pretrial motion practice, litigation as a means of achieving the best possible negotiated result, and alternative dispute resolution mechanisms (including mediation and arbitration). In other words, we will study the things that litigators spend most of their time doing and thinking about: how lawyers go about gathering and preserving evidence, the everyday interactions they have with courts, and the reasons they do all these things even though they rarely expect to get all the way to trial. The course will include simulations and extensive drafting assignments.
LAWS 400. Pretrial Practice: Criminal (2)
This course introduces students to the key activities lawyers undertake in a criminal case in advance of trial. This course examines the various steps leading up to trial, such as the preparation of an indictment, the drafting of discovery requests, motion practice related to discovery and the suppression of evidence, preparation and negotiation of plea agreements, and other motion practice related to the pre-trial phase. This course is designed to expose students to the pretrial phase in a criminal case from the perspective of both the prosecution and defense. Anticipated topics for discussion will include case investigation, the gathering of evidence, pretrial problems typically encountered in a criminal case, and the role sentencing guidelines can have in shaping plea negotiations and other pretrial negotiations. The course will include simulations, drafting assignments, opportunities for mock oral argument, and negotiating exercises. Limited to 12 students.

LAWS 401. The Lawyering Process (2)
Certain legal skills basic to the practice of law, including interviewing, counseling, and negotiating, are discussed, and students have the opportunity to practice those skills in simulated interviews and negotiations under the supervision of the instructor. Videotapes of lawyers and/or students are shown and reading materials assigned. Class discussions of reading materials and videotapes and experience in simulations enable students to confront basic problems of interpersonal communications, role conflicts, and decision-making posed by law practice.

LAWS 402. Pretrial Practice: Medical Malpractice (2)
This advanced skills course is a specialized version of the Pretrial Practice (Civil) course. The focus is on the work of counsel for plaintiffs and defense counsel in medical malpractice cases including pleading, discovery, motion practice, and settlement negotiation. The course will emphasize the special problems confronted in medical malpractice cases such as obtaining and interpreting medical records and dealing with expert medical witnesses.

LAWS 403. Criminal Justice Clinic I (3)
Students handle a limited number of misdemeanor cases in municipal courts throughout Cuyahoga County. The seminar sessions are devoted to discussions of cases being handled by the students and to ethical and strategic considerations of criminal law practice, trial tactics, and plea bargaining. Hypothetical case studies are also used to increase the breadth of the students' exposure to the criminal justice system. Each student also handles some prosecution in local court. Prereq: LAWS 327.

LAWS 407. Death Penalty Lab (3)
This Lab will involve students in an integrated experience of academic research and public service. Students will work on semester-long research projects arising from actual death penalty cases that will be of assistance to practitioners in death penalty cases or research projects for governmental and non-governmental organizations engaged in support for, opposition to, or reform of the death penalty at a local state, national, or global level. Issues may include: victim's rights; jury selection (race/gender discrimination); proportionality (discrepancies in geographic application or application to different fact patterns); economic impact on the system; eleemosynary and transnational problems with foreign accused; systemic review (e.g., Illinois commission); and other specific recurring issues arising from innocence, assistance of counsel, experts, jury instructions, or misconduct (judge, attorney, jury). The students will have no direct representation responsibilities.

LAWS 409. Death Penalty Lab II (2)
This lab will involve students in an integrated experience of academic research and public service. As enrollment is limited to students who have successfully completed Lab I, these students will assume a supervisory role working with Lab I students. Students will work on research projects arising from actual death penalty cases that will be of assistance to practitioners in death penalty cases or research projects for governmental and non-governmental organizations engaged in support for, opposition to, or reform of the death penalty at a local state, national, or global level. Issues may include: jury selection issues; proportionality issues; economic impact of the application of the death penalty; examination of issues surrounding a specific state's ability to provide a viable clemency; issues of international law: research, investigation, and litigation of case specific issues ranging from actual innocence, ineffective assistance of counsel, ineffective assistance of experts, prosecutorial misconduct, judicial misconduct, juror misconduct, etc. Prereq: LAWS 407.

LAWS 411. Civil Litigation & Mediation Clinic I (3)
In this course, students handle various kinds of civil disputes on behalf of consumers who need legal assistance but cannot afford to pay for a private lawyer. Students are responsible for all phases of litigation, including the initial client interview and case assessment, preparation of pleadings and motions, conducting discovery, settlement negotiations, and, if necessary, trying the case before a judge or jury. A weekly two-hour seminar session provides a regular forum for learning the substantive law that applies to the students' caseloads, as well as discussion of the various legal, professional, and ethical issues that arise in the cases. In addition, after completing required basic mediation training, students act as mediators in small claims and/or landlord-tenant cases in municipal court. Students must be enrolled in and complete both semesters to receive credit. Prereq: LAWS 207 or LAWS 212 and LAWS 432.

LAWS 412. Civil Litigation & Mediation Clinic II (3)
Continuation of LAWS 411. Both semesters must be completed before credit is given.

LAWS 414. Criminal Justice Clinic II (3)
Continuation of LAWS 413. Both semesters must be completed before credit is given.

LAWS 418. Health Law Clinic I (3)
Students represent clients in social security disability claims, adult guardianships, health insurance claims and disputes, access to health care, special education for disabled children, nursing home transfers and discharges, and other health and disability law-related issues. They investigate complaints in nursing home and represent clients in administrative and court proceedings. A major part of the student's responsibilities is to analyze the problems and determine the best way of resolving them. Seminar sessions are primarily devoted to specific skills and to discussions of matters being handled by the students. The ethical and practical problems encountered in health law practice are emphasized, as well as legal theory. This is a year-long course; students must be enrolled in and complete both semesters of work to receive credit. Prereq: LAWS 207 or LAWS 212 and LAWS 227 or LAWS 373.

LAWS 419. Health Law Clinic II (3)
Continuation of LAWS 418. Both semesters must be completed before credit is given.

LAWS 423. Financial Integrity in Emerging Markets Lab (3)
In this course, which is offered alternately as either a lab or a seminar, students study and research key aspects of the international financial system integrity rules, with a focus on the anti-money laundering and terrorist financing standards of the Financial Action Task Force (FATF) and the Basel Core Principles on Banking Supervision of the Basel Committee (as well as similar standards promulgated for other financial institutions). When offered as a lab, the course engages students in projects for a variety of organizations involved in improving the integrity of financial institutions, including the FATF (as well as FATF-style regional bodies), the International Monetary Fund, the World Bank, the United Nations Office on Drugs and Crime, and locally based governmental and non-governmental organizations. Students satisfactorily completing this course will be eligible to apply for a fully paid summer internship with a local bank that will involve work in the bank's legal, anti-money laundering and financial intelligence units. Recommended preparation: LAWS 211 and LAWS 307.

LAWS 430 Community Development Clinic I (3)
This is a year-long course; students must complete both semesters of work to receive credit. Students represent businesses and non-profit entities in formation of their businesses and to obtain tax exemption for non-profit corporations. They act as general counsel helping their clients plan for future projects and activities and operate in compliance with law that regulates their activities. Students may also help to structure tax, real estate and corporate transactions for entities. Students may have the opportunity to work on simple intellectual property matters including trademark, trade name and copyright registrations, as well as website issues and nondisclosure agreements. This clinic is primarily transactional in nature and is designed to expose students to the special problems encountered in representing entities and in structuring transactions. Seminar sessions will be devoted to discussions of applicable law pertaining to specific cases students are working on and development of the skills necessary to represent individuals and entities in transactional matters. Students also will be exposed to the ethical problems associated with entity representation.
Prereq or Coreq: LAWS 261.

LAWS 431. Community Development Clinic II (3)
(See LAWS 430.)

LAWS 432. Basic Mediation Training (1)
This course provides students with basic mediation training. After successful completion, students will be certified, allowing them to serve as volunteer mediators in forums where basic training is required.

LAWS 436. Immigration Law Practicum I (3)
The Immigration Clinic will be both a real client representation clinic and provide students with experience of working on consulting projects with such organizations as the American Immigration Law Foundation. Examples of the activities that students may work on include 1) representation of individuals in matters before the Immigration Court, 2) preparation of legal memoranda, briefs, or policy papers on targeted immigration law issues. Examples of the kinds of cases and issues to be included are asylum, removal, petitions based upon the Violence Against Women Act, protections of non-citizen victims of domestic violence, and legality of detention. This is a year-long course. Prereq: LAWS 277.

LAWS 437. Immigration Law Practicum II (3)
The “Immigration Law Practicum” provides students a unique opportunity to assist persons from other countries and cultures while gaining hands on experience drafting legal documents and briefs, preparing factual and expert witness affidavits, and conducting human rights and international law research. Students may work on a variety of pro bono asylum, refugee, and removal (deportation) cases, helping individuals to obtain freedom from abuse, torture and persecution. Students desiring a two-semester experience may follow up “Immigration Law Practicum” by enrolling in “Immigration Law Practicum II.” Prereq: LAWS 277 and LAWS 436.

LAWS 438. Digital Law and Business (1)
The course provides Law and MBA students with an understanding of legal issues that need to be addressed in the development of digital business at the level of website management and transactions. The course also highlights the critical role of technology as a source of new legal requirements, and also as a means to address and enforce legal requirements that are critical in conducting on-line business (e.g. demand for authenticity, or non-repudiation). The course is organized as a series of topics that focus on critical aspects of e-business development and related contractual issues, business transactions and their enforcement, security, privacy, intellectual property rights, consumer protection, international legal issues and e-business regulation. Specific legal topics include: a). Copyright, trademark, and (to a lesser extent) patent issues (web development, content management). b). Contract law in the e-business context (formation, repudiation, E-sign, UETA, UCITA, etc.). (B2B, B2C transactions, financial transactions). c). Online privacy law and privacy policies (marketing topics). d). DMCA, ACPA, ECFA and the Patriot Act, COPPA. e). Website Terms of Use (web development), f). Website affiliate agreements (web development), g). Website development and maintenance agreements (web development). h). Web product distribution agreements. i). Shrinkwrap, clickwrap, and EDI agreements (B2B). j). Various IP-related licensing, confidentiality, development, and assignments, agreements, domain naming (Internet). Offered as LAWS 438 and MIDS 438.

LAWS 440. International War Crimes Project (3)
Students in this unique course undertake legal research projects for various international criminal tribunals (including the International Criminal Court and the tribunals in Cambodia and Sierra Leone, among others). They prepare memoranda on selected issues related to current tribunal cases. The course sessions explore the development of international criminal law and the establishment of the tribunals, as well as their jurisprudence and their Rules of Procedure and Evidence. Grades are based on the quality of student papers and in-class presentations. Completed research projects along with their accompanying source notebooks become part of the tribunal libraries.

LAWS 442. Access to Justice Externship (3)
This is an externship program in which students work at the Legal Aid Society of Cleveland for 12 hours per week with and under the direct supervision of Legal Aid attorneys. (For the summer program, students will work full time for 10 weeks during the summer months.) Students will research substantive and procedural legal issues, draft memoranda, and assist with preparation of cases. Students will work on a variety of issues, depending on student interest and agency need. In the past students have worked on substantive matters in the areas of family law, bankruptcy, housing, worker's compensation, government benefits, special education and immigration. Students will interact with the law school faculty liaison through journals and periodic meetings to discuss and further reflect upon the externship experience. For more information about the Legal Aid Society of Cleveland, students are encouraged to visit http://www.lasclev.org/.

LAWS 451. Global Corporate Governance Lab (3)
This Lab will involve students in an integrated experience of academic research and public service. Students will work on research projects on corporate governance law and policy for publicly owned companies in emerging markets such as India, Russia, Turkey, and South Africa. The course will engage students in projects for a variety of organizations involved in improving corporate governance in emerging markets, including the Organization for Economic Cooperation and Development (OECD), the International Fiscal Corporation, the Institute of International Finance (IFF), and locally based governmental and non-governmental organizations. Students will study and research key aspects of corporate governance, including minority shareholder protection, the structure and responsibility of the board of directors, accounting and auditing requirements, transparency of shareholder ownership and control, and enforcement as they apply to emerging markets. Special attention will be paid to the importance of fashioning rules appropriate for the economic, social, and legal environment of each jurisdiction.

LAWS 454. Urban Development Lab (2)
This course will involve students in an integrated experience of academic research and public service to the Greater Cleveland area. Students will work on semester long research projects arising from issues raised by local nonprofit development organizations and the development arms of other local nonprofit groups and government agencies. Specific topics will vary from semester to semester, but will generally fall within (i) barriers to development of urban properties, (ii) the role of local government and communities in encouraging or discouraging development projects and (iii) solutions for making urban areas, in general, and Cleveland, in particular, more livable and sustainable. When possible, students will present their findings directly to the organization(s) raising the issue. Students can expect direct or indirect exposure to aspects of real estate, finance, land use, tax and other regulatory law.

LAWS 500. Supervised Research Seminar (1 - 2)
Second- and third-year students may earn graded credit for an individual research project of scholarly depth and scope, under the close supervision of a faculty member. Approval of the faculty supervisor is required before registration. No student may undertake more than two Supervised Research projects or earn more than a total of four hours of Supervised Research credit. No student may work on more than one Supervised Research project in one semester. May satisfy the writing requirement.

LAWS 501. International Tribunal Externship (12)
This program provides opportunity for students to participate in a semester long program with a tribuneal program arranged through the Cox International Law Center.

LAWS 503. U.S. Attorney Externship: Civil (3)
This is an externship program in which students selected by the law school will work at the United States Attorney's Office in Cleveland for 12 hours per week, with and under the direct supervision of Assistant US Attorneys on civil cases being handled by that office. Most cases will involve torts, employment discrimination, immigration and prisoner habeas, administrative appeals, environmental enforcement, bankruptcy, debt collection and civil fraud. Students will observe and, in some cases, participate (as assistants to the USA on the case) in pretrial and court proceedings, and will work on projects to assist in the prosecution of the cases to which they are assigned. Students will research significant legal issues, draft briefs and pleadings and assist with witness and exhibit preparation. Students will also attend a 1-hour weekly seminar in which they will review and reflect upon the court proceedings observed and the work engaged in on the cases assigned, and discuss various topics relating to federal civil litigation involving the government. Topics in the seminar may include authority and responsibility of the U.S. Attorney, ethics, litigation with the government, discovery and post-trial practice, expert witnesses, damages, compromise and settlement.
sancions and civility. Students must be approved by the United States Attorney following completion, review and approval of a security clearance application.

**LAWS 505. Curricular Training: Law Field Research (0)**

This course is intended exclusively for the foreign national J.D. or L.L.M. law student who wishes to gain applied legal experience based on their intended career path with an organization that offers course credit for internship experience. These internships may be either paid or unpaid. This course will provide a means for the student to build required skills and bridge the gap between the classroom and real world application. The student is encouraged to explore and discover additional avenues to assist in the management and advancement of his/her career. Does not count toward J.D. credit.

**LAWS 508. ERISA (4)**

This class will cover employee benefits law. (ERISA): defined benefit plans, including in-depth consideration of defined benefit plan documents; VEBAs, their use and regulation; group life, Accidental Death & Dismemberment, and Long Term Disability plans and related insurance documents; insured and non-insured medical benefit plans; reporting and disclosure requirements of ERISA, including summary plan descriptions, summary of material modifications, Form 5500, and “top hat” elections; and requests for favorable determinations of qualified plans, including Form 5300 and Notices to Interest Parties.

**LAWS 509. Law of the Visual Arts (2)**

This course deals with legal aspects of the world of visual arts. In particular, the course will explore art theft; plunder of art in times of war; governmental regulations affecting the import and export of works of art; tax and estate planning issues for art collectors; artists’ rights (including freedom of speech, moral rights, copyright, and resale royalty rights); and the problems art museums face in acquiring, exhibiting, and deaccessioning works of art. Several classes will examine works of art with particular relevance to the course. In addition, the CMAs deputy director of development, its legal counsel, and the chairman of its board will talk about the myriad legal issues the CMA and its staff face on a daily basis.

**LAWS 510. Intellectual Property Theory Seminar (3)**

We will explore and ask several questions from a philosophical and historical perspective, including: Should one’s intellectual product be entitled to protection? What are the reasons for granting or denying protection? What form, if any, should this protection take? What are the costs and benefits to society of protecting one’s intellectual product?

**LAWS 511. Supreme Court Seminar (3)**

Students will examine the judicial process in the U.S. Supreme Court, including the nature of decision-making in a multi-member tribunal, procedural and jurisdictional issues, and the development of a justice’s jurisprudential philosophy. Students follow and analyze a particular justice or an aspect of the Court’s operation. May satisfy the writing requirement.

**LAWS 512. Tax Policy Seminar (3)**

This advanced seminar for students interested in fundamental issues of tax policy and tax reform considers the favorable treatment of capital gains, the advisability of adopting a comprehensive tax base under a new definition of gross income, the use of tax incentives to achieve non-tax policy goals, and the basic system of taxing corporations and shareholders. May satisfy the writing requirement. Recommended preparation: LAWS 211.

**LAWS 519. Torts Theory Seminar (3)**

This seminar will allow students to examine theories of justice in the context of tort law. In the seminar, we will be reading and discussing a series of articles that seek to provide a basis for understanding and evaluating tort doctrine. This will include readings concerning the economic approach, the corrective justice approach, and approaches based on distributive justice. The doctrine that we study will be that which is familiar from the first year course: strict liability, the requirements of the reasonable person, proximate cause, duty and product liability. Students will pick an area of tort doctrine and write a paper that will apply one or more theories to that area. A student might, for example, examine a manufacturer’s duty to warn customers about possible harm in the use of the product, and would write a paper helping us to understand that duty in light of economic and corrective justice theories.

**LAWS 531. Control of Toxins in Products and Workplaces (3)**

This seminar will explore the regulation of potentially dangerous levels of toxic substances in products and workplaces. Particular attention will be devoted to considering the structure of the current legal framework for ensuring that the public is adequately represented in these highly complicated regulatory programs that impose substantial costs on manufacturers. After studying key aspects of the major federal programs that oversee the manufacture and marketing of toxins in products and workplaces, seminar participants will consider the role that the market and tort law play in supplementing regulation. Students will be expected to write a substantial research paper related to one of the themes of the course.

**LAWS 550. Advanced Nonprofit Organizations Seminar (3)**

In this seminar, students will explore selected topics related to structure, governance, tax exemption, and government oversight of nonprofit organizations. Class readings and discussions for the first several weeks will build on the basic understanding developed in LAWS 234, Law of Nonprofit Organizations. Topics will be selected to consider framework in context, using recent real-life case studies. Students will write a significant paper on a chosen topic and present it to the class. The course grade will be based on the paper, the presentation, and class participation. Paper may satisfy writing requirement. Prereq: LAWS 234.

**LAWS 553. United States Attorney Externship: Criminal (3)**

This is an externship program in which students selected by the law school will work at the United States Attorney's Office in Cleveland for 12 hours per week, with and under the direct supervision of Assistant U.S. Attorneys on cases under investigation or being prosecuted by that office. Most cases will involve general crimes (robbery, theft, immigration, etc.), or offenses involving drugs or firearms. Students will observe and, in some cases, participate (as assistants to the AUSA on the case) in court proceedings, and will work on projects to assist in the prosecution of the cases to which they are assigned. Students will also attend a 1-hour weekly seminar in which they will review and reflect upon the court proceedings observed and the work engaged in on the cases assigned, and discuss various topics relating to federal criminal law and prosecutions. Topics in the seminar may include arrest through indictment, seizures and warrants, pretrial proceedings, plea bargaining, sentencing, discovery, pretrial conferences, jury selection and trials, post conviction proceedings, trial skills and appeals. Students must be approved by the United States Attorney following completion, review and approval of a security clearance application. Prereq: LAWS 212, LAWS 327 and LAWS 375.

**LAWS 554. 14th Amendment Seminar (3)**

This seminar focuses on the Fourteenth Amendment through Supreme Court cases and the social implications of these holdings. We will discuss the definition of equality under the law and approaches to reaching equity goals. Students should gain a frame work for comparing equal arguments asserted in a variety of settings for different groups, e.g., gender in employment settings, wealth discrimination, and race in education.

**LAWS 556. Judicial Externship Seminar (4)**

Students in the spring of their first year are selected for summer externships with specific federal district and circuit judges. Classes in the spring of the first year, during the externship summer, and in the fall of the second year complement the eight weeks of externing in the judge’s chamber. Recommended preparation: Permission of the instructors.

**LAWS 557. Genetics and Law (3)**

The current federal Human Genome Project is attempting to understand the health and behavioral implications of the 50,000 to 100,000 genes in the human body. Genetic tests are being offered to let people know if they are at risk of having a child with a genetic defect or if they will later in life suffer from cancer or other disease. Genetic predispositions are also being investigated for certain behaviors such as gay sexual preference, intelligence, and anti-social behavior. This course will cover the tort law, family law, constitutional law, criminal law, employment law, and insurance implications of developments in genetics.


This seminar will examine selected issues in comparative and international law affecting patents, copyrights, trademarks, and trade secrets. By looking at comparative systems, we will understand
the differing philosophies underlying intellectual property in different legal cultures. By examining the movements to harmonize and unify national systems (looking at the process of harmonization, extraterritorial enforcement of rights, conflicts of law, and global protection), we will see how the different cultures are being merged. May satisfy the writing requirement. Recommended preparation: LAWS 370.

LAWS 570. Foreign Graduate Seminar (2) This seminar is the required introductory course for foreign students enrolled in the Graduate Program in U.S. Legal Studies. It begins with a series of lectures introducing students to American legal education; American government, courts, and culture; various common law subjects; and professional responsibility. Throughout the year seminar sessions are held with legal practitioners from law firms and corporations in the Cleveland area who are involved in an international practice. Limited to the foreign LLM students. 

LAWS 574. Selected Topics on American Legal Professions (3) This seminar will consider the history, structure and demographics of the American legal profession. We will focus primarily on recent changes in the organization and operation of law practice and the effect of those trends on the delivery of legal services and the working lives of lawyers. Students will be required to write and present a substantial paper, which may satisfy the writing requirement. Grade is based on class participation, a presentation, and a paper.

LAWS 595. U.S. Contract Law (3) The subject matter and coverage of this course is approximately the same as the subject matter and coverage of first-year Contracts (LAWS 123) as abbreviated and modified to reflect that it (a) is limited to foreign students who are candidates for the LLM in U.S. Legal Studies and (b) consists of 3 (not 5) credit hours.

LAWS 596. Social History of Crime Seminar (3) This course is designed to offer students a somewhat different optic on the way that law operates in society, different, that is, from the sense one might get from reading case books. Here our concern is with the meaning of law in the largest sense, not so much from the standpoint of legal doctrine, but in the sense of how it works as a system of power to advance certain interests in society at the expense of less powerful groups. By “social history” I refer to the study of ordinary people, as opposed to political leaders and rulers. Thus the course explores how the law played out in the lives of ordinary men and women during the period from the eighteenth century to the present. What is a crime? How have certain customary rights been criminalized and why? What are the ideological underpinnings of the law? These are some of the questions we will take up as we examine crime in Britain and the U.S. from a thematic perspective.

LAWS 599. Doing Business in the United States (3) The course is designed to introduce foreign students to many areas of U.S. domestic law through consideration of a transnational business transaction. Examples of areas of law covered: restrictions on foreign investment, regulatory agencies, banking and finance, importing and exporting, business entities, litigation and alternative dispute resolution, labor relations, immigration law, taxation. Limited to candidates for the LLM in the U.S. Legal Studies. 

LAWS 601. Canada-United States Law Institute Seminar (2) Canada-US Legal Relations provides students with a broad examination of the issues confronting the Canada-US relationship. Topics discussed include comparative constitutional law, North American trade & investment law, immigration, Canada-US border security, and environmental issues – including the Great Lakes. The course includes lectures by practitioners and government officials. Students are required to author a paper that may be published in Canada-US Law Institute materials and journals.

LAWS 603. Research Ethics and Regulation (2) This course is designed to introduce students to the ethical, policy, and legal issues raised by research involving human subjects. It is intended for law students, post-doctoral trainees in health-related disciplines and other students in relevant fields. Topics include (among others): regulation and monitoring of research; research in third-world nations; research with special populations; stem cell and genetic research; research to combat bioterrorism; scientific misconduct; conflicts of interest; commercialization and intellectual property; and the use of deception and placebo. Course will meet in one per week for 2 hours throughout the semester. Grades will be based on class participation and a series of group projects and individual short writing assignments. Offered as CRSP 603 and LAWS 603.

LAWS 660. Federal Public Defender Externship (3) This externship program will give students an opportunity to observe and participate in many facets of federal criminal procedure and practice. Under the supervision of the Federal Public Defender and his staff, students will research and draft legal memoranda, pre-trial motions, sentencing motions, and appellate briefs. Students will also observe court proceedings and assist in trial and hearing preparation. Students will work on a variety of cases, including drug, firearm, fraud, and white collar crime. Given the pace and work demands of the Office of the Federal Defender, this externship program will have students assisting with substantive legal work.

LAWS 661. Federal Trade Commission Externship (3) This externship program will expose students to federal civil practice involving the Federal Trade Commission in a range of civil matters primarily focused on the FTC’s consumer protection mission. The externship includes seminar-style discussions with both junior and senior FTC litigators in the East Central Region office. Students will assist FTC attorneys and staff in the preparation and presentation of their cases.

LAWS 662. Internal Revenue Service Externship (3) This externship program will expose students to federal civil tax practice involving the IRS and Office of IRS Chief Counsel, including a broad range of issues involving the assessment and collection of federal taxes. The externship includes seminar discussions and placement in the local office of IRS Chief Counsel. Students will assist the attorneys in providing legal assistance to IRS personnel, in federal tax litigation in the U.S. Tax Court, and providing legal assistance to the U.S. Attorney’s Office in federal tax litigation.

LAWS 709. Canada - United States Law Journal (0) Students enrolled in this non-credit course will serve as writers and editors for the annually published Canada - U.S. Law Journal.

LAWS 712. The Pictet Moot Court (1) The Pictet Moot Court course provides one co-curricular credit for the work of the three students who have been selected to represent CWRU Law School in the annual Jean Pictet International Humanitarian Law Moot Court Competition. Students must take International Humanitarian Law, as well as International Law, International Criminal Law, or International Human Rights as pre- or co-requisites.

LAWS 718. Health Matrix Seminar (2) Students write their Health Matrix notes through the year long Health Matrix Seminar. Students work closely with the instructor to develop their topics, outlines, several drafts, and final notes. The course will include multiple individual meetings with the professor, extensive feedback, and oral presentations of the papers. Students will develop their writing and oral presentation skills and will receive training concerning advanced legal research, plagiarism, and statutory interpretation. 2L associates also will have responsibilities for journal production work, such as verifying footnotes.

LAWS 719. Health Matrix Seminar (3) The Health Matrix seminar will provide training in writing, editorial skills, and advanced legal research for students writing notes for the Journal of International Law. Topics to be covered will include topical research, advanced Westlaw and Lexis training, writing techniques, and plagiarism. 2L associates also will have responsibilities for journal production work, such as verifying footnotes.

LAWS 740. Journal of International Law Seminar (3) The seminar will provide training in writing, editorial skills, and advanced legal research for students writing notes for the Journal of International Law. Topics to be covered include plagiarism, a topic, web-based research, advanced Westlaw and Lexis training, and Westlaw research, advanced research training in selected substantive areas, and writing techniques. Satisfactory completion of the seminar will satisfy the upper-level writing requirement. Grade is based on the quality of the note and class participation.

LAWS 745. Law Review Seminar (2) The seminar will provide training in writing, editorial skills, and advanced legal research for students writing notes for the Case Western Reserve Law
This course is the second of the required courses in the CaseArc Program which trains students in the fundamental skills of practicing law. Students build on their learning in CORE 1 by confronting more complex and challenging problems. The format of the course and teaching methods are similar to CORE 1, but the writing component of the course shifts from the objective mode to the persuasive, and the research component incorporates electronic research in depth. In addition, the students learn more complex fact gathering, document analysis, and counseling. Finally, students are introduced to negotiation theory and technique and to the principles of effective oral presentation in formal and informal settings. Students must take this course in the spring semester of their first year. Recommended preparation: LAWS 801.

**LAWS 803. Core 3: Transaction, Writing, and Skills (2)**

This is the third of the required sequence of courses in which students are introduced to the fundamental skills of practicing law. Students build on their learning in CORE 1 and CORE 2 by applying the principles of legal research, analysis, writing, interviewing, counseling and negotiation in the transactional setting. Students also learn about the challenges of applying these lawyering skills in the representation of groups and entities. The format of the course and teaching methods are similar to CORE 1 and CORE 2. Students must take this course and Focused Problem Solving in their second year. They will be assigned one in the fall and the other in the spring. Recommended preparation: LAWS 801 and LAWS 802.

**LAWS 804. Focused Problem Solving (2)**

This is the fourth of the required sequence of courses in which students are introduced to the fundamental skills of practicing law. Students apply and expand the skills learned in CORE 1 and 2 in the context of a specific area of law. The overarching emphasis of the course is legal problem solving, and strategy formation and implementation. Students will identify and evaluate options to solve specific legal problems, engage in fact gathering, develop strategies for accomplishing goals, interview and counsel clients, evaluate ends/means considerations, and depending on the type of problem, function in the litigation and/or transactional contexts. Students must take this course and CORE 3 in their second year. They will be assigned one in the fall and the other in the spring. Recommended preparation: LAWS 801 and LAWS 802.

**COURSE DESCRIPTIONS (LINS)**

**LINS 114. Intervention and Law in Vietnam and Iraq (2)**

Using the examples of American intervention in Vietnam and Iraq, this course examines some of the international and domestic legal issues raised by war and military intervention. Among the topics covered will be the legal justifications for intervention and the arguments for the illegality of the two wars; constitutional limits on executive war making powers; the justiciability of issues of war and peace under U.S. law; the draft, the volunteer army, and conscientious objection; GI rights and GI dissent; the law of war and international humanitarian law and the recurring problems of massacre, murder, and torture.

**LINS 115. Comparative Employment Law and Policy (2)**

It is commonly said that workers face a global labor market, and yet the laws regulating the employment relationship differ considerably from one country to another, and, in particular, between the United States and European countries. How do different forms of regulation shape National labor markets and what are the implications for global competition? This course examines the differing regulatory approaches taken on such issues as job security, discrimination, employee privacy, protection of whistle blowers and restrictions on post-employment competition.

**LINS 117. Role of the Judge from a Comparative Perspective (2)**

This course will unveil how judges use their arsenal to review the acts of the political branches. This includes lowering or raising the standing barrier, using rigorous or lenient tests, limiting or broadening the scope of the political question doctrine, finding rights which are not enumerated in the Constitution, and other strategies. By applying these strategies effectively, the judiciary has become a major player in society, which sometimes rivals the political branches. The course, which revolves around the concept of separation of powers, draws on cases from the U.S. and non-U.S. jurisdictions. No prior knowledge of these jurisdictions is required.
WEATHERHEAD SCHOOL OF MANAGEMENT

Our Values
- We believe that management is a noble profession committed to the advancement of human life.
- We value our strong ethical foundation and strive to promote a culture rich in ideas and reflection. We are committed to increasing individual creative and critical capacities, nurturing new and expansive patterns of thought.
- We value research of enduring consequence and judge its significance by the impact it has on management thought, management action, and public policy.
- We value learning that is active and collaborative. Students, faculty and staff together engage important management problems with an innovative, knowledge-creating approach.
- We are responsive to the needs of our students.
- We consider alumni our important partners and strive to add value to their personal and professional lives.

ACADEMIC DEGREE PROGRAMS

Undergraduate Programs
- Bachelor of Science in Accounting
- Bachelor of Science in Management
- Bachelor of Arts in Economics (awarded by the College of Arts and Sciences)

Professional Programs
- Master of Accountancy (MAcc)
- Master of Business Administration (MBA)
- Master of Science in Management (MSM)

Specializations:
- Finance
- Operations Research
- Supply Chain
- Master of Science in Positive Organization Development and Change (MPOD)
- Master of Engineering and Management
WEATHERHEAD SCHOOL OF MANAGEMENT

Robin Dubin
Associate Dean for Graduate and Professional Programs

Laura Gordos
Director of Finance and Administration

Julia Grant
Associate Dean for Undergraduate Studies and Academic Administration

Sonia Winner
Associate Dean for External Relations

WEATHERHEAD SCHOOL DEGREE PROGRAMS

Undergraduate Programs
Bachelor of Science in Accounting
Accountancy demands a high degree of technical training, similar to the professions of architecture, law, engineering and medicine. The accounting profession requires a broad knowledge of the fundamentals of economics and business, and a commitment to public well being. Career opportunities in accounting include the public, corporate, government, non-profit, and health care sectors. The undergraduate program in accountancy is designed to prepare students for entrance into these careers and to provide a foundation for the examination to become a Certified Public Accountant (CPA) or to achieve other professional certifications.

As part of the sequence of courses leading to the Bachelor of Science degree in Accounting offered through the Weatherhead School of Management, the student takes required and elective courses in related fields of banking and finance, economics, marketing, organizational behavior, management information systems, management policy, and operations.

REQUIRED ACCOUNTING COURSES
• ACCT 101 - Introduction to Financial Accounting (3 hours)
• ACCT 202 - Management Accounting (3 hours)
• ACCT 300 - Corporate Reporting I (3 hours)
• ACCT 301 - Corporate Reporting II (3 hours)
• ACCT 304 - Advanced Financial Reporting (3 hours)
• ACCT 305 - Income Tax: Concepts, Skills, Planning (3 hours)
• ACCT 314 - Attestation and Assurance Services (3 hours)

Students pursuing the BS in Accounting are advised to take the two introductory classes as early as possible, and the required MGMT 250/251 sequence in the second year. Accounting majors may not use the P/NP option for any Weatherhead School of Management courses. Twelve credit hours of accounting course work taken at another accredited institution may be considered for transfer toward the Bachelor of Science degree in Accounting, although transfer credit for courses beyond introductory accounting must be approved by the Department of Accountancy. Each student is required to consult with an advisor in the Office of Undergraduate and Integrated Study Programs at Weatherhead.

Bachelor of Arts in Economics (College of Arts and Sciences)
Economics is concerned with the problems of allocating scarce resources to meet human needs. Students who study economics gain an understanding of how consumers (households), producers (firms) and governments make decisions affecting the allocation of resources and, therefore, a society’s economic performance. Economics also involves an examination of how the interaction of these decisions in markets and in the political process produces certain outcomes, and how legal and institutional arrangements can influence these outcomes. Finally, the study of economics leads to a better appreciation of the ways in which trade, investment, and the movement of people and information across national boundaries tie the global economy together.

An undergraduate major in economics provides an excellent preparation for a variety of professional careers, such as management, law and government service. This major is essential for those wanting to pursue graduate work in economics.

Major (for BA degree)
A major in economics consists of 33 credit hours, with a minimum of 27 credit hours of economics courses. It leads to the Bachelor of Arts degree.

REQUIRED COURSES
• ECON 102 and 103
• STAT 207, STAT 243, or ECON 226
• ECON 307
• ECON 308 or 309
• ECON 326

SENIOR CAPSTONE—TO BE CHOSEN FROM THE FOLLOWING LIST
Other approved projects in conjunction with capstone requirements in other majors.

ELECTIVES
Minimum of five additional courses in economics at 200-level or 300-level. At least two of these courses must be in 1 concentration (see below). Up to three hours of the student’s capstone experience can count toward the 15 hours of electives.

Economics Concentrations:

RESOURCES & MARKETS
- ECON 255 - Economic History of the United States
- ECON 332 - Economics of Labor Markets
- ECON 333 - Economics of Organizations and Employment Relationships
- ECON 341 - Banking and Finance
- ECON 367 - Energy Economics and Engineering Solutions
- ECON 368 - Environmental Economics

INDUSTRIAL ORGANIZATION
- ECON 328 - Experimental Economics
- ECON 329 - Game Theory
- ECON 364 - Industrial Organization
- ECON 369 - Economics of Technological Innovation

PUBLIC ECONOMICS
- ECON 342 - Public Finance
- ECON 343 - Economics of State and Local Governments
- ECON 378 - Health Care Economics
- ECON 386 - Urban Economics

INTERNATIONAL ECONOMICS
- ECON 372 - International Finance
- ECON 373 - International Trade
- ECON 375 - Economics of Developing Countries
- ECON 350 - World Economic History

Minor (for BA or BS degree)
ECON 102, ECON 103, and three additional economics courses (9 credit hours) selected in consultation with the minor advisor.

Bachelor of Science in Management
Graduates of the Bachelor of Science in Management program have obtained a broad education within a scientific framework that enables them to bring an unusual degree of analytical capability to the problems of management and business. Each management student is required to obtain a concentration by completing a course sequence in banking & finance, marketing, or an approved, individualized program of study. In addition, each student must consult with an advisor in the Office of Undergraduate and Integrated Study Programs at Weatherhead.

Management Concentrations

CONCENTRATION I: BANKING & FINANCE (15 CREDIT HOURS):
- BAFI 356 - Investments (3)
- BAFI 357 - Financial Modeling, Analysis & Decision Making (3)
- BAFI 359 - Intermediate Corporate Finance (3)
- BAFI 372 - International Finance (3)
- ACCT 300 - Corporate Reporting I (3)

CONCENTRATION II: MARKETING (15 CREDIT HOURS):
Required:
- MKMR 304 - New Product Development and Marketing (3)
- MKMR 310 - Market Research (3)
- MKMR 311 - Consumer Behavior (3)
Plus one or both of:
- MKMR 307 - Marketing through the Supply Chain (3)
- MKMR 312 - Selling and Sales Management (3)
Plus, if needed, one of:
- ANTH 314 - Cultures of the United States (3)
- ECON 373 - International Trade (3)
- PSCL 315 - Social Psychology (3)

CONCENTRATION III: DEAN’S APPROVED CONCENTRATION
Subject to approval by the Undergraduate Curriculum Committee, a student may construct a 15-credit sequence of courses in an area of individual interest.
Students pursuing a BS in Management are advised to take the MGMT 250/251 sequence in the second year. Management majors may not use the P/NS option for any Weatherhead School of Management courses.

Minors
ACCOUNTING MINOR (15 CREDIT HOURS)
- ACCT 101
- ACCT 102
- ACCT 300
At least two additional 300-level courses approved by the Department of Accountancy.
Undergraduate accounting majors accepted to the joint BS in Accounting/MAcc program are permitted to double count six credit hours of course work towards both the BS in Accounting and the MAcc. Hence, the two programs require 152 credit hours of study rather than 158 credit hours (122 credit hours for the BS and 36 credit hours for the MAcc). For the first eight semesters of study, students register as an undergraduate in Case Western Reserve University; thereafter, students register in the graduate professional degree program in the Weatherhead School of Management. Students complete and are awarded the Bachelor of Science in Accounting prior to completing the master’s degree program.

**Accelerated BS in Accounting/Master of Accountancy (MAcc)**

The accelerated BS in Accounting/MAcc program allows motivated students to complete both the BS in Accounting and the MAcc degrees in four years of study. These students are able to double count six credit hours of course work reducing the total credit hour requirement from 158 credit hours to 152 credit hours. To enroll in this program, students must have:

- completed 90 hours of undergraduate course work;
- completed all of the undergraduate WSOM SAGES General Education Requirements;
- completed 36 hours of the WSOM major requirements (including 15 hours of the required accountancy coursework); and
- achieved at least a 3.0 overall GPA.

For all eight semesters of study, the student will register as an undergraduate in Case Western Reserve University and never as a graduate student in the graduate professional degree program in the Weatherhead School of Management. Students in this program will receive both the BS and the master’s degree at the end of the program.

**Program Requirements**

To be eligible, a student must:

- have completed 21 credit hours of course work at Case Western Reserve (prior to the start of the work assignment);
- have a minimum GPA of 2.5 and be in good academic standing;
- have completed ACCT 101 and ECON 102 or 103;
- register for MGMT 001 or MGMT 002, a non-credit practicum course;
- complete pre-practicum assignments with the University Career Center;
- secure a Weatherhead faculty member as a practicum advisor; and
- develop an approved Learning Agreement with the practicum advisor.

*An assistant dean in Weatherhead Undergraduate Programs may serve as practicum advisor for summer practica.*

All practica developed through the University Career Center must be taken for transcript notation and have a faculty member serve as a practicum advisor. If a student elects to work in an internship/practicum without enrolling in the course for academic notation, he or she will neither have the benefits of full-time student status, nor represent the practicum program in any official capacity.

**PROFESSIONAL PRACTICUM**

The primary goal of this active learning experience is the intellectual, personal and professional growth of the student in an area related to the student’s academic goals. The practicum should provide the student with new skills, insights and experiences that are transferable to the academic setting.

A practicum is a planned, structured, supervised workplace experience at an approved “site” organization. The practicum is an experiential learning arrangement between the student, the employer and the practicum advisor in conjunction with the University Career Center. Employers provide appropriate supervision and work related learning, while the practicum advisor guides and evaluates the student’s experience.

Students apply to the University Career Center in the semester preceding the work assignment. A student may participate in up to two practica, but must spend at least one intervening semester on campus.
# Bachelor of Science in Accounting Degree Requirements

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<th>Course Number</th>
<th>Course Name</th>
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<tr>
<td>MATH 125</td>
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<td>Humanities</td>
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<td>Natural Science</td>
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**First Semester Credits**: 17

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**Second Semester Credits**: 16

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<td>MGMT 250</td>
<td>Managing Orgs and People</td>
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<td>STAT 207</td>
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<td>ECON 102</td>
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**Third Semester Credits**: 15

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**Fourth Semester Credits**: 15

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**Eighth Semester Credits**: 12
### Bachelor of Science in Management Degree Requirements

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GRADUATE PROGRAMS

The MBA Program
Weatherhead’s highly regarded MBA curriculum guides students in self-examination, growth and learning, in both theory and practice. Our newly redesigned core curriculum provides a solid foundation in management skills. In the core, and in distinctive year-long electives, students are introduced to our two signature themes: Sustainability and World Benefit, and Manage by Designing. The Weatherhead MBA program prepares students to be business leaders in the 21st Century, and is delivered in a variety of formats, as described below.

Full-Time MBA Program Twenty-one-month Curriculum Core Courses (33 credit hours)
The two-year, full-time MBA program is designed for individuals with diverse academic backgrounds and relevant work experience. In the first year of the program, students acquire basic business skills by taking the integrated core curriculum. The core is comprised of a yearlong class in marketing and supply chain, two semesters each of accounting and finance, and one semester each of statistics, strategy, leadership development, and human values in organizations. The core also introduces students to economics and systems. A distinctive feature of the first year experience is the executive dialogues seminar, in which teams of executives meet with students to discuss problems in their organizations and their solutions.

In the second year of the program, students can specialize in areas of interest by taking elective classes. Students will also have the opportunity to take newly designed yearlong electives. All of the yearlong electives are project based classes, allowing student projects to be more sophisticated and in depth than would be possible in the typical, one semester, elective.

CONCENTRATIONS
There are no concentration requirements to complete the degree; however, some students may wish to pursue a concentration. More detailed information is available at the website: www.weatherhead.case.edu/academics/masters/mba/concentrations/.

INDEPENDENT STUDY
MBA students are limited to 6 credit hours of elective credit as independent study. Any student wishing to take more than 6 credit hours of independent study must petition the associate dean for graduate and professional programs.

Other courses at the university may be eligible for MBA elective credit. Contact the Student Services Office for additional information.

STATISTICS AND FINANCE PREPARATION WORKSHOPS
All admitted students in the 21-month curriculum who do not have an academic or employment background in these areas are strongly encouraged to attend the appropriate workshops in advance of starting the MBA program. The workshops are offered during the two weeks before the start of full-time orientation in August.

EVENING AND SATURDAY PART-TIME MBA PROGRAMS
The evening and Saturday part-time MBA programs are designed for qualified students who wish to pursue their graduate management education while continuing to work full time. Evening and Saturday instruction is available as a 48 credit hour program for qualified candidates with diverse academic backgrounds, or as a 42 credit hour program for qualified students with undergraduate business degrees from a U.S. institution.

EVENING AND SATURDAY CORE CURRICULUM (48 CREDIT HOURS)

- MGMT 403 - Leadership Assessment and Development (3) (cannot be waived)
- MGMT 499 - Strategic Issues and Applications (3) (cannot be waived)
- MGMT 413 - Human Value in Organizations (3)
- QUMM 414 - Statistics and Decision Modeling (3)
- ACCT 401 - Finance and Managerial Accountability (3)
- BAFI 402 - Financial Management I (3)
- MIDS 409 - Information Design and Management (3)
- MKMR 403 - Marketing (3)
- OPMT 405 - Operations Management (3)
- ECON 403 - Economics for Management (3)

Students who have completed undergraduate equivalent course work of an MBA core course may petition to waive a core course and substitute an elective. Substitution of four or more electives will qualify students for the 42 credit hour program (see below).

EVENING AND SATURDAY ADVANCED ELECTIVES (15 CREDIT HOURS)
Students in both the 42 and 48 credit hour evening and Saturday part-time MBA programs take between 12 and 18 credit hours of electives depending upon the program. See the departmental course offerings section for detailed course descriptions.

Cleveland Clinic Health Management Scholars Program
Cleveland Clinic and Case Western Reserve University’s Weatherhead School of Management have joined forces to create the Health Management Scholars Program. This innovative partnership gives four students the unique opportunity to participate in Weatherhead’s full-time MBA program with a Health Systems Management concentration and in specialized action learning assignments at the Cleveland Clinic. Qualifying scholars will also receive the following benefits:

- a tuition scholarship of $15,000 per year;
- courses at Cleveland Clinic and the Weatherhead School;
- prestigious paid summer internships at Cleveland Clinic; and
- seminars featuring Cleveland Clinic managers as guest speakers.

For additional information about this program or to apply, please call 216-368-2030 or e-mail bizadmission@case.edu/.

The Executive Master of Business Administration (EMBA)
The Executive Master of Business Administration (EMBA) is a 21-month program specifically designed to prepare experienced managers with the knowledge, skills and perspective required for expanded general managerial and executive responsibility. A qualified applicant must have 10 years of experience, 5 of those in a management capacity, and his or her company endorsement. The program is delivered in five integrated semesters through a unique format which provides flexibility for a comfortable learning/work/life balance. Each semester contains modules that deal with a particular theme. Action learning projects throughout the program allow the participants to work
on real issues that affect their sponsoring organizations and provide instant ROI. Each semester starts with a four-day residency, after which, participants come to campus one contiguous Friday and Saturday each month. These sessions are combined with technology-enhanced learning elements that enable participants to remain engaged and connected while working individually and within a supportive team environment. For more information call Carleen Henderson, director, EMBA program at 216-368-2554.

Executive Doctor of Management (EDM)
The Executive Doctor of Management (EDM) Program is an interdisciplinary doctoral degree program, designed specifically for experienced professionals. The EDM program focuses on the broad economic, political, social, and technological forces facing organizations today. Qualifications for the EDM Program include a master’s degree, at least 15 years of experience, and a personal commitment to seeking a deeper understanding of management in a global context by conducting issue-oriented research. For further details, a program brochure and information on applying to the EDM Program, contact Sue Narrker, director, EDM program at 216-368-1943.

Master of Accountancy (MAcc)
The Master of Accountancy is an integrative program, which builds directly upon the student’s undergraduate education. Qualified students should have an undergraduate degree in accountancy from an accredited U.S. program or the equivalent. Students who do not have an accountancy degree may still be admitted, but will need to take additional courses to provide an appropriate foundation in business and accountancy. The program is normally 36 credit hours for those who have an undergraduate accountancy degree. Entering students without this degree will usually require an extended period of study in the program to meet prerequisites in the following areas:

- General Business: business law, corporate finance, marketing, micro and macro economics, operations management and statistics
- Accountancy: principles, intermediate financial accounting, advanced financial accounting, managerial accountancy, U.S. taxation and auditing

The program is primarily designed for students interested in full-time study. Part-time students are also admitted, contingent upon their commitment to complete the program on a timely basis. Students may be admitted for study at the beginning of the fall, spring or summer semesters, but it is generally advantageous to begin study in the fall semester. Some scholarships are available to exceptional applicants for the full-time program.

Undergraduate accounting students at Case Western Reserve University are strongly advised to enter and complete the Master of Accountancy program in their fifth year. University policies permit such students an opportunity to complete the Master of Accountancy in 30 credit hours, rather than 36, if course selection is properly planned. Certain highly qualified Case Western Reserve University students in Accounting may be eligible to accelerate their completion of the BS in Accounting and the Master of Accountancy through the integrated studies program. This program allows such students to enroll as both an undergraduate and a graduate student during the senior year. Because of the necessity for proper planning of course work and programs, undergraduate students are strongly encouraged to apply for the Master of Accountancy in the junior year.

A typical 36 credit hour course of study for a student with an undergraduate accountancy background includes:

ACCOUNTANCY CORE COURSE CURRICULUM
- ACCT 520 - Advanced Financial Accountancy Theory (3)
- ACCT 540 - Analysis of Contemporary Accountancy Issues (3)
- ACCT 405 - Advanced Federal Taxes (3)
- ACCT 444 - Advanced Auditing Theory and Practice (3)
- Accountancy Electives (6 credit hours)

Students may choose any 12 credit hours from any graduate accountancy courses (excluding basic courses in the MBA core). A concentration is not required although students may develop a concentration in taxation or reporting and assurance services.

Supporting Electives (18 credit hours)
The electives allow students to develop a background in areas that complement and support careers in professional accountancy. Concentrations are not required, but students may choose concentrations in certain areas such as banking and finance, organizational and human resource development, information systems, operations and supply chain management, strategic management and other areas. No more than three credit hours of accountancy course work may be taken as a supporting elective. Courses must be taken in at least two areas (not including accountancy). These electives may not include basic courses in the MBA core. Courses will be selected in consultation with the graduate program advisor.

Contact Professor Larry M. Parker, director, Master of Accountancy Program, 216-368-2065, larry.parker@case.edu; or Tiffany Welch, program director, Master of Accountancy Program, 216-368-2058, tiffany.welch@case.edu, for further information.

Master of Engineering and Management (MEM)
The Master of Engineering and Management (MEM) program is designed to meet the needs of industry by offering young engineers the critical skills needed to be successful in an engineering career. The MEM program is a 42 credit hour program which takes three semesters to complete. Courses are taught by the highly ranked faculty of the Case School of Engineering and Weatherhead School of Management.

MEM ADMISSION REQUIREMENTS
Students who are enrolled in accredited baccalaureate engineering programs and who hold junior or senior level status will be considered for admission. In addition, students with less than five years of work experience after receiving their bachelor’s degree from an accredited engineering program are also eligible for admission.

Additional information regarding the MEM program is available in the Case School of Engineering section of the General Bulletin.

Master of Science in Management (MSM)
In the Master of Science in Management (MSM) program, students gain the entry-level management and business skills. Unlike most other graduate business degrees, recent bachelor’s of arts degree graduates with no prior business course work may qualify for this two-semester degree program. The MSM curriculum is designed to give students a broad experience of all major areas of the current business spectrum, providing a solid foundation for thorough, informed decision-making in today’s business environment.
NINE-MONTH CURRICULUM

- MGMT 403 - Leadership Assessment and Development I (3)
- MGMT 499 - Strategic Issues and Applications (3)
- MGMT 413 - Human Value in Organizations (3)
- QU MM 414 - Statistics and Decision Modeling (3)
- ACCT 401 - Financial Reporting and Control (3)
- BAFI 402 - Managerial Finance (3)
- MKMR 409 - Information Design and Management (3)
- OPMT 405 - Operations Management (3)
- ECON 403 - Economics (3)
- QU MM 498 - Action Learning Consulting Course (3)
- International Institute (3)

STATISTICS AND FINANCE PREPARATION WORKSHOPS

All admitted students to the nine month MSM curriculum are required to attend Statistics and Finance preparation workshops in advance of starting the MSM program. The workshops are offered during the weeks before the start of full-time orientation in August.

MBA OPPORTUNITIES

Students who have completed the MSM may return to Weatherhead after at least one year of full-time work experience to complete an accelerated MBA degree with two additional full-time semesters. The total academic period for the combined MSM and accelerated MBA is four semesters — the same as a traditional MBA degree. Students may also complete the MBA in the part-time program.

For more information regarding the MSM program, call 216-368-2030 or e-mail bizadmission@case.edu.

Master of Science in Management with a specialization in Operations Research (MSM-OR)

Operations research uses mathematics, statistics and computers to help managers make decisions regarding complex organizational problems. These types of problems arise in manufacturing and service companies, as well as in many other kinds of organizations. Decision problems may be solved by developing mathematical models of the problem, using a computer to obtain a solution, then validating that the solution can be implemented and will perform as predicted by the model.

The MSM-OR program trains students in the techniques and applications of operations research and provides them with a basic understanding of business fundamentals in order to contribute value to organizations and communicate effectively with professionals in other business disciplines.

Requirements for the 36 credit hour MSM-OR can be completed in 12 months of full-time study by taking 6 credit hours in the summer semester and 15 credit hours each in the fall and spring semesters. The program is available on a full- or part-time basis. For more detailed information e-mail msm-oper@case.edu or visit the department website: http://weatherhead.case.edu/orom/.

MSM-OR CURRICULUM

The MSM-OR curriculum has three components: the business core, the operations research core, and a specialty track.

BUSINESS CORE (6 CREDIT HOURS TOTAL)

The business core provides students with an introduction to the major principles and concepts of business operations. Business core selections include accounting, economics, finance, information systems, marketing or operations. The specific set of courses selected depends on the specialty track chosen.

OPERATIONS RESEARCH CORE (18 CREDIT HOURS TOTAL)

The operations research core provides a solid grounding in the techniques of management science. Course requirements include:

- Prerequisite Mathematics Courses (if needed)
- Core Courses (1.5 credit hours each)
- Linear Programming
- Deterministic Models with Applications
- Stochastic Models with Applications
- Probability and Statistics for Management Science I
- Probability and Statistics for Management Science II
- Regression and Forecasting
- Simulation Design
- Simulation Models with Applications
- Integrated Problem Solving
- Data Structures
- Open Elective (3 credit hours)
- Specialty Track (12 credit hours total)

To obtain an in-depth, marketable set of skills in one area of concentration, students take a coherent sequence of courses in one of four tracks: Operations Research, Operations Management, Finance and Information Systems.

Master of Science in Management with a specialization in Supply Chain (MSM-SC)

Supply chain management deals with the coordination of all activities that affect a product, flowing from its sources of raw materials to customers for the purpose of creating value in the end product. The product may be a physical good, a service, an idea, information or other entity that flows through a defined pipeline or channel.

The 36 credit hour MSM-SC program trains students at the master's level in supply chain methods and concepts, business fundamentals, and quantitative techniques in order to be effective analysts in manufacturing and service companies.

Requirements for the 36 credit hour MSM-SC degree can be completed in 12 months by taking 6 credit hours in the summer semester and 15 credit hours in both the fall and spring semesters. The program is available on a full- or part-time basis. For more detailed information e-mail msm-oper@case.edu or visit the department website: http://weatherhead.case.edu/orom/.

MSM-SC CURRICULUM

The curriculum is composed of two components: the business core and the supply chain core.

BUSINESS CORE (12 CREDIT HOURS TOTAL)

The business core provides students with an introduction to the major principles and concepts of business operations. Subject areas addressed in the business core are accounting, finance, marketing, and operations.

SUPPLY CHAIN CORE (24 CREDIT HOURS TOTAL)

The supply chain core consists of the following quantitative and managerial courses:

- Prerequisite Mathematics Courses (if needed)
- Quantitative (1.5 credit hours each):
  - Linear Programming
  - Deterministic Models with Applications
  - Probability and Statistics for Management Science I
  - Probability and Statistics for Management Science II
  - Regression and Forecasting
  - Simulation Models with Applications

WEATHERHEAD SCHOOL OF MANAGEMENT
Th e core set of classes includes:

- BAFI 403 - Financial Management II
- BAFI 404 - Financial Modeling
- BAFI 434 - Financial Econometrics
- BAFI 430 - Derivatives and Risk Management
- BAFI 435 - Empirical and Computational Finance

Electives (12 Hours)

Students may take any graduate level finance or accounting electives, as well as other appropriate graduate electives to be chosen in consultation with an advisor.

Master of Science in Positive Organization Development and Change (MPOD)
The context of organizational development has shifted radically within the last 20 years. Today’s leaders need to be prepared to embrace accelerated change, technology, distributed organizing, social entrepreneurship, and globalization. The MPOD degree enables professionals to create a better world by developing human potential with strength-based methods of inquiry, design, and change management.

The Department of Organizational Behavior offers a 19-month, 40 credit hour program delivered in five week-long residencies and one 10-day international study tour, with virtual conferencing and intensive Internet-mediated learning between residential periods.

This distinct learning atmosphere offers Weatherhead students a unique opportunity to experience a new global educational delivery model, called “collaborative excellence.” This model connects the best in experiential learning, expansive virtual collaboration tools, and the exciting new fields of positive organizational scholarship and human systems change.

The MPOD includes certifications in both Appreciative Inquiry for Business & Society and Leadership Development through Emotional Intelligence and Coaching. In addition, participants complete two team-based consulting projects in the field, and an individual application project in their workplace. The program also offers a multicultural experience with OD students and practitioners in countries outside the United States.

Residency One

Foundations of Positive OD; Experiential Learning for Individuals, Teams, and Organizations; Joining the Global Inquiry (BAWB)
management or supervisory experience. Executive MNO students typically take 30 hours of required courses and 15 hours of elective courses. Students who have taken prior course work in the required areas may, with faculty approval, replace specific required courses with other elective courses. For further information, contact the Mandel Center’s director of recruitment at 216-368-6025.

Admission to the 45-credit Executive MNO degree option will be considered only at the time of the initial admission into the master’s degree program. Students may not apply for this option once they have matriculated into the 60-hour program.

ADMISSION REQUIREMENTS
For additional information concerning the MNO program (including scholarship information), contact the director of recruitment at 216-368-6025, by e-mail to mcnoadmissions@case.edu, at the website: www.case.edu/mandelcenter, or by mail at: Mandel Center for Nonprofit Organizations, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio 44106-7167.

SCHOLARSHIP AID
The Mandel Center offers numerous scholarship opportunities, both merit- and need-based.

WAIVER POLICY
A total of six credit hours are eligible for waiver, subject to the following requirements:

- Courses to be waived must have been taken from an accredited institution within five years of the date of application to the MNO degree program.
- A grade of at least B must have been earned.
- A Mandel Center faculty member must review and approve the waived course. Courses will not be waived based on work experience.
- A student must register for and complete at least 54 credits toward the MNO degree in residence at the university, in addition to any courses waived.

A waived course may reduce degree requirements.

TRANSFER CREDIT
Courses granted transfer credit must be approved as applicable to the MNO program. Courses must be taken at an accredited institution and approved prior to enrollment. A grade of at least B must be earned, and these grades are not counted in the cumulative grade point average. Transfer credit is limited to six credit hours.

SUBSTITUTION
An additional nine credit hours may be approved for substitute credit. Substitute courses replace required MNO courses but do not reduce the total number of credit hours required to complete the program. Substitute courses must be selected and approved in accordance with a clearly defined written proposal consistent with student interests/needs and the MNO program mission.

RESIDENCY REQUIREMENT
Students must complete a minimum of 54 credit hours of course work in residence through the Weatherhead School of Management to be eligible to receive the MNO degree.

REGISTRATION
Registration for MNO programs is done through the Weatherhead School of Management. Refer to the section on Registration and Academic Information for information about course changes and withdrawals.

RETENTION AND GRADUATION REQUIREMENTS
The retention requirements for continued study in the MNO program are:

- minimum GPA after 15 credit hours of study: 2.5;
- minimum GPA after 23 credit hours of study: 2.7;
- minimum GPA after 29 credit hours of study: 3.0; and
- minimum GPA for graduation: 3.0

A student will be placed on academic probation after any semester in which the minimum GPA is not attained. A student who is on academic probation in a particular semester will be allowed one additional semester to attain the minimum GPA in order to continue in the MNO program.

NON-DEGREE STUDENTS
Individuals may register as non-degree students and take a maximum of 12 credit hours through a total of four (4) Mandel Center graduate level courses. For questions about this option, please contact the Mandel Center Admissions Office at 216-368-6025 or visit http://www.case.edu/mandelcenter/grad/.

WEATHERHEAD SCHOOL OF MANAGEMENT

JOINT DEGREE PROGRAMS

MBA/JD Joint Degree Program
The Weatherhead School of Management at Case Western Reserve University has a formal full-time joint-degree program with the School of Law. Students enrolled in the program who fulfill the requirements set for graduation by both schools will receive both a JD and an MBA degree. The MBA/JD joint-degree program is designed for individuals who want to specialize in the legal, contractual, and governmental aspects of management.

Program Structure
The Weatherhead School of Management offers two curriculum options for MBA students: the accelerated, 11-month MBA Program (for students with undergraduate business degrees), and the traditional, two-year MBA Program (for students with all other undergraduate degrees).

Students enrolled in the traditional MBA Program may complete the three-year JD program and the two-year MBA program in four academic years by completing 127 credit hours (including a 7 credit hour overload which can be taken during the academic year or during the summer semester). Students in the accelerated MBA Program may complete the MBA/JD Program in three years, plus one summer semester, by completing 116 credit hours. Joint-degree candidates may start the MBA/JD program at either school.

The School of Law allows joint-degree students to use 12 credit hours from the MBA to fulfill both JD and MBA requirements. The Weatherhead School of Management allows joint-degree students to use 12 credit hours from the School of Law to fulfill both MBA and JD requirements. Students must achieve a grade of C or better to receive double credit for the courses. This reduces the total number of hours required for the two degrees by 24 credit hours.

The School of Law is a full-time day program with no evening division; therefore, MBA/JD students may enroll only on a full-time basis, except during summer sessions. Joint-degree students must receive both the JD and the MBA degrees simultaneously upon completion of degree requirements at both schools in order to receive the 24 hours of cross-credits described above.

ADMISSION TO THE MBA/JD PROGRAM
MBA/JD applicants must meet all of the ad-
mission requirements of both schools, including taking both the LSAT and the GMAT, completing separate applications to both schools (indicating on both applications that they are applying for the MBA/JD), and paying both application fees. Students may defer the decision to apply to the MBA/JD program until after enrolling in either the MBA or JD program provided that the application to the second school is received before the beginning of the third semester in either program. Students are expected to take one full year of study in one program followed by one full year of study in the other. During the third and fourth years of the MBA/JD, students combine courses in both schools each semester. Additional information may be obtained by phoning the Weatherhead School at 216-368-2030 or the School of Law at 216-368-3600.

REGISTRATION
Throughout the joint-degree program, MBA/JD students continue to register in the first school they attended. After completion of both degree programs, two separate diplomas are awarded. Course work for both programs must be completed within six years of the date of initial enrollment in either program.

MBA/JD CURRICULUM
For more information about the MBA/JD curriculum, visit the website: http://weatherhead.case.edu/academics/masters/mba/joint/mbajd/.

MBA/MD Joint Degree Program
Case Western Reserve University’s School of Medicine and Weatherhead School of Management collaborate to offer the joint MBA/MD degree program. The MBA/MD provides physicians with the management knowledge and skills necessary to deal with rapid changes in the healthcare industry and the economy.

PROGRAM STRUCTURE
Students can complete the four-year MD degree and the two-year MBA degree in five years or less. The Weatherhead School of Management offers two curriculum options for MBA students: the accelerated, 11-month MBA Program (for students with undergraduate business degrees); and the traditional, two-year MBA Program (for students with all other undergraduate degrees).

Students enrolled in the traditional MBA Program may complete the four-year MD program and the two-year MBA program in five academic years by completing 51 MBA credit hours plus all requirements for the MD program. Students in the accelerated MBA Program may complete the MBA/MD Program in four years, plus one summer semester, by completing 38 MBA credit hours plus all requirements for the MD program. Joint-degree candidates may start the MBA/MD program at either school. The School of Medicine is a full-time day program with no evening division; therefore, MBA/MD students may enroll only on a full-time basis. Joint-degree students must receive both the MD and the MBA degrees simultaneously upon completion of degree requirements at both schools in order to receive the dual degree.

ADMISSION TO THE MBA/MD PROGRAM
MBA/MD applicants must meet all admission requirements of the School of Medicine and the Weatherhead School of Management, including taking both the MCAT and the GMAT and completing separate applications to both schools. MD students may apply to the MBA/MD program as late as the beginning of the third semester of medical school. Students are expected to take one full year of study in one program followed by one full year of study in the other. During the third and fourth years of the MBA/MD, students combine courses in both schools each semester. Additional information may be obtained by phoning the Weatherhead School at 216-368-2030 or the Medical School at 216-368-3450.

REGISTRATION
Throughout the joint-degree program, MBA/MD students continue to register in the first school they attended. After completion of both degree programs, two separate diplomas are awarded. Course work for both programs must be completed within six years of the date of initial enrollment in either program.

MBA/MIM Joint Degree Program
The Weatherhead School and the American Graduate School of International Management (the Thunderbird School) jointly offer a graduate level program in both management and international studies.

The MBA/Master of International Management (MIM) provides the strengths and career planning advantages of both schools for students who wish to build a career in international business by offering the following:

- a unique management skills assessment and development process, as well as strong functional concentrations through the MBA program at the Weatherhead School of Management;
- foreign language fluency—with an emphasis on business communications—and a wide range of course offerings in international studies and world business through the MIM Program at Thunderbird; and
- access to all placement services and alumni networks at both schools, both during enrollment in the joint-degree program and as a graduate of the joint-degree program.

PROGRAM STRUCTURE
Because of the interdisciplinary advantages achieved when taking both degrees simultaneously, students in the MBA/MIM joint-degree program are able to accelerate and streamline course work in both schools. As a result, most students can complete the 81 credit hour joint program in 24 months, as compared to the 3½ years (102 credit hours) required to complete the two programs separately. In order to progress through the joint-degree program at the most efficient pace, students should start the program at the Weatherhead School of Management and complete the program at the Thunderbird School.

Both degrees will be awarded simultaneously at the completion of all degree requirements for the MBA and MIM.

ADMISSION TO THE MBA/MIM PROGRAM
Prospective students who are interested in applying to the joint MBA/MIM program offered by the Weatherhead School of Management and the Thunderbird School should apply separately to each school. (Applicants to the Weatherhead School of Management should indicate their interest in the MBA/MIM in the appropriate area under “Intended Program” at the bottom of the first page of the Weatherhead MBA application.) Separate transcripts, GMAT and TOEFL scores, recommendations, essays and other materials required to complete application at each school must be sent individually to each school.

The admissions committees of each institution will maintain independent control over their admissions criteria and procedures. Students must be admitted separately to each of the programs. Admission to one school does
not guarantee admission to the other.

Students who have already enrolled in the MBA or MIM program before pursuing their interest in the joint MBA/MIM degree will be permitted to apply to the joint-degree program provided they have completed no more than 27 credit hours in either program.

Students applying to the joint-degree program are also eligible to apply for scholarships, fellowships and loan programs at both schools. Please refer to each school’s application for information regarding tuition, financial aid, etc.

To request application materials, contact the schools:

Director of Admissions
Weatherhead School of Management
Case Western Reserve University
10900 Euclid Avenue
Cleveland, OH 44106-7235
216-368-2030 or 800-723-0203
Fax: 216-368-5548
E-mail: bizadmission@case.edu

Director of Admissions
American Graduate School of International Management,
Thunderbird
15249 North 59th Street
Glendale, AZ 85306-6003
602-978-7131
Fax: 602-439-5432
E-mail: admissions@t-bird.edu

MBA/MIM CURRICULUM

For information about the MBA/MIM curriculum, visit the MBA/MIM website: http://weatherhead.case.edu/academics/masters/mba/joint/mbamim/.

MBA/MSM-OR and MBA/MSM-SC Joint Degree Programs

The joint MBA/MSM in OR or SC provides an exceptionally rich curriculum for students who are particularly interested in combining general management skills with depth in areas such as logistics or quantitative finance. The MBA/MSM-OR and MBA/MSM-SC programs share a common goal: to prepare graduates with the principles and concepts associated with a business specialty. They also possess a basic understanding of managerial functions, facilitating practical problem solving and effective communication with non-technical management personnel.

PROGRAM STRUCTURE

Students may pursue the MBA/MSM-OR or MBA/MSM-SC on a full- or part-time basis. Students planning to attend part time should confer with an advisor to determine the appropriate sequence of courses in the program. Full- and part-time students who already have begun the MSM or MBA program may apply to the joint-degree program provided they have completed no more than 18 credit hours in the MSM program or 30 credit hours in the MBA program (12 credit hours in the accelerated MBA program).

Students in the joint-degree program will receive both degrees simultaneously, regardless of whether course work for one of the degrees has been completed. Course work for both programs must be completed within six years of the date of initial enrollment in either program. Students in the joint-degree program will be granted an automatic one-year extension to the five-year deadline for completion of the MSM degree.

RETENTION REQUIREMENTS

GPAs of students in the joint-degree program will be calculated separately to determine compliance with retention requirements in each program. Students may have up to an additional 6 credit hours beyond the minimum to meet degree requirements to improve their cumulative GPA in order to attain the graduation GPA requirement for the appropriate program.

Students must also comply with the 36 credit hour residency requirement of the MBA program and the 36 credit hour requirement for the MSM-OR/SC.

MBA/MSM-OR/SC CURRICULUM STRUCTURE

For more information, visit the MBA/MSM-OR website: http://weatherhead.case.edu/academics/masters/mba/joint/mbamsmor/ or the MBA/MSM-SC website: http://weatherhead.case.edu/academics/masters/mba/joint/mbamsmscm/.

MBA/MSSA Joint Degree Program

The MBA/Master of Science in Social Administra-

WEATHERHEAD SCHOOL OF MANAGEMENT

ADMISSION TO THE MBA/MSSA PROGRAM

Candidates must apply separately to the MSSA program at the Mandel School and the MBA program at the Weatherhead School, and complete all application requirements of both schools, indicating on both applications their intent to join the joint-degree program. Applicants must have completed a minimum of two years of full-time experience in a social service organization. Admission decisions are made independently by each school. For more information, please contact the Weatherhead School at 216-368-2030 or visit the MBA/MSSA program website: http://weatherhead.case.edu/academics/masters/mba/joint/mbamssa/.

MBA/MSN Joint Degree Program

The MBA/MSN in Nursing (MSN) joint-degree program is offered in partnership with the Frances Payne Bolton School of Nursing. The joint degree combines the 63 credit hour MBA and the 40 credit hour MSN degree in a 78 credit hour integrated academic experience for nurses who wish to advance their practitioner, management and leadership skills.
WEATHERHEAD SCHOOL OF MANAGEMENT

PROGRAM STRUCTURE
The curriculum plan is designed for MBA/MSN students who intend to complete the joint degree in four semesters, with course overloads and an internship opportunity in the summer between the first and second year of the program. Some MBA/MSN students prefer to complete the joint degree at a slower pace. Those students will finish in five semesters, and will have the opportunity to obtain internships during the first and second summers between academic years.

ADMISSION TO THE MBA/MSN PROGRAM
Candidates must apply separately to both the Weatherhead School of Management and the Frances Payne Bolton School of Nursing, including submission of official scores from the MAT or GRE for the School of Nursing and the GMAT for the School of Management. After admission, students will register in the School of Management for their entire course of study in the MBA/MSN. For more information about the MSN degree, visit the website: http://fpb.case.edu/.

MBA/MSN CURRICULUM
For details about the curriculum structure, visit the website: http://weatherhead.case.edu/academics/masters/mba/joint/mbamsn/.

MBA/MPH Joint Degree Program
The joint MBA/Master in Public Health (MPH) degree was developed by the School of Medicine, the School of Graduate Studies and the Weatherhead School of Management to provide the skills and knowledge necessary for those who wish to attain the following goals:
• a career of working with communities to improve the health of their members by identifying and assessing the health needs of the population and planning and implementing programs to meet those needs; and
• management leadership to ensure continued economic viability, human development and effective communication for the public health organization and community in which they practice.

PROGRAM STRUCTURE
Because of the complementary nature of both degrees, students who integrate the MBA/MPH course work to complete the joint degree will be able to reduce the degree credits of the MPH by 6 credit hours and the MBA by 12 credit hours. Joint-degree candidates will thereby reduce the total requirement for both degrees from 99 to 81 credits hours. Full-time MBA/MPH students may be able to complete the joint-degree in two or two and one half years, including one or two summer sessions. Students completing the MBA/MPH on a part-time basis may complete joint-degree requirements in four to four and one half years. Both diplomas will be awarded upon completion of all course work for both degree programs. Students enrolled in the MD program at the School of Medicine can also integrate the dual MBA/MPH degree program with their MD degree program.

ADMISSION TO THE MBA/MPH PROGRAM
MBA/MPH candidates must complete separate applications, participate in the required admission tests (the GMAT for the MBA program) and be admitted separately to each program. Throughout the MBA/MPH program, joint-degree students will continue to register in the school where they first register. MBA/MPH students may be included in the resume book and the on-campus interview schedule at the Weatherhead School of Management Career Management Center throughout the duration of their joint program.

For more information about the MPH program, contact the program director, MPH Program, School of Medicine, 216-368-3197.

MBA/MPH CURRICULUM
For details about the curriculum, visit the website: http://weatherhead.case.edu/academics/masters/mba/joint/mbamph/.

JD/MNO Joint Degree Program
This program combines the Master of Nonprofit Organizations (MNO) degree with the Master of Science in Social Administration degree (MSSA). It provides career preparation for students with interests in non-profit management, social service, and the social work profession.

New students can apply to either program simultaneously or separately. Students must apply and be accepted for each degree program to qualify. Students who choose to begin their studies in the MSSA program must apply to the MNO program prior to completing their first semester of MSSA courses. Dual-degree students must receive the MNO and MSSA degrees simultaneously to be granted credit for specific courses taken in the other program.

For more information on the MSSA/MNO degree, visit the website: http://msass.case.edu/academic/.

MA/MNO Joint Degree Program
This program combines the MNO degree with the Master of Arts in Music History (MA). It provides preparation for students who desire to blend a strong background in music and the arts with management in non-profit organizations.

Students must apply and be accepted for each degree program to qualify. Students in either program must be admitted within the first year of study to the other program in order to be admitted to dual-degree status. New students may apply to both programs simultaneously or at separate times. Dual-degree students must receive the MNO and MA degrees simultaneously to be granted credit for specific courses taken in the other program.

For more information on the MA/MNO degree, visit the website: http://music.case.edu/mused/programs.html/.

MBA/CNM
MBA students with a career focus in the management of non-profit organizations may ob-
tain a Certificate in Nonprofit Management (CNM), offered through the Mandel Center for Nonprofit Organizations, by completing 15 credit hours of Mandel Center courses (9 of the 15 credit hours may be counted as MBA electives). By enrolling in one additional course in two of the last three semesters of the MBA program, full-time students may complete the MBA and the CNM without extending their course of study or incurring additional tuition fees.

CREDIT REQUIREMENTS FOR THE MBA/CNM
Students in the dual program must complete 15 credits toward the CNM and 57 hours toward the MBA degree. These students may double count nine credit hours of Mandel Center courses that have been approved for credit in both programs. Because of double counting, students completing the CNM and MBA concurrently will have a 63 credit hour program requirement.

COURSES CURRENTLY APPROVED FOR MBA AND CNM CREDIT
There is one required course for the MBA/ CNM, MAND 401 (Introduction to the Nonprofit Sector).

For a complete listing of courses which are eligible for both the MBA and the CNM, visit the website: http://weatherhead.case.edu/academics/masters/mba/concentrations/nonprofit.cfm

Students wishing to propose any modification in the recommended sequence of study on the basis of prior course work, past experience, or professional interest must present a written request for consideration and approval by the MBA/CNM faculty advisor.

For more information, contact the Mandel Center’s director of recruitment at 216-368-6025 or by e-mail at mcnoadmissions@case.edu.

ADMISSION/ENROLLMENT PROCEDURES FOR THE DUAL MBA/CNM PROGRAM
Candidates must complete both applications and be admitted to each program separately. Full-time MBA students must apply to the CNM program no later than the end of their first semester in the MSSA program. Candidates interested in, for example, practicing law within a nonprofit organizational setting; working as a program officer in a foundation; serving as a leader or manager of a non-profit organization; working in the area of non-profit public policy and advocacy; or working in the field of planned giving.

The program consists of five courses that must include a Law course, LAWS 234. Candidates must complete both applications and be admitted to each program separately. JD students must apply no later than the end of their first year in the MBA program. JD/CNM students must receive both credentials simultaneously to be granted credit for specific courses taken in the other program.

For more information, contact the Mandel Center’s director of recruitment at 216-368-6025 or by e-mail at mcnoadmissions@case.edu.

MBA/CNM
The M SSA/CNM combines the Master of Science in Social Administration (MSSA) with the Certificate in Nonprofit Management. The M SSA/CNM provides career preparation for students with interests in nonprofit management, social service, and the social work profession.

fifteen credit hours of Mandel Center courses. MSSA students should apply to the degree/certificate program no later than the end of their first semester in the MSSA program. Candidates must complete both applications and be admitted to each program separately. MSSA/ CNM students must receive both credentials simultaneously to be granted credit for specific courses taken in the other program.

For more information, contact the Mandel Center’s director of recruitment at 216-368-6025 or by e-mail at mcnoadmissions@case.edu.

JD/CNM
The JD/CNM combines the Juris Doctor degree (JD) with the Certificate in Nonprofit Management. It provides preparation for students interested in, for example, practicing law within a nonprofit organizational setting; working as a program officer in a foundation; serving as a leader or manager of a non-profit organization; working in the area of non-profit public policy and advocacy; or working in the field of planned giving.

The program consists of five courses that must include a Law course, LAWS 234. Candidates must complete both applications and be admitted to each program separately. JD students must apply no later than the end of the second year in the JD program. JD/CNM students must receive both credentials simultaneously to be granted credit for specific courses taken in the other program.

For more information, contact the Mandel Center’s director of recruitment at 216-368-6025 or by e-mail at mcnoadmissions@case.edu.

CERTIFICATE PROGRAMS
Certificate in Health Systems Management (HSM)
Admissions qualifications: bachelor’s degree, professional experience in health care delivery system, or professional or graduate degree in the health sciences. Individuals with an MBA or working toward an MBA may also enroll in the certificate program. Contact 216-368-2030 for additional information.

SUGGESTED CURRICULUM AND SEQUENCE OF COURSES:
A total of 15 credit hours of course work from the following courses is required for completion of the Certificate:

- HSMC/BAFI 420 – Health Finance (3)
- HSMC 421/ECON 421 – Health Economics and Strategy (3)
- HSMC 427/LAWS 227 – Health Law (3)
- HSMC/MIDS 432 – Health Care Information Systems (3)
- HSMC 446/IIME 446 - Models of Health Care Systems (1.5)
- HSMC 447/IIME 447/BIO5447 - Regulatory Affairs for the Biosciences (1.5)
- HSMC 456 – Health Policy and Management Decisions (3)
- HSMC 501 G – Medical School Electives (1-3)
- HSMC 502 – Health Care Executive Education Series (3)

ADDITIONAL HEALTH COURSES (SCHOOL OF LAW)
- LAWS 295 – Health Care Organization and Finance (2)
- LAWS 298 – Health Care Transactions (2)

ADDITIONAL HEALTH COURSES (GRADUATE SCHOOL/SCHOOL OF MEDICINE)
- MPH 429 - Introduction to Environmental & Occupational Health (3)
- MPH 439 - Public Health Management and Policy (3)

TUITION PAYMENT
Tuition for each 3-credit course will be charged at the current rate for the semester in which the student registers.

ACADEMIC POLICY
Courses in the HSM Certificate Program are documented on an academic transcript from Case Western Reserve University. A Certificate in Health Systems Management will be awarded after the student completes five courses with passing grades and completes a graduation application through the Weatherhead Student Services office. All HSM Certificate participants who matriculate into the MBA Program within five years of completion of the Certificate may transfer the five courses toward completion of MBA degree require-
Certificate in Nonprofit Management (CNM)
The Certificate Program in Nonprofit Management, offered through the Mandel Center for Nonprofit Organizations, is designed for practicing managers and leaders in human service, fine and performing arts, cultural, educational, community development, religious, civic and other non-profit organizations who aspire to senior-level executive positions.

For more information on the CNM program, contact the Center’s Director of Recruitment at 216-368-6025, mcnoadmissions@case.edu, or visit www.case.edu/mandelcenter/grad/cnm. CNM students must satisfactorily complete a set of five approved courses (15 credits) in residence, including one required course, Introduction to the Nonprofit Sector.

REGISTRATION
Registration for the CNM program is through the Weatherhead School of Management. Refer to the section on Registration and Academic Information for information about course changes and withdrawals.

RETENTION REQUIREMENTS FOR STUDENTS IN THE CNM PROGRAM
A CNM student who earns a final grade below a B in any course may no longer continue in the program. There is no academic probation period for the CNM, due to the short duration of the program.

For additional information concerning the CNM program (including scholarship information), contact the Mandel Center’s director of recruitment at 216-368-6025 or by e-mail at mcnoadmissions@case.edu, or on the website at: www.case.edu/mandelcenter/.

Certificate in Operations
The Department of Operations offers a graduate certificate consisting of 15 credit hours of coherent course work. Designed for practicing professionals who seek greater expertise, the Certificate in Operations program can be tailored to specific interests. Sample areas are Supply Chain Management, and Operations Research.

Upon completion of all requirements below, the student should request the certificate through the Weatherhead Student Services Office.
• Completion of 15 credit hours of the courses selected in collaboration with the department’s director of graduate programs.
• Maintain a B (3.0) grade point average through all course work.

PHD PROGRAMS
PhD in Management
The PhD in Management program is designed for individuals whose career goals are to conduct research and teach in academic, policymaking, or research institutions. The program provides both a general background in management and strong specialization in the individual’s choice of major field (accountancy, economics, entrepreneurship, information systems, labor and human resource policy, marketing, and management policy). A program of study is tailored to each student’s needs and career goals. Students are encouraged to engage in publishable research before receiving their doctorates. They also are given the opportunity to teach courses after admission to candidacy.

An integral strength of the PhD in Management program at the Weatherhead School of Management is its attention to the individual. A successful doctoral experience requires more than course work. Frequent one-to-one interaction with faculty in the area of one’s specialization is necessary for developing conceptual and methodological skills. Only a few students are admitted to the doctoral program each year, guaranteeing direct communication with faculty in research, teaching and advanced independent study courses.

The PhD in Management program has been designed so that the student, in cooperation with an advisor, can develop the plan of study that best meets his or her career objectives. Students are encouraged to be eclectic and take course work outside of the Weatherhead School.

Because only a small number of applicants can be admitted each year, selection is limited to those whose credentials are strong and whose interests match well with the faculty. Each applicant is required to furnish an official copy of his or her GMAT score, official transcripts, at least three letters of recommendation, and a statement of his or her area of interest. Financial aid is available on a competitive basis, ranging from graduate assistantships to fellowships and lectureships. For more information, visit the website: http://weatherhead.case.edu/academics/doctorate/.

PhD in Operations Research
For the PhD degree in Operations Research, a number of required courses in specific areas must be taken. Required and elective courses form a coordinated program of study that provides depth of knowledge of the field as well as a comprehensive understanding of related subjects. The program culminates in a dissertation, which presents new, significant research findings.

Contact the Department of Operations for further information (216-368-4141), e-mail at PhD-opert@case.edu, or visit the website: http://weatherhead.case.edu/academics/doctorate/operations-research/.

PhD in Organizational Behavior
The doctoral program offered by the Department of Organizational Behavior focuses on research and helping at the individual, team, organizational, and global system levels. Students also are encouraged to develop the skills necessary to use their knowledge to promote constructive change.

For further information, visit the website: http://weatherhead.case.edu/academics/doctorate/organizational-behavior/.

Executive Doctor of Management
The Executive Doctor of Management (EDM) Program, offered by the Weatherhead School of Management at Case Western Reserve University, integrates concept and practice within the context of today’s emerging and pressing global issues. The EDM is available to a small, select group of experienced executives who possess graduate degrees and are committed to pursuing formal, rigorous study as practitioners-scholars. By addressing practicing professionals’ specialized needs for advanced knowledge and skills, the EDM Program enables dedicated professionals to explore new horizons of executive management within their organizations and beyond. For additional information, please visit: http://weatherhead.case.edu/academics/doctorate/executive-doctor-of-management/.

WEATHERHEAD CENTERS
Health Systems Management Center
The Health Systems Management Center (HSMC) is an interdisciplinary education and research center jointly sponsored by the Weatherhead School of Management and the School of Medicine. HSMC focuses its programming on issues involving three key
groups in the health care delivery system: medical providers, institutional providers and purchasers of health care services. For more information, contact J.B. Silvers, faculty director, at 216-368-5417.

The Mandel Center for Nonprofit Organizations (a university-wide academic center)
Founded in 1984, the Mandel Center for Nonprofit Organizations, at Case Western Reserve University, is one of the preeminent non-profit management academic centers in the world. The center offers nationally recognized graduate programs focused on developing the non-profit community and its leaders, conducts cutting-edge research on the non-profit sector, offers executive education and other non-credit professional development programs, and sponsors a leading journal featuring non-profit management researchers’ work. The Mandel Center is distinguished by the quality of its faculty, by the strength of its ties with non-profit leaders, and by its close relationships with four partner schools – the College of Arts and Sciences, the School of Law, the Mandel School of Applied Social Sciences, and the Weatherhead School of Management. For more information, please refer to the Mandel Center for Nonprofit Organizations section of this publication.

Business as an Agent of World Benefit
The Center for BAWB advances extraordinary business innovation and entrepreneurship by turning the global environmental and social issues of our day into core value creation opportunities.

The Center for BAWB provides solutions to the how of sustainable value and social entrepreneurship, helping companies become the leading-edge stars of their industries through applied sustainability, research, and education efforts.

WEATHERHEAD UNDERGRADUATE STUDENT ORGANIZATIONS

Alpha Kappa Psi
Alpha Kappa Psi is a national professional business fraternity whose objective is to help develop well-trained, ethical, and skilled leaders. The Omicron Omega chapter of AKPsi was founded in 1999 at the Weatherhead School, and is open to any student majoring in a business related field. Members interact with speakers from the business community, attend conferences with other Alpha Kappa Psi chapters, and organize social events on and off campus. At the end of each academic year, the chapter holds the Yellow Rose Reception to celebrate the year’s activities and to present special awards.

Beta Alpha Psi
Beta Alpha Psi is the honorary accounting fraternity. The Weatherhead School is home to one of the oldest chapters in the country, founded in 1930. Beta Alpha Psi hosts professionals from all of the major accounting and consulting firms to talk about career opportunities in the accounting profession. The fraternity also periodically sponsors field trips to accounting firms and corporations. Membership to this fraternity is restricted to accounting majors; however, all students can attend meetings and guest speaker presentations. The Beta Alpha Psi Banquet is held at the end of each spring semester and is attended by accounting faculty, staff, alumni and current undergraduate and graduate accounting students. In addition, many members of the professional accounting community attend the event. The banquet is held to honor outstanding accounting students, both current and former, and to induct new BAP members.

Omicron Delta Epsilon
Omicron Delta Epsilon is the international honor society in economics. Students who maintain a high academic record are invited to join the organization. Meetings and activities are held throughout the year and highlighted by the McMyler Memorial Lecture at the end of the school year.

Wolstein Society
The Wolstein Society was formed to recognize outstanding undergraduates who represent the spirit of enterprise as demonstrated by leadership, scholarship, community service and professional will, the prized attributes of effective and successful individuals. The organization is named in honor of Iris S. and the late Bert L. Wolstein, benefactors of Wolstein Hall, and supporters of undergraduate education in the Weatherhead School. All students with junior standing who meet a certain set of criteria are evaluated for membership. The group is overseen by a faculty and staff committee and has a faculty moderator. Members of the Wolstein Society are required to organize and participate in various activities aligned with the mission of the Society. The Wolstein Society inducted its first members in fall of 2006.

Case Marketing Association
The Case Marketing Association provides undergraduate students with an opportunity to undertake creative advertising and marketing experience by tackling projects for the Case community. Additionally, internal workshops and programs help build the skills of its members, and its AAF affiliation helps link its members to professionals within the Cleveland area.

WEATHERHEAD GRADUATE STUDENT ORGANIZATIONS

There are many opportunities for Weatherhead students to engage and further develop their leadership abilities. The first of these experiences begins in the classroom where students are expected to lead class discussions and group projects and challenge their colleagues to reach their full potential. Beyond the classroom, students have access to leadership opportunities in both the Weatherhead School and Cleveland communities.

Graduate Business Student Association (GBSA)
The Graduate Business Student Association and other student-run organizations design and manage multiple social, community and networking programs throughout the school year. Often students take the lead on new initiatives that shape the future of the school and the community.

Consulting Club
The Consulting Club assists and empowers students with resources and opportunities in their preparation for a consulting career.

Entrepreneurial Venture Association
The Entrepreneurship Venture Association (EVA) is a student-run organization at the Weatherhead School of Management dedicated to channeling student activities toward the creation and growth of businesses in the Cleveland area and beyond. The goal of the EVA is to take a leadership role in transforming Cleveland into an active member of the new economy.

Finance and Investment Club
The Finance and Investment Club is a club designed to provide guidance to Weatherhead students pursuing a career in finance.
Awareness of the business aspects of medicine and health sciences. The mission of the HSM-BC is to promote interaction between healthcare industry leaders and WSOM students.

Marketing Club
The Weatherhead Marketing Club provides the graduate business community with opportunities to explore all facets of marketing. Our vision is to further the aspirations of Weatherhead students interested in a career in marketing.

Net Impact: Students for Responsible Business
Weatherhead Net Impact is a student-run body dedicated to creating an atmosphere where people can develop and expand their personal view of the role of business in society and their role as business leaders. This group provides an introduction to innovative business models, best practices, and cool companies that can make an impact.

Supply Chain Management Club
Supply Chain Management is all about delivering the right product at the right place, at the right time and at the right price. Supply Chain Management Association was founded to foster the talents that we have at Weatherhead School of Management to meet these challenges.

Wine Society
The Wine Society meets several times a year to sample different wines from around the world. These events are consistently well subscribed with representation from all degree programs.

Alumni Association
Members of the Weatherhead School of Management Alumni Association include all alumni of the Weatherhead School’s graduate and professional programs. The association works to promote the welfare and advance the objectives of the school, and sponsors a range of activities and services for alumni and students to encourage professional development, provide for the exchange of ideas, and stimulate social interaction.

HONORARY SOCIETIES

Beta Gamma Sigma
Beta Gamma Sigma is a national scholarship honor society in the field of business administration and commerce. MBA candidates whose academic performance is outstanding (usually in the top 20 percent of the graduating class) may be elected to membership in the Eta Chapter of Ohio, which was established at Case Western Reserve University in 1958.

Omega Rho
Omega Rho is an international honor society founded in 1975 to honor academic excellence in operations research and closely allied intellectual disciplines. As a founding chapter of Omega Rho, the Case Western Reserve University unit recommends membership for students who have achieved high honors in the graduate program in operations research. The Department of Operations initiates chapter members annually.

GRADUATE STUDENT LEADERSHIP AWARDS

The Scott S. Coven Student Leadership Award is presented to a Weatherhead School graduate student who serves as a leader and as a model for Weatherhead students. The recipient promotes the Weatherhead School image in a positive way, contributes to the total community and stimulates the classroom experience. This award is presented at the Weatherhead Diploma Ceremony in May. The recipient of this award is chosen by a selection committee comprising alumni representatives of all Weatherhead programs. Students, alumni, faculty, staff and friends of the Weatherhead School make nominations.

The Theodore M. Alfred Distinguished Service Award is presented to a Weatherhead School graduate student who participates in community service inside and outside the Weatherhead community, brings community service opportunities to Weatherhead students and promotes service opportunities to Weatherhead students. This award is presented at the Weatherhead Diploma Ceremony in May. The recipient of this award is chosen by a selection committee comprising alumni representatives of all Weatherhead programs. Students, alumni, faculty, staff and friends of the Weatherhead School make nominations.

The Student Life Award is presented to a Weatherhead School graduate student who actively participates in and supports Weatherhead student activities and events, encourages and supports student participation in student life activities, and creates, revitalizes or provides added value to Weatherhead student organizations, activities or programs. This award is presented at the Graduation Awards Reception in May. The recipient of this award is chosen by a selection committee comprising alumni representatives of all Weatherhead programs. Students, alumni, faculty, staff and friends of the Weatherhead School may make nominations.

The Rita Kicher Award is presented to a graduating, part-time graduate student at the Weatherhead School. The award recipient should be recognized as an outstanding colleague in Cleveland’s professional/business community by his/her peers and supervisors, be an active member of one or more community non-profit organizations, contribute to one or more professional societies or organizations, demonstrate leadership qualities advocated by the Weatherhead School, and promote the Weatherhead School in a positive way. This award is presented at the Graduation Awards Reception in May. The recipient of this award is chosen by a selection committee comprising alumni representatives of all Weatherhead programs. Students, alumni, faculty, staff and friends of the Weatherhead School may make nominations.

REGISTRATION AND ACADEMIC INFORMATION

Course Loads
Full-time graduate students must register for at least 9 credit hours per semester to maintain full-time status. A typical full-time course load, however, is 15-17 credit hours per semester. Part-time students who are employed full-time generally register for a maximum of 6 credit hours per semester and 3 credit hours in the summer, which is considered halftime status. Requests for course overloads should be directed to the Weatherhead Student Services office at 216-368-2030.

Course Registration
A student may enroll during each registration period through the last day of late registration, as set by the official university calendar. Exceptions will be granted only upon the recommendation of the dean of the Weatherhead School of Management. A fee of $25 is charged during the late registration period.

To register, students must have a clear balance.
unless they are participating in the Bridge Loan Program. In this case, a company tuition reimbursement letter must be submitted. Students will register online using the Student Information System. Students who wish to apply for federal loans can visit the website: www.fafsa.ed.gov.

During any semester, students may not register in more than one school or college of Case Western Reserve University. Transfer within the university requires the approval of the deans of the schools or colleges involved. Special arrangements are made for students in joint-degree programs. (See the relevant section of this bulletin for details.)

If at any time a student fails to register in two consecutive semesters, excluding the summer session, he or she must reapply for admission to the Weatherhead School of Management unless a prior arrangement has been made.

Course Changes
Requests for changes in courses and sections may be processed online, via e-mail (wsomregistrar@case.edu), or by contacting a Weatherhead Student Services Coordinator (216-368-4809) by the last day of the drop/add period.

Withdrawals
To withdraw from all courses in a semester, the student must contact the Weatherhead Registrar, wsomregistrar@case.edu, before the university deadline for withdrawal to have an official withdrawal form processed. All withdrawals after the official drop/add periods will result in a transcript entry. The grade of W will be given if a student officially withdraws from a semester-length course by the deadline specified in the official university calendar. A student withdrawing after this date will receive the grade of F unless, in the judgment of the associate dean of graduate and professional programs, there are valid reasons for recording the grade of W.

Failure to attend class, giving notice to the instructor, or nonpayment of fees will not be regarded as official notice of withdrawal. A grade of F may be assigned to each course from which the student has not officially withdrawn.

Tuition charges for withdrawals after the drop/add deadline are prorated based upon the week of withdrawal and according to the schedule published in the semester registration materials.

Note: A student is not entitled to any tuition adjustment for a course dropped after the drop/add deadline (unless student withdraws from all course work for the semester). If a student must drop a course for circumstances that are unavoidable and unforeseen, he or she may petition (in writing to Weatherhead School Registrar) for a partial tuition refund for the course.

Grades
The grading system for Weatherhead School of Management students is:

- **A** 4 quality points
- **B** 3 quality points
- **C** 2 quality points
- **D** 1 quality point
- **R** successful completion of the first semester of a two-semester course
- **P** Pass 0 quality points (with degree credit)
- **S** 0 quality points (with degree credit)
- **F** 0 quality points (averaged in cumulative grade point average, no degree credit)
- **I** Incomplete (no degree credit)
- **AD** Audit (no degree credit)
- **NG** Unsatisfactory audit
- **W** Withdrawal from a class (no degree credit)
- **WD** Withdrawal from all courses in a semester (no degree credit)

Grade of Incomplete
The grade of Incomplete (‘I’) is assigned at the discretion of an instructor, provided that two criteria are met:

- There are extenuating circumstances, explained to the instructor before the assignment of the grade, which clearly justify an extension of time beyond the requirements established for other students in the class. It is the student’s responsibility to notify the instructor of the circumstances which prevent completion of the course.
- The student has been passing the course and only a small segment of the course remains to be completed, such as a term paper, for which the extenuating circumstances justify a special exception.

In order to receive credit for a course marked I, the student must complete the work by the date specified by the instructor, and in no event later than the end of the next regular semester (fall or spring).

In the absence of notification or adequate justification, the instructor has the authority to assign the student a final grade that assumes a failing grade for the missing work.

If the student wishes to petition to extend a grade of I beyond the stated deadline, the student must obtain approval from the faculty member who assigned the incomplete grade and the associate dean before the deadline. A request must be made in writing and convey (a) extenuating circumstances justifying the extension, and (b) the expected date of completion of the work. If approved, the request should be initialed by the faculty member and delivered by the student to the associate dean for approval. Failure to complete course requirements by an extended date will result in a grade of F.

Grade of Satisfactory
The grade of S indicates passing performance only in designated courses approved by the Curriculum Committee. The grade of S is not counted in determining quality average, and an S, once entered on the student’s record, may not be changed. Under no circumstances should some students in a course receive an S while other students receive letter grades. No student can receive credit for more than six credit hours of grades of S toward the MBA degree.

Extra Assignments
No student is permitted to do extra assignments beyond the work assigned to all students in a course in order to obtain a higher grade. This policy applies to changing an I grade to a regular grade, or to changing one regular grade to another. However, faculty may replace or substitute assignments for individual students in a course, depending on extenuating circumstances.

Course Audit
The grade of AD (audit) will be given when a student has officially registered to audit a course and has satisfied the requirements specified by the instructor for this grade. The instructor may designate that the student has not completed all requirements for auditing the course and that NG (no grade) be recorded on the student’s transcript. The designation of NG is not available under any other circum-

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Students will be permitted to change their registration in a course from credit to audit (AD) only if the change is officially made by the deadline specified in the university calendar. Students may audit only with permission of the instructor and may not audit a required course in the MBA curriculum. Any course that has been audited may not be repeated for credit.

Retention Requirements
For retention in the MBA, EMBA, MSM and MAcc degree programs of the Weatherhead School, a student must meet the following academic requirements: (1) a quality-point average of 2.25 at the completion of 12 semester hours of graduate study; (2) a quality-point average of 2.4 or higher at the completion of 21 semester hours or more of graduate study; (3) a quality-point average of 2.5 or higher at the completion of 33 semester hours or more of graduate study. In calculating the quality-point average, all graduate courses for which quality points are given are counted, including courses that may have been repeated. (Refer to the MNO degree information in this bulletin or to the School of Graduate Studies section for retention requirements for that degree program.)

In addition, students must receive a minimum grade of C in core courses. If the minimum grade of C is not obtained, the student must take the course again to meet graduation requirements and prior to taking any classes that require that course as a prerequisite.

Graduation Requirements
A cumulative quality point average of 2.50 in all graduate courses taken for credit in the MBA, EMBA, MSM or MAcc degree programs is required for the awarding of these degrees. All requirements for each of the professional degree programs must be fulfilled within six years from the date of the student’s initial registration in graduate study in the Weatherhead School of Management.

A candidate for a degree awarded by the Weatherhead School must complete an application for graduation and submit it to the Weatherhead Student Services office no later than two months before the graduation date at which the degree is expected to be awarded. Upon receipt of the student’s application, the registrar will verify the student’s eligibility for graduation at the anticipated date. Students are advised to contact the Student Services Office if they have any questions regarding the time or the requirements for graduation.

An annual convocation ceremony is held in May. Candidates who are awarded degrees in August or January will be invited to attend the ceremony the following May.

Transcripts
Case Western Reserve University considers grades and other information about students’ performance at Case Western Reserve University to be a private matter and will release such information to students only upon written request. Transcripts will not be issued to or on behalf of students who have not discharged all financial obligations to the university.

Transcripts of work completed at other institutions will not be released to students or other third parties.

Transfer Credit
Six hours of transfer credit may be granted toward the MBA degree in accordance with the following provisions:

- the student registers for and completes a minimum of 36 credit hours of course work in the Weatherhead School of Management toward the MBA degree;
- the work to be transferred must have been completed at another AACSB accredited graduate school of business;
- grades for the work to be transferred are not documented on an official transcript, nor is the course counted in the student’s grade point average; and
- the courses are applicable to the MBA program at Case Western Reserve University.

Course work to be transferred from a local college or university must not be offered by the Weatherhead School of Management. The student must contact the Weatherhead School registrar to initiate a request for transfer credit for a course to be taken at another university. The registrar will seek approval from the associate dean for graduate and professional programs. The school will not be liable for acceptance of transfer credit unless this approval process is completed prior to a student’s enrollment in courses at another university. This prior approval of course work will be acknowledged in writing. An official transcript from the other school, mailed directly to the Weatherhead School registrar, must be on file before the transfer of credit can be completed. Graduate courses counted toward another degree are not eligible for transfer credit.

Double Counting of Courses for Joint-Degree Students
Any student wishing to double count courses for any joint-degree program in the Weatherhead School of Management will be subject to the following restrictions:

- a minimum of 36 credit hours of course work will be required for each degree awarded by the Weatherhead School of Management, over and above all courses taken in any other degree program at Case Western Reserve University; and
- in the MBA program, elective courses may be double counted within the limits stated above, with the further provision that a minimum of three electives must be Weatherhead School of Management elective courses. A grade of C or higher must be received for any elective taken outside the Weatherhead School of Management in order to be counted for MBA credit.

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Ernst and Young Faculty Fellow, Professor of Accountancy
Timothy J. Fogarty, PhD
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KPMG Peat Marwick Faculty Fellow, Professor of Accountancy
Julia E. S. Grant, PhD
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David Pearson, DBA
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Professor for the Practice of Accountancy

Gary J. Previts, PhD
(University of Florida), CPA
Professor of Accountancy, E. Mandell de Windt Professor of Leadership and Enterprise Development

Yi-Jing Wu, PhD
(University of South Carolina)
Assistant Professor of Accountancy

ACCOUNTING (ACCT)

ACCT 101. Introduction to Financial Accounting (3)
This course covers concepts, principles, and practices including the preparation and interpretation of financial reports, record-keeping procedures, and internal controls.

ACCT 202. Management Accounting (3)
This course focuses on management accounting as a supporting system, helping managers to run businesses and other organizations. The course builds on knowledge of microeconomics, organizational design and behavior, production, and logistics as a foundation to explore how management accounting provides information for management planning, control and decision activities. Prereq: ACCT 101 and ECON 102.

ACCT 300. Corporate Reporting I (3)
This course covers financial accounting theory, generally accepted accounting principles and reporting practices, including evaluation of current issues and practices related to asset valuation, including receivables, inventory and fixed assets. It also covers the users and uses of financial statements, the difference between cash-basis and accrual accounting, the determination of income, the financial statements, financial statement analysis, revenue recognition, and the role of financial information in valuation decisions and contracting. Prereq: ACCT 101 and ACCT 202.

ACCT 301. Corporate Reporting II (3)
This course covers financial accounting theory, generally accepted accounting principles and reporting practices. Areas of focus include: liability determination, long-term debt, derivatives, leases, pensions and other post-retirement benefits, accounting for income taxes, earnings per share, stock options, and investments. International aspects also are considered. Prereq: ACCT 300.

ACCT 303. Survey of Accounting (3)
The course covers the principle of financial and managerial accounting for non-management students, including the framework that underlies financial and manual accounting and how accounting information should be used by: (1) parties external to the firm, i.e., stockholders, creditors and government, to evaluate the financial performance of an organization; and (2) internal management to fulfill the planning, control and performance evaluation functions. Enrollment is limited to students who are neither management nor accounting majors nor enrolled in the Weatherhead School of Management. This course cannot be substituted for ACCT 202 without a waiver from the chair. Offered as ACCT 303 and ACCT 403.

ACCT 304. Advanced Financial Reporting (3)
This course covers partnerships, consolidations, foreign exchange, international aspects of accounting, accounting for state and local governments and not-for-profit organizations, segment reporting and interim reporting. Prereq: ACCT 301.

ACCT 305. Income Tax: Concepts, Skills, Planning (3)
This course covers underlying federal income tax and concepts and law applicable to various entities. May not be taken for credit if ACCT 430 is taken for credit. Prereq: ACCT 202 or ACCT 401.

ACCT 314. Attestation and Assurance Services (3)
This course covers the role of the auditor, the audit process, the public accounting profession, audit risk and materiality, fraud, audit methods and techniques, audit planning, internal control, the effects of information technology on the audit, auditing revenue, receivables and inventories, professional ethics, legal responsibilities, emerging assurance services, and recent developments in the auditing profession. Prereq: ACCT 301.

ACCT 360. Independent Study (1 - 18)
ACCT 401. Financial and Managerial Accountancy (3)
This course examines the underlying framework of financial and managerial accountancy, focusing on how financial information is used by: (1) parties external to the organization to evaluate financial performance, i.e., stockholders, creditors, and government agencies; and (2) internal management to plan, control, and evaluate the information for key decisions of the organization.

ACCT 401A. Financial and Managerial Accountancy (1)
The accounting component will cover the use and application of basic financial statements, the basic cost structures in a firm, and decision making using accounting information. We will discuss usage and analysis of information from the annual report, focusing on the balance sheet, income statement, cash flow statement, and related notes. The course will also cover internally generated accounting information about the cost structure of the firm. We will discuss use of this information in decision making. You are expected to be comfortable with definitions of basic accounting terms, and you should be familiar with the accounting structure and the financial statements. Prereq: Open to ACL-MBA students.

ACCT 403. Survey of Accounting (3)
The course covers the principle of financial and managerial accounting for non-management students, including the framework that underlies financial and manual accounting and how accounting information should be used by: (1) parties external to the firm, i.e., stockholders, creditors and government, to evaluate the financial performance of an organization; and (2) internal management to fulfill the planning, control and performance evaluation functions. Enrollment is limited to students who are neither management nor accounting majors nor enrolled in the Weatherhead School of Management. This course cannot be substituted for ACCT 202 without a waiver from the chair. Offered as ACCT 303 and ACCT 403.

ACCT 405. Advanced Federal Taxes (3)
Corporate income taxes, estate and gift tax, fiduciary income taxes, partnerships, and hybrid forms of organization are covered. Prereq: ACCT 305.

ACCT 406. Accounting Information Systems (3)
This course addresses the intersections of information technologies and accounting. Current themes include corporate communications/investor relations, as well as e-commerce. The corporate communications/investor relations module focuses on the use of technology in communicating with investors, particularly in terms of investor relations websites, XBRL (an electronic financial reporting format), the use
of online investment analysis tools, and trends in the use of technology in communicating with investors. The e-commerce module focuses on functionality and security issues related to e-commerce web platforms.

**ACCT 413. Seminar in Management Accounting and Control Systems (3)**

Managerial accounting is concerned with providing information to managers and others inside the organization to direct and control its operations. Successful modern-day companies are moving away from the mass production models of yesterday and moving quickly towards manufacturing models described as lean or described as patterned after the Toyota Production System. Unfortunately, accounting models are not moving to meet that need. This course is intended to discuss the traditional methods, their limitations in today’s environments, and to explore what financial and other information is necessary to profitably grow contemporary organizations of today. Prereq: ACCT 401.

**ACCT 414. Corporate Reporting and Analysis (3)**

This course provides a basis for evaluation of traditional and proposed uses of report and information for decision making in investment, credit and internal planning and control. Students are introduced to concepts and analytical techniques that can be used to critique and interpret the financial health of the organization. At a practical and theoretical level, the course integrates research in the areas of accounting, quantitative methods and finance which has proved useful in the financial analysis of organizations. Prereq: ACCT 401 and BAFI 402.

**ACCT 418. Fraud, Governance and Reporting (3)**

This course examines managerial fraud, primarily made possible by the manipulation of accounting. This includes treatments of the motives for fraudulent behavior but focuses primarily upon the techniques of earnings management and the processes of its detection. Governance of organizations in the post-Enron, WorldCom and Tyco environment will also be studied. Regulation and the duties of those responsible for proper governance will be among the topics in this portion of the course. Guest speakers from the forensic industry and materials from practice institutes will be employed. Prereq: ACCT 401 and BAFI 402.

**ACCT 419. Financial Reporting and Capital Structure (1.5)**

Corporations require sources of capital, which typically include both debt and equity financing. These different contract forms lead to different financial statement implications due to the rules of accrual accounting. This course covers the detailed financial reporting techniques and procedures related to these contracts that affect the information produced and subsequently used in capital markets. Prereq: BAFI 402.

**ACCT 429. Social Ethics and Taxes (1.5)**

During the first part of the semester students will learn to prepare income tax returns for low-income workers. After students are trained to prepare returns, they will assist low-income clients in the preparation of tax returns. Readings and classroom discussion will focus on federal and local tax policy, financial statement analysis, and the impact of tax policy on wage earners. All students will be challenged to consider how their experiences can help them become better managers and leaders as they advance in their careers.

**ACCT 430. Taxes and Management Decisions (3)**

This course is designed to sensitize students to the importance of tax planning opportunities and pitfalls inherent in management decisions. The course will focus on helping students recognize potential tax opportunities and problems by examining a variety of practical managerial decision contexts. The course is specifically designed for students preparing for careers in management, not necessarily in accounting or tax. Prereq: ACCT 401 or MAND 425 and MAND 426.

**ACCT 431. Tax Research Methods (3)**

This course concentrates on the basic nature of the tax research process: identification of pertinent facts, issue definition, determination of appropriate authoritative sources, evaluation of authoritative sources, development of issue resolution alternatives, and communication of research results. The course includes a study of available research sources as well as reviewing the development and hierarchy of those sources. Library research materials are used, including tax services, journal articles, Internal Revenue Code, course cases, and administrative rulings. Tax research cases are employed as the basic methodology for simulating actual tax research problems. Computer applications for tax research are assigned. Prereq: ACCT 405.

**ACCT 437. Principles of Personal Financial Planning and Taxation (3)**

This course focuses on financial planning for individuals. It is designed to be an overview course that touches on the basic concepts of each area of financial planning including general principles of financial planning, insurance planning, investment planning, income tax planning, retirement planning, estate planning, and planning for college education funding. Upon completion of this course, the student should be able to identify major issues in these areas and prepare a basic comprehensive financial plan for a hypothetical client. This course should provide the student with an appreciation for the amount of additional education necessary in order to become qualified as a Certified Financial Planner. Prereq: ACCT 401 and BAFI 402. Prereq or Coreq: ECON 403.

**ACCT 439. Regulation of Accountancy (3)**

This course examines the role and structure of government standard-setting agencies, including the U.S. Securities and Exchange Commission (SEC) and the Public Company Accounting Oversight Board (PCAOB) and related legislative and regulatory aspects as found in the Sarbanes-Oxley Act of 2002, and in studies by the General Accounting Office (GAO) and other regulatory agencies. The 1993 and 1994 securities acts, the notions of full and fair disclosure and auditor independence are addressed as important aspects of securities regulation. Research papers and assignments address technical and disclosure requirements of operating companies and mutual funds. Extensive use is made of web-based information including company and mutual fund sites and databases. Prereq: ACCT 301.

**ACCT 444. Advanced Auditing Theory and Practice (3)**

This course examines auditing concepts and issues in depth. A special focus exists on audit evidence and how auditors make decisions. Some topical areas include ethics, analytical review, fraud, and the role of technology. Prereq: ACCT 314.

**ACCT 495. Advanced Accounting Seminar (1)**

ACCT 495 is a one semester credit hour seminar course designed to permit focus and attention upon specialized technical accounting and reporting topics which are individually insufficient to warrant larger credit offerings. It is expected that the topics of individual ACCT 495 seminars will vary based upon faculty availability and interest and the rapidly changing environment of professional circumstances. Individual seminar topics will be proposed, reviewed and approved by the accounting faculty at appropriate times and thereafter added to the ACCT 495 offering
list. Possible seminar topics include: International Financial Accounting Standards; Securities and Exchange Commission Accounting; Federal Financial Accounting and Reporting; Mutual Fund Reporting; Financial Controls and Board Governance; Research Methods and Topics; and Triple-Bottom Line/Accountability topics.

ACCT 501. Special Problems and Topics (1 - 18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

ACCT 520. Advanced Accounting Theory (3)
This course studies contemporary issues in financial accounting theory and business reporting. Topics are considered from their historical development to contemporary circumstances. Academic and professional literatures are employed to gain a variety of perspectives on current matters. The development of communication skills, written and verbal, and use of support technology for presentations is emphasized throughout. Students are required to make several individual and team presentations, to conduct database and periodical research and to provide frequent written and oral research reports. Prereq: ACCT 304.

ACCT 540. Contemporary Accountancy Policy (3)
This is a seminar on subjects of contemporary concern to the profession of accountancy which are currently being analyzed and debated by professional bodies and the academic community. These subjects involve the role of the profession in society, and the appropriate execution of that role. Some of the potential topics are government oversight in the profession, competitive pressures, independence, scope of services, and education/competency issues. The seminar provides a participative understanding of the press of society on the accountancy profession. Prereq: ACCT 405 and ACCT 520.

ACCT 601. Special Problems and Topics (1 - 18)
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

ACCT 701. Dissertation Ph.D. (1 - 18)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF BANKING AND FINANCE
Peter Ritchken, Chair
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Aaji Singh, PhD
(University of Iowa)
Professor of Banking and Finance
Sam Thomas, PhD
(University of Pennsylvania)
Senior Lecturer, Banking and Finance
Lucille Mayne, PhD
Professor Emerita of Banking and Finance
Thomas Morrissey, PhD
Professor Emeritus of Banking and Finance

BANKING AND FINANCE (BAFI)

BAFI 341. Money and Banking (3)
This course emphasizes the importance of financial markets, the nature and role of the financial system, and the linkages between these—money and banking—and the economy. Emphasis is placed on both theoretical and practical constructs, on major innovations and contemporary changes, and the closely intertwined condition of financial and economic systems with monetary and fiscal policy. Offered as BAFI 341 and ECON 341. Prereq: ECON 102 and ECON 103.

BAFI 342. Public Finance (3)
Government intervention is a pervasive feature of every modern economy. The goal of this course is to develop the economic tools for understanding and evaluating a wide range of government behaviors such as taxation and redistribution policy, the public provision of goods and services, and the regulation of private markets. ECON 342 begins by considering “market failures” that justify government intervention in a market economy. To respond to such failures, governments must raise revenues through taxation. Using the tools of microeconomic theory, we will develop a framework for thinking about the positive and normative effects of alternative forms of taxation. Particular attention will be paid to the individual income tax in the U.S., allowing students to understand the efficiency, distributional and behavioral implications of recent changes in the tax code. We will then turn to the expenditure side of the public sector. The economic principles used to evaluate public expenditures will be discussed and exemplified through the analysis of significant public programs. Of particular interest will be the effect of public programs on the incentives faced by workers and families. Offered as BAFI 342 and ECON 342. Prereq: ECON 102.

BAFI 355. Corporate Finance (3)
The basic goals of this course are to familiarize students with the concepts and tools used in financial management at both the corporate and personal levels. They include the notion of present value, securities valuation, risk and return analysis, and other financial analysis techniques. The concepts and techniques are, in turn, used to evaluate and make decisions regarding the firm’s investments (capital budgeting) and the cost of capital. Prereq: Minimum sophomore standing; ACCT 101 or ACCT 303.

BAFI 356. Investments (3)
This course is about investing in securities. It provides a comprehensive introduction to security analysis and portfolio management. Investing is a rational decision-making process in which the investor seeks to select a package or portfolio of securities that meets a pre-determined set of objectives. Descriptive, insti-
tutional and quantitative decision-making methods are arranged in a cohesive framework of analysis of interest to the informed investor. Topics include modern portfolio theory, the relation between risk and return, efficient markets, bonds, and options, among others. Prereq: BAFI 355.

BAFI 357. Financial Modeling, Analysis and Decision Making (3)
Firms try to create value. In their day-to-day operations, they are faced with numerous challenges: Should we accept trade credit or borrow? Will an acquisition create or destroy value? Should we introduce a new product line even if it cannibalizes an existing one? In each of these situations they try to quantify the impact on the value of their firm. The goal of this course is to develop your skills in financial modeling and valuation, so you can tackle issues like the ones described above. The course is designed to be “hands-on”: You will learn to apply the theory and develop spreadsheet modeling skills through homework, case studies and a group project. By the end of the course you will have a good understanding of both the theory and practice of valuation, and possess a set of cutting-edge financial modeling skills. This course is designed for students who aspire to work in a regular company, a bank or a consulting firm in (i) corporate finance (including mergers and acquisitions); (ii) strategy; or (iii) equity analysis. Prereq: BAFI 355.

BAFI 359. Intermediate Corporate Finance (3)
This is the second course in the undergraduate corporate finance sequence with an emphasis on applications. It is a case-based course that will apply and amplify concepts developed in the first course (BAFI 355 Corporate Finance). The cases selected for BAFI 359 will cover, among other topics, cash budgets and working capital management, financial strategy, capital budgeting, capital structure/dividend policy concepts, public equity valuation/initial public equity offerings, leveraged buyouts, and mergers and acquisitions. Students will develop both conceptual and financial-modeling skills. Prereq: BAFI 355.

BAFI 360. Independent Study (1 - 18)
This course is offered for candidates undertaking reading in a field of special interest. Permission of department chair required.

BAFI 372. International Finance (3)
This course deals with open-economy macroeconomics and international financial markets, covering open-economy national income analysis, international macroeconomic policy coordination, exchange rate determination, foreign portfolio investment, and global financial crises. Recommended preparation: ECON 102 and ECON 103. Offered as BAFI 372 and ECON 372.

BAFI 402. Financial Management I (3)
In this course, students are introduced to the basics of corporate finance, including the objectives, tasks, and decisions made by corporate financial managers. The course covers discounted cash flows, bond and stock valuation, cost of capital, capital budgeting, asset risk and return, and short-term and long-term financial management. Coreq: ACCT 401.

BAFI 402A. Managerial Finance (1)
This module reviews knowledge and refreshes core skills in managerial finance, especially those related to financial statement analysis, discounted cash flow valuation, and risk and return in the capital markets. Teaching methods include lectures, discussions, cases, and extensive exercises. Prereq: Open to ACL-MBA students.

BAFI 403. Financial Management II (3)
This is a continuation of BAFI 402 and serves as a prerequisite for several advanced electives in banking and finance. Its purpose is to familiarize the student with the theory and application of additional models used in financial decision-making by corporations. Issues relating to efficient markets, dividend policy, capital structure, financing decisions, option pricing, leasing, and risk management are among the topics considered. In addition, special topics may include mergers and acquisitions, pension funds, and international financial management. Prereq or Coreq: ACCT 401, BAFI 402 and QUMM 414. Prereq or Coreq: ECON 403.

BAFI 404. Financial Modeling (3)
Firms try to create value. In their day-to-day operations, they are faced with numerous challenges: should we accept trade credit or borrow? Will an acquisition create or destroy value? Should we introduce a new product line even if it cannibalizes an existing one? In each of these situations they try to quantify the impact on the value of their firm. The goal of this course is to develop your skills in financial modeling and valuation, so you can tackle issues like the ones described above. The course is designed to be “hands-on”: you will learn to apply the theory and develop spreadsheet modeling skills through homework, case studies and a group project. By the end of the course you will have a good understanding of both the theory and practice of valuation, and
credit risk. Fixed income securities account for about two thirds of the market value of all outstanding securities, and hence this topic is important. The course covers the basic products of fixed income markets including treasury and LIBOR products, such as interest rate swaps. Risk management and hedging strategies are covered as well as selected topics in credit risk models and mortgage-backed securities. Prereq: BAFI 430.

BAFI 432. Corporate Risk Management (3)
This is a unique strategic risk management course aimed at participants who wish to enhance their understanding of the risks faced by corporate firms, both financial and nonfinancial, learn techniques to identify and measure these risks, and understand how derivatives and risk management solutions can be used to manage these risks, create value, and advance the strategic goals of the firm. The course is designed in a manner such that it would be of use to executives of all corporations, financial and nonfinancial, across all functional areas. Prereq or Coreq: BAFI 403.

BAFI 434. Financial Econometrics (3)
BAFI 434 represents a rigorous study of the latest developments in the area of financial econometrics. The class assumes no prior knowledge of econometrics. It assumes that you have had a basic statistics class and that you have had regression analysis. It is taught using economic motivations and examples from the financial world. The course concerns modern econometric topics like time-series forecasting, volatility modeling, and panel data analysis. Various concepts and approaches in the course will be subjected to real world data. Students are expected to have basic knowledge of the fundamentals of corporate finance and statistics. The course aims at providing a lasting conceptual framework for model building using modern applied econometric techniques commonly employed in finance. Prereq: QUMM 414 and BAFI 402.

BAFI 435. Empirical Finance (3)
BAFI 435 provides an introduction to empirical analysis and research in finance. This involves the management of empirical datasets and the aspects of quantitative applications of finance theory. The goal is to enable the student to deal with the need to analyze complex and large financial and economic datasets that is present in many fields of the financial profession. The scope of the data as well as the quantitative methods used in such analysis often requires familiarity with robust computational environments and statistical packages. As such, another goal of the course is to familiarize the student with at least one such environment. Applications are conducted using real financial and economic data. The course draws on the theoretical aspects of the subjects covered, but mainly focuses on the practical matters required to undertake an empirical analysis of financial topics - e.g., the definition of the research question, the datasets required, the computational needs, and, then, the implementation. The course enables the student to evaluate outstanding financial research as well as to conduct his or her own research. Prereq: BAFI 434.

BAFI 440. Advanced Corporate Finance (3)
This course exposes the students to a more in-depth treatment of some of the topics covered in BAFI 403 and introduces them to new topics. Topics include investment decisions, financing decisions, payout decisions, contracting decisions and performance metrics, internal control systems, risk management, real options, diversification and valuation. Topics covered may vary from semester to semester. Prereq: BAFI 403.

BAFI 444. Entrepreneurial Finance (3)
The objective of this course is to introduce students to the issues of financial management and capital formation in new ventures. The course will address issues of estimation of cash requirements, development of pro forma financial plans, firm valuation and the process and tools used in raising debt and equity financing. Bootstrapping, angel investing, venture capital, strategic alliances and initial public offerings will be covered. The emphasis is on the entrepreneur and how he/she can assess financial needs and develop a sensible plan for acquiring financial resources in a manner that is consistent with their financial needs and other strategic goals. Offered as BAFI 444 and ENTP 444. Prereq: BAFI 402.

BAFI 450. Mergers and Acquisitions (3)
This course examines the economic rationale and motivation for the different merger and acquisition and recapitalization activities undertaken by firms and individuals in the U.S. market. Emphasis is on the comparable publicly traded proxy company, comparable “change of control” transaction, and discounted cash flow methods of valuing a firm. The class will also review the different types of debt and equity capital employed to fund mergers and acquisitions and recapitalizations, how senior lenders and equity investors structure their loans and/or investments, and how investors realize the gains through different exit strate-
choices concerning the use of scarce resources, how prices and incomes are determined in competitive markets, and how market power affects the prices and quantities of goods available to society. We will also examine the impact of government intervention in the economy.

ECON 103. Principles of Macroeconomics (3)
While Microeconomics looks at individual consumers and firms, Macroeconomics looks at the economy as a whole. The focus of this class will be on the business cycle. Unemployment, inflation and national production all change with the business cycle. We will look at how these are measured, their past behavior and at theoretical models that attempt to explain this behavior. We will also look at the role of the Federal Government and the Federal Reserve Bank of the United States in managing the business cycle.

ECON 120. Life After Graduation (1)
This is a one-credit seminar intended for freshmen, sophomores and juniors. The purpose of the class is to help students understand what career choices they will have with an economics major. During this course, students will assess their strengths and weaknesses, learn networking tools, and explore the options available to them. The class will meet once a week for an hour. Graduating seniors need to obtain permission to enroll. Students may not earn credit for ECON 120 if they have completed MGMT 250.

ECON 205. Economic Perspectives (3)
This course examines important contemporary and historical issues from an economic perspective. It enables students to think about the world “like an economist.” Possible topics of current interest include the transformation of Eastern Europe, ethnic and racial strife, environmental policy and sustainable development, and professional sports.

ECON 255. Economic History of the United States (3)
The growth of the American economy from the colonial period to the present. Competing explanations of economic growth; significant attention to the political and legal environment in which the U.S. economy developed; “lessons” of past experience for contemporary policy; some attention to inequality and the changing distribution of wealth and income. Offered as ECON 255 and HSTY 255.

ECON 307. Intermediate Macro Theory (3)
Macroeconomics studies aggregate indicators of the performance of an economy, most commonly measured in terms of GDP, unemployment rate and inflation rate. An important goal of macroeconomic researchers is to develop a model of an economy that is simple, yet powerful enough to explain the historical trends of these aggregate economic indicators. Needless to say, coming up with a good model has remained a very difficult task. So far, there is no single model that is good enough to coherently explain even the most prominent historical trends of aggregate economic indicators. But several models have been built, each offering insight into a certain aspect of the economy. Throughout the course model building is motivated by real world cases from the American economy. Prereq: ECON 103.

ECON 308. Intermediate Micro Theory (3)
This course will give you an overview of microeconomic theory, which forms a basis for much of economic analysis. The main focus of the class will be theoretical, in order to give you a solid foundation for future study in virtually any other field of economics. This includes the theory of how consumers decide what to consume and how firms decide when to stay in business, and how much to produce at what price. Note: a student cannot receive degree credit for both ECON 308 and ECON 309. Prereq: ECON 102.

ECON 309. Intermediate Micro Theory: Math Based (3)
This course will cover the same topics covered in Economics 102: theory of the consumer, theory of the firm, markets and government intervention in the market. However, we will cover these topics in more detail and we will use calculus in our analysis. You should come away from this course with a greater understanding of how consumers and firms make their decisions and how they interact in the market place. Note: a student cannot receive degree credit for both ECON 308 and ECON 309. Prereq: ECON 102, MATH 121 or MATH 125.

ECON 326. Econometrics (3)
Econometrics is the application of statistics to empirical economic analysis. One way of testing the validity of economic theories is to gather data and apply statistical tests to see if the data support the theory. These data are usually gathered by observing actual economies, firms and consumers, rather than by performing experiments in a laboratory. Because economic analysts lack the precision and control of the laboratory, they must compensate by adjusting their statistical procedures. In this class, we will concentrate on regression analysis, which is the basic tool of the economic researcher. We will study the assumptions commonly made in the application of
ECON 330. Economic Behavior and Psychology (3)

This course covers the relatively new field of Behavioral Economics, also sometimes called “Psychology and Economics.” Behavioral economics involves incorporating insights into economics from other disciplines that enrich the understanding of how people make economic decisions. Most of the crossovers come from the field of psychology, but there is also a growing interest in ideas from sociology and neuroscience. We will cover fundamental concepts related to decision-making, such as how people respond to risk, how people make decisions over time, and the ways in which people really aren’t as selfish as economists sometimes make it seem. We will also discuss empirical work that shows how these concepts affect how economists think about real-world issues. Examples include examining how to set the default options for 401k programs, understanding why people pay for costly gym memberships they do not use, and looking at whether sellers on Ebay use the best possible ending times for their auctions. Prereq: ECON 102.

ECON 332. Economic Analysis of Labor Markets (3)

This course is about the economics of work and pay. We will take a comprehensive look at labor markets in the U.S. and other advanced countries and examine related social policy issues. This will include the effect of unions on wages, the underpinnings of the income distribution of the U.S., issues of poverty and welfare, discrimination and wage differential by gender and race, the relationship between work and family, education as a determinant of wages, and the way firms use wage and employment practices to motivate their employees to work productively. What makes labor economics special is that the commodity we examine is human labor, something that is central to the organization of our lives and the functioning of the economy. Labor economics thus applies the standard neoclassical model of demand, supply, and equilibrium to many areas that also have a profound human dimension. Prereq: ECON 102.

ECON 333. The Economics of Organizations and Employment Relationships (3)

Organizational Economics is the study of effective organizational design and management. It applies the powerful tools of modern economics to such questions as: what are the practices and structures that make for successful firms? Why are successful firms able to excel at some things (think Microsoft and word processors and spreadsheets) but not at other things (think Microsoft and web-based search)? Fundamentally organizations are human enterprises and their performance is driven by the people they employ. For this reason a good deal of organizational economics is concerned with how firms structure relationships with their employees. One of the important benefits students gain from studying organizational economics is a rigorous and logical framework for thinking about their jobs and careers. By applying this framework to many different real world settings, students become adept at translating general insights to their specific concerns. Organizational economics is built upon a hybrid approach to human behavior that draws from economics and social psychology. From economics, we take the idea that individuals can skillfully use the resources and information at their disposal to achieve their goals. From social psychology we take the idea that individual pursuits of their interests is complicated by the emotions, impulses, and cognitive biases built into human brains. The economic emphasis on goals implies that successful organizations must structure incentives and design jobs in ways that are consistent with the interests of employees. The psychological approach implies that successful organizations must also adopt motivational strategies that appeal to both the rational and non-rational drivers of human behavior. Prereq: ECON 102.

ECON 341. Money and Banking (3)

This course emphasizes the importance of financial markets, the nature and role of the financial system, and the linkages between these--money and banking--and the economy. Emphasis is placed on both theoretical and practical constructs, on major innovations and contemporary changes, and the closely intertwined condition of financial and economic systems with monetary and fiscal policy. Offered as BAFI 341 and ECON 341.

ECON 342. Public Finance (3)

Government intervention is a pervasive feature of every modern economy. The goal of this course is to develop the economic tools for understanding and evaluating a wide range of government behaviors such as taxation and redistribution policy, the public provision of goods and services, and the regulation of private markets. ECON 342 begins by considering “marker failures” that justify government intervention in a market economy. To respond to such failures, governments must raise revenues through taxation. Using the tools of microeconomic theory, we will develop a framework for thinking about the positive and normative effects of alternative forms of taxation. Particular attention will be paid to the individual income tax in the U.S., allowing students to understand the efficiency, distributional and behavioral implications of recent changes in the tax code. We will then turn to the expenditure side of the public sector. The economic principles used to evaluate public expenditures will be discussed and ex-
emphasized through the analysis of significant public programs. Of particular interest will be the effect of public programs on the incentives faced by workers and families. Offered as BAFI 342 and ECON 342.

ECON 343. Economics of State and Local Governments (3)
This course uses economic analysis to gain insight in the U.S. system of state and local governments. In the case of local governments, unlike the familiar case of the U.S. government, people often display their displeasure with the government’s actions by leaving rather than by voting against the incumbents. A careful consideration of the circumstances under which people will choose “exit” (moving out) over “voice” (voting) is central to the course. We’ll also examine economic theories of why people vote and how people vote. We consider a broad range of policy issues. Among them are school finance, zoning, local government economic development policies, lotteries, and affordable housing policy. Of course, we also analyze the full range of state and local government taxes, including the property tax, personal income tax, corporate income tax, and sales tax. Prereq: ECON 102 or consent of instructor.

ECON 345. Public Choice (3)
This course covers economic theory and empirical analysis of the behavior of politicians, bureaucrats, and voters based on the assumption of rational pursuit of self-interest, comparison with other approaches to the study of political behavior, and implications of alternative collective decision procedure. Prereq: ECON 102 and ECON 103.

ECON 350. World Economic History: From Poverty to Prosperity (3)
The average person living in the industrialized world today has 10-20 times the annual income of his or her forbears in 1800 and a much longer lifespan. What explains the massive increases in living standards for residents of the industrialized world? The average person living in Africa today has roughly the same if not less annual income than in 1800. Why haven’t all the world’s people seen a similar increase in living standards since 1800? These questions are the central themes of this course on the evolution of the world economy over the past millennium. Highlights of the class will include the pre-1800 Malthusian economy, the industrial revolution and its spread, 19th and 20th century globalization booms, and the development successes and failures of the 20th century. Prereq: ECON 102.

ECON 351. Managerial Economics (3)
This course explores the economic principles that underlie strategic decisions in firms. Topics include the determination of vertical and horizontal boundaries of firms, strategic positioning and the sources of competitive advantage. Prereq: ECON 102.

ECON 354. Industrial Organization (3)
This course examines how companies compete against each other and interact with customers in an effort to increase profits. Topics include: pricing strategies, product differentiation, advertising, R&D strategies, bundling and tie-ins, entry barriers, mergers and acquisitions, collusion and cartels, the dynamics of network industries (e.g. information technology), and technology adoption and diffusion. The course will take two complementary perspectives. First, we will consider the point of view of companies, and ask how different business strategies can affect competitive success. Second, we will consider the perspective of consumers and policymakers: we will ask whether different firm strategies enhance or reduce social welfare, and will explore different policy options to increase welfare (e.g. antitrust policies, patent systems). The first part of the course will utilize a range of basic economic tools. In the second part of the course, we will apply what was learned in the first part to real examples of firms and industries, including both business and legal cases. Prereq: ECON 102.

ECON 361. Energy Economics and Engineering Solutions (3)
This course examines the economics of markets for various energy sources, and the potential of emerging technologies to alter the market outcomes. We will look at why energy markets have historically been subject to extensive government intervention. We will analyze the effects of traditional policy measures such as price controls and regulation; and we will examine current policy issues arising from the relationships among energy use, economic growth, and the environment. Prereq: ECON 102.

ECON 366. Environmental Economics (3)
This course will use economic theory as an aid to understanding environmental problems and their solutions. We will start with a study of the firm. Once we have developed an understanding of firms’ incentives to pollute and overexploit natural resources, we will learn how various economic policies can change these incentives and thus prevent environmental degradation. Thereafter, we will evaluate the efficiency of these economic policies.

Finally, we will apply our theoretical analysis to specific environmental problems. Prereq: ECON 102.

ECON 369. Economics of Technological Innovation and Entrepreneurship (3)
This course is designed to help students identify, evaluate, and obtain control over technological opportunities so they may successfully understand the challenges of starting new companies. The course focuses on four themes: 1) the source, discovery and evaluation of technological opportunities; 2) the process of organizing a new firm to produce new technology that satisfies the needs of customers; 3) the acquisition of financial and human resources necessary to exploit technological opportunities; and 4) the development of mechanism to appreciate the returns from exploitation of technological opportunities. Prereq: ECON 102.

ECON 372. International Finance (3)
This course deals with open-economy macroeconomics and international financial markets, covering open-economy national income analysis, international macroeconomic policy coordination, exchange rate determination, foreign portfolio investment, and global financial crises. Recommended preparation: ECON 102 and ECON 103. Offered as BAFI 372 and ECON 372.

ECON 373. International Trade (3)
This course deals with international trade theories and policies, covering gains from and patterns of trade, immigration, foreign direct investment, protectionism, multilateral trade liberalization, regionalism and the costs and benefits of globalization within as well as among nations. Prereq: ECON 102 and ECON 103.

ECON 375. Economics of Developing Countries (3)
This course focuses on international aspects of economic development. The term “developing country” is often defined as a country that exhibits low per capita income, high poverty level, low level of industrialization, or low life expectancy. In terms of size, the developing countries make up at least three-fourth of the world population. Why do we study those countries’ economies separately from the industrialized economies? In fact, low economic growth, high unemployment, or high poverty rates also exist in many developed countries. The differences lie not in the types of problems but in the causes of these problems. In addition, differences in the kind of institutions that prevail in developing countries also
lead to different policy prescriptions. Among developing countries, differences in historical experience, cultural practices, political institutions and economic conditions are also enormous. Illustrations and explanations of those differences are provided from a wide range of developing countries. Prereq: ECON 102 and ECON 103.

Global & Cultural Diversity

ECON 377. Economics of Nonprofit Organizations (3)
The purpose of this course is to familiarize students with the private non-profit sector of the U.S. economy, with economic theory contributing to our understanding of this sector, and with the policy and management issues affecting non-profit organizations. Topics include understanding the different types of non-profit organizations; the size, scope and economic significance of the non-profit sector; the different parts of the economy in which non-profits operate; economic theories of why non-profit organizations exist and how they behave; analysis of important trends such as commercialization and globalization of the sector and its changing relationships with government, and how the U.S. non-profit sector compares with the third sector in other countries. Prereq: ECON 102.

ECON 378. Health Care Economics (3)
The health care industry is the fastest growing sector of the U.S. economy, with expenditures on health care now accounting for over 14% of total GDP. Because of its complexity and sheer size, the health care industry affects virtually every facet of the economy including labor productivity, income distribution and international competitiveness. The goal of ECON 378 is to apply the tools of economic analysis to develop students’ understanding of health care markets and related public policy issues. The course begins with an overview of the health care system in the U.S. with attention to disturbing statistics that have inspired calls for reform. The remainder of the course is approximately divided between analysis of the consumer side of the health care market and analysis of the provider side. Throughout the course, proposals for reforming the health care system will be described and discussed. Prereq: ECON 102.

ECON 386. Urban Economics (3)
Microeconomic theory as taught in principles (and even intermediate) does not usually take into account the fact that goods, people, and information must travel in order to interact. Rather, markets are implicitly modeled as if everyone and everything is at a single point in space. In the first part of the course, we will examine the implications of spatial location for economic analysis. In the second part of the class, we will use microeconomic tools to understand urban problems. Topics that we will cover include urban growth, suburbanization, land use, poverty, housing, local government, transportation, education, and crime. Prereq: ECON 102.

ECON 391. Advanced Topics and Writing in Economics (3)
This course is characterized by intense yet open-ended intellectual inquiry, guided by reading from primary and secondary sources, and will include extensive practice in written and oral communication. The focus will be on contemporary economic issues and scholarship, and assumes a high level of ability in undergraduate economics training. Specifically, this course provides an avenue for an intellectual discourse on some of the most challenging present day economic issues, and we will rigorously think and write about how economic concepts can be applied to virtually any topic, issue and event in the social world. Students will be challenged throughout the course to think and write like an economist and see the world through the economist’s lens. Prereq: ECON 308 or ECON 309 and ECON 326 and junior or senior standing.

SAGES Dept Seminar

ECON 395. Public Policy Case Competition (4)
This course uses economics to conduct an in-depth analysis of an important and current public policy issue. The specific issue will change from year to year, as will the set of economic tools used in the analysis. A constant feature of this capstone however will be the Richard Shatten Public Policy Case Competition. In this competition, students in the class will form teams and present policy suggestions to faculty as well as to public policy makers. Monetary prizes will be awarded to the top three team projects. The competition is in memory of Richard Shatten, a professor at the Weatherhead School who was also executive director of Weatherhead’s Center for Regional Economic Issues (REI). Through his work at REI and his earlier work as executive director of Cleveland Tomorrow, Richard was an important voice shaping public and private economic decision-making in Northeast Ohio. Prereq: Junior or Senior standing.

SAGES Senior Cap

ECON 397. Honors Research I (3)

All students admitted to the Honors Program will undertake an independent research project (senior thesis) under the guidance of a faculty member (thesis advisor). All Honors students will enroll in the 397/398 sequence. ECON 397 is used to define the topic, review the literature, formulate hypotheses, and collect appropriate data. Students will complete their research in ECON 398. Prereq: Junior standing and minimum GPA of 3.3 in ECON major and 3.0 overall. Coreq: Declared ECON major.

SAGES Senior Cap

ECON 398. Honors Research II (1 - 3)
This is the second course in a two course sequence to complete the Honors Research Program in Economics. Prereq: ECON 397. Coreq: Declared Economics major.

SAGES Senior Cap

ECON 399. Individual Readings and Research (1 - 6)
Intensive examination of a topic selected by the student.

ECON 403. Economics for Management (3)
This course surveys of the basic principles of micro and macroeconomics. Topics covered in microeconomics include supply and demand, market structures and factor markets. Macroeconomics topics are the national incomes accounts, the determination of national income, employment and inflation, fiscal and monetary policies and international trade.

ECON 403A. Economics (1)
This course serves as a review of economic principles and an introduction to the use of economics in the management setting. Basic economic concepts will be demonstrated by analyzing economic issues and policies relating to the environment in which organizations function. Economic analysis will be demonstrated with reference to particular decisions confronted by firms, including game theory. Prereq: Open to ACL-MBA students.

ECON 406. Innovation and Entrepreneurship (2)
The purpose of this module is to acquaint and ultimately engage clinical researchers with the business of innovation and entrepreneurship. Goals include: (1) to provide researchers with many of the skills that they would need to translate academic research into commercial uses; (2) to sensitize clinical researchers to the goals of the business community and facilitate their ability to work with the private sector on technology development; and (3) to
make clinical researchers aware of the processes of academic technology development and transfer. Sessions consist of lectures and case discussion facilitated by the instructor. Some sessions include members of the business community as guest lecturers. As an example, students will discuss the financing of new companies with local venture capitalists. Student products include the evaluation of the commercial potential of a university technology in which they apply their new knowledge about commercialization of scientific discoveries. Offered as CRSP 503, ECON 406, and HSMC 406.

ECON 421. Health Economics and Strategy (3)
This course has evolved from a theory-oriented emphasis to a course that utilizes economic principles to explore such issues as health care pricing, anti-trust enforcement and hospital mergers, choices in adoption of managed care contracts by physician groups, and the like. Instruction style and in-class group project focus on making strategic decisions. The course is directed for a general audience, not just for students and concentration in health systems management. Offered as ECON 421, HSMC 421, and MPH 421. Prereq: ECON 403.

ECON 431. Economics of Negotiation and Conflict Resolution (3)
Students frequently enroll in a negotiation class with one thought in mind—negotiating a better job offer from an employer. They soon learn, however, that negotiation skills can do far more than improve a pay check. Negotiations occur everywhere: in marriages, in divorces, in small work teams, in large organizations, in getting a job, in losing a job, in deal making, in decision making, in board rooms, and in court rooms. The remarkable thing about negotiations is that, wherever they occur, they are governed by similar principles. The current wave of corporate restructuring makes the study of negotiations especially important for M.B.A.s. Mergers, acquisitions, downsizing and joint ventures call into question well established business and employment relationships. Navigating these choppy waters by building new relationships requires negotiation skills. The increased stress on quality and other hard-to-measure aspects of relationships with customers and suppliers makes the process of negotiation even more complex and subtle. For these reasons, negotiation classes have taken center stage in the study of management. Every major business school now offers classes in negotiation and these classes are overflowing with students. Offered as ECON 431 and LHRP 413.

ECON 436A. Economics of Organizations-E.M.B.A. (2)
Dramatic changes in technology, work force demographics and economic competition are forcing firms to rethink their internal organization. Implementing new internal strategies is remarkably hard for organizations and managers to do. This class is designed to provide the economic tools that managers need to understand why their organizations are the way they are and why change can be as difficult as it is important. This course focuses on two elements of a firm’s internal strategy: structuring incentives and investing in relationships. In the incentives section, we analyze how organizations allocate decision rights; evaluate performance; and implement motivation strategies. In the relationships section, we analyze how organizations sustain functional, long-term relationships in competitive or conflictual environments. A small number of surprisingly simple economic models, it turns out, offer important insights into incentive design and investments in long-term relationships.

ECON 436B. Economics of Organizations-M.B.A. (3)
Dramatic changes in technology, work force demographics and economic competition are forcing firms to rethink their internal organization. Implementing new internal strategies is remarkably hard for organizations and managers to do. This class is designed to provide the economic tools that managers need to understand why their organizations are the way they are and why change can be as difficult as it is important. This course focuses on two elements of a firm’s internal strategy: structuring incentives and investing in relationships. In the incentives section, we analyze how organizations allocate decision rights; evaluate performance; and implement motivation strategies. In the relationships section, we analyze how organizations sustain functional, long-term relationships in competitive or conflictual environments. A small number of surprisingly simple economic models, it turns out, offer important insights into incentive design and investments in long-term relationships.

ECON 441. Economics of Financial Intermediation (3)
Institutions such as commercial banks, investment banks, insurance companies, and mutual funds perform important financial intermediation roles in an economy. This course provides a conceptual framework that allows the exploration of how these financial institutions perform their intermediation role through their different activities, such as loan origination, underwriting, insurance, and asset management. This framework also lends itself to the study of how and why regulation can be critical in ensuring the safety and soundness of the financial system. Prereq: ACCT 401, BAFI 402, ECON 403 and QUMM 414.

ECON 450. Health Care Economics for the Biosciences (1.5)
This course utilizes economic principles to explore such issues as health care pricing, anti-trust enforcement and pharmaceutical economics, choices in adoption of managed care contracts by physician groups, and the like. Instruction style and in-class group project focus on making strategic decisions. The course is directed for a general audience, not just for students and concentration in biosciences or health systems management. Offered as BIOS 450, ECON 450, and HSMC 450.

ECON 462. The Digital Economy (3)
What is the digital economy all about? How big is it, and what are its main features? Despite the dot-com debacle and subsequent stock market decline, there are some fundamental changes taking place in the economy, due to the Internet, that will affect business for many years to come. Among the topics discussed are the effects on productivity growth, structural change at the industry level and organizational change at the corporate level, the role of small business and entrepreneurship, the digital economy in Cleveland, and issues for public policy. Prereq: ECON 403.

ECON 464. Technology Entrepreneurship (3)
This course is designed to help students to identify, evaluate, and obtain control over technology opportunities that they can successfully exploit by starting new companies. The course focuses on four themes: (1) the source, discovery, and evaluation of technological opportunities, (2) the process of organizing innovation to produce new technology that satisfies the needs of customers, (3) the different mechanisms available to appropriate the returns from the exploitation of technological opportunities, and (4) the differences between opportunities and approaches that are valuable and sustainable for independent entrepreneurs and large firms. Students taking this course may not receive credit for both ECON 464 and ENTP 441. Offered as ECON 464 and ENTP 464.

ECON 474. International Trade (3)
This course deals with the causes and effects of international trade and investment. Its cov-
erage includes the global and regional commercial agreements and institutions that affect the international business environment. The European Union, the North American Free Trade Agreement, and the World Trade Organization are treated extensively. Prereq: ECON 403.

ECON 475. International Finance (3)
This course covers the global financial markets that multinational corporations, government agencies, and banks use in conducting business. These financial markets include the market for foreign exchange, the Eurocurrency and related money markets, the Eurobond and global equity markets, the commodity markets, the markets for forward contracts, options, swaps, and other derivatives. Prereq: ECON 403.

ECON 486. Value Creation Through Real Estate (3)
Introduction to economic analysis of real estate markets, with focus on development of urban land. Introduction to financial instruments used in development, and to the role of government in facilitating and constraining the use of real property. Prereq: ECON 403.

ECON 501. Special Problems and Topics (1 - 18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

ECON 525. Advanced Microeconomic Theory (3)
This course will give students an introduction to microeconomic theory at the Ph.D. level. Topics to be covered include consumer theory, the theory of the firm, general equilibrium (in other words, the theory of competitive markets), imperfect competition (models of Cournot oligopoly, Bertrand oligopoly, etc.), information economics (with focus on principal-agent problems), and auction theory. Students in the course will be expected to have a working knowledge of calculus. Some knowledge of constrained optimization and real analysis will be useful as well, although this is not required. While this is not a course in game theory, basic game theoretic concepts will be introduced to the extent they are necessary to understand the material. No previous background in economics will be assumed. Prereq: Ph.D. standing.

ECON 526. Advanced Econometrics (3)
This course focuses on the theoretical underpinning of multivariate regression analysis. The course also develops practical applications of econometric analysis. The course also introduces students to more advanced topics including discrete choice analysis, instrumental variables, and time-series methods.

ECON 601. Special Problems and Readings (1 - 18)
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

ECON 701. Dissertation Ph.D. (1 - 18)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF MARKETING AND POLICY STUDIES

DIVISION OF LABOR AND HUMAN RESOURCE POLICY
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FACULTY
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Professor of Labor and Human Resource Policy
Paul F. Salipante Jr., PhD
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Professor of Labor and Human Resource Policy

LABOR AND HUMAN RESOURCE POLICY (LHRP)

LHRP 311. Labor Problems (3)
This course examines labor-capital/government relations from current and historical perspectives. It reviews sociological, political, psychological, and economic explanations for conflicts and cooperation between labor and management. Selected aspects of law and negotiated institutions, such as individual rights and grievance procedures and a comparison of the U.S. with other countries, are also covered.

LHRP 360. Independent Study (1 - 18)
This course is offered for candidates undertaking reading or independent research in a field of special interest.

LHRP 409A. Unions, Collective Bargaining, and Management Policy (1.5)
The course examines why and how employees join or do not join unions; the processes of certifying and decertifying unions; alternative strategies used by management in dealing with unions; and models of union-management cooperation in traditional manufactur-
zation members are considered, covering such areas as hiring, performance appraisal, labor-management relations, employee rights, pay systems, grievance systems, and worker participation.

LHRP 424. Developing High Performance Work Systems (3)
This course will focus on understanding the factors shaping high performance work systems (HPWS) in organizations. Overall, an HPWS is based on a philosophy of using people to provide a sustainable competitive advantage; a reorganization of work structures and processes to maximize organizational learning and customer responsiveness; a set of human resource policies that seeks to build employees’ motivation and skills, and align individual interests with those of the organization; and new approaches to managing employees that are consistent with these philosophies, work organizations, and policies. Prereq: MGMT 413.

LHRP 425. Managing Human Resource Issues in Entrepreneurial Firms (3)
This course examines how entrepreneurial firms can develop human resource practices and strategies to sustain their vision, grow their businesses, and create value for customers, shareholders, and employees. The first half of the course will be devoted to exploring the distinctive challenges entrepreneurial firms encounter in aligning organizational goals and human resource strategy and practices. Among those practices are staffing, recruitment and selection, compensation, and employee motivation. The second half of the course will explore these issues further in the context of key organizational phases ranging from firm foundings, the transition from entrepreneurial to professional management, the development of “entrepreneurship” in existing organizations, and the spin-off of the new corporate ventures. Offered as ENTP 425 and LHRP 425.

LHRP 431. Negotiations for Managers (3)
The aim of this course is to enhance individual as well as organizational performance and competitive advantage through “principled negotiation”, “win-win bargaining”, and collaborative as opposed to competitive approaches to team problem solving. The context crosses all types of business, government and non-governmental organizations. Concepts, strategies, and models of negotiation are drawn from social psychology, economics, labor relations, and legal literature. Students will also be introduced to mediation (both as mediators and negotiators); to the complex art of advocacy and to the latest alternative dispute resolution (ADR) techniques. There is heavy reliance on simulations and role play to enhance student understanding of key course concepts. Although immediate skill enhancement through practice is a goal, students understanding of key concepts will enable them to continuously improve their insights and skills long after the course is concluded. There is no prerequisite for the course.

LHRP 435A. International Human Resources Management (1.5)
This course examines the unique challenges of managing Human Resources globally. Particular emphasis is on cultural and other contextual differences, and their influence on other HR practices such as selection, training, performance management, compensation, and union relations. The course establishes a conceptual foundation in cross-cultural cognitive and behavioral differences. Heavy emphasis is on case analysis. There is no formal prerequisite, but it is recommended that students have either completed, or are taking concurrently, the Human Values in Organizations course (MGMT 413) or LHRP 421.

LHRP 435B. International Human Resources Management (2)
Same as LHRP 435A except that students enrolling in the 2.0 credit version of the course will select a particular region or country (other than the one where they hold citizenship) and develop an independent analysis of particular advantages and challenges facing the human resource manager assigned to this country or region. The instructor may approve alternative projects.

LHRP 445. Compensation and Benefits (3)
Strategic management of compensation and benefits for effective motivation of managers and employees is introduced through the use of cases and student development of a wage and salary system based on a live organization. Since government-mandated and voluntary benefits comprise a third of compensation costs for many firms, significant attention is given to the attraction, retention, and motivational effects of benefits such as tuition reimbursement and training programs. Contingent compensation as a motivator and employment cost control device are also given significant attention.

LHRP 451. Alternative Dispute Resolution (2)
Students will examine the processes of alternative dispute resolution (ADR) through reading materials, videotapes, guest lectures, and simulation exercises. Particular emphasis will be given to the interaction of lawyers and clients in business negotiations and in litigation. Negotiation, arbitration, mediation, the summary jury trial, and the mini-trial will be examined. The class will also cover impediments to ADR, such as lack of understanding or hostility on the part of clients or lawyers. Offered as LAWS 351 and LHRP 451.

LHRP 501. Special Problems and Topics (.5 - 18)
This course is offered, with permission, to students undertaking individual reading or research projects in a field of special interest.

LHRP 601. Special Problems and Topics (1 - 18)
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

DIVISION OF MANAGEMENT POLICY

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Vasudevan Ramanujam, PhD
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Associate Professor of Management Policy

MANAGEMENT POLICY (PLCY)
PLCY 200. Social and Political Environment of Management (3)
This course is concerned with the relationship between business activities and the broader social environment. Business is a part of society and has responsibilities and obligations beyond mere profit maximization. These responsibilities and obligations are those that fall on all citizens: to contribute to the health and well-being of our democracy and civil society. In this course, we will explore and debate these responsibilities and obligations in the context of a broad array of ideas and cases. Our goal will be to make some progress toward answering the question: “What is the right ethical responsibility of business, both inside and outside the organization, and how is it correctly implemented?”

PLCY 360. Independent Study (1 - 18)

PLCY 399. Business Policy (3)
This course uses case analysis to develop perspective and judgment on business problems through the integration of functional areas. Formulation, development, and implementation of organization goals and policies, the development of strategy in relation to the competitive environment, and applications of quantitative and behavioral decision-making techniques are examined. Prereq: Senior standing.

PLCY 418. Enterprise Development (3)
Course features new product launch by students and new business idea competition judged by actual venture capitalists. Students will also learn how to acquire control of an existing company, including valuation methods, sources of funding, tactics for finding companies to buy, and how to negotiate the purchase of a business. Also includes actual student negotiation with sellers of a company. Course is designed to accelerate career success through bold entrepreneurial strategies. Offered as ENTP 418 and PLCY 418.

PLCY 419. Entrepreneurship and Personal Wealth Creation (3)
Course explores the accumulation of personal wealth utilizing entrepreneurial strategies. The underlying competencies of successful entrepreneurs are identified and applied to individual lives of students. Active entrepreneurs will be studied, and original case studies of start-ups and acquisitions provide the basis for class exercises. Offered as ENTP 419 and PLCY 419.

PLCY 420. Managing the Family Firm (3)
The vast majority of U.S. firms are family controlled and present special problems in strategic management including the interaction of family and firm objectives, executive succession, management development and motivation, finance, estate planning, etc. This course explores solutions to these problems in the context of guiding the firm’s growth through the threshold between personal and professional management. The course pedagogy is participative and experiential. Offered as ENTP 420 and PLCY 420.

PLCY 422. Managing an Emerging Growth Enterprise (3)
Students are exposed to what it is like to work in an emerging growth company with sales under $100 million. Prospective students might be individuals who are considering employment with middle market company, entrepreneurs who may start a company, or business persons who may buy a middle market company. The learning experience will stem from participating in an actual semester-long project. In-class discussions include: business planning, selling, managing technology transfer, and creativity/innovation, and guest presentations by CEOs from middle market companies. Offered as ENTP 422 and PLCY 422. Prereq: ACCT 401, BAFI 402, MKMR 403 and MIDS 409.

PLCY 425. Chief Executive Officer (3)
This course is designed for students who aspire to become a chief executive officer. The unique role, responsibilities, and requirements of the CEO will be explored. Students will benchmark CEO best practices through exposure to leading chief officers, study the paths to and preparation for the top job, and develop a personal career strategy to increase their chances of becoming a CEO.

PLCY 426. International Entrepreneurship (3)
This course introduces the area of international entrepreneurship by focusing on various aspects of this area. Topics to be covered include: conditions making small, medium-sized, and new ventures increasingly important in international business; information sources relevant to international entrepreneurship; critical steps in deciding on doing international entrepreneurship, strategic planning and methods in conducting international entrepreneurship; and benefits and problems of going international as a new venture. Offered as ENTP 426 and PLCY 426.

PLCY 427. Entrepreneurial Strategy (3)
Creating and managing a new venture inside or outside a corporation is a task that few individuals are able to accomplish, even though many profess the desire. The primary goal of this course is to provide an understanding of entrepreneurship and the entrepreneurial process. The course will broaden a basic understanding obtained in the functional areas (organization, strategy, finance) as they apply to new venture creation and growth. While most of the examples in class will be drawn from new venture formations, the principles also apply to new business development in corporate settings and to non-profit entrepreneurship. Offered as ENTP 427, PLCY 427.

PLCY 429. New Venture Creation (3)
The primary goal of this course is to provide an understanding of entrepreneurship and the entrepreneurial process. The course will broaden a basic understanding obtained in the functional areas as they apply to new venture creation and growth. Offered as ENTP 429 and PLCY 429.

PLCY 439. Intrapreneurship - Entrepreneurship within the Corporation (3)
Intrapreneurs are the entrepreneurs within corporations who combine innovation, creativity and leadership to develop and launch new products, new product lines, and new business units that grow revenues and profits from within. Intrapreneurial innovation and creativity have never been needed more by U.S. corporations than they are today. Numerous corporations have been increasing revenues through mergers and acquisitions, rather than through internal product innovation and new business creation. Today, many companies are returning to their entrepreneurial roots. Revitalizing existing companies through intrapreneurial activity creates new capital, retains and increases jobs, and creates exciting places to work and achieve. The purpose of this course is to encourage students to research and understand the theories, principles, concepts, and practices of entrepreneurship within organizations--Intrapreneurship. Students will become acquainted with trends, expectations, organizational challenges to innovation, and opportunities in today’s corporate America. Offered as ENTP 439 and PLCY 439.

PLCY 450. Challenges to U.S. Management from East Asia (3)
Examination of the Japanese, Chinese, and other East Asian business systems. Looks at how the business systems relate to broader social, economic, and political contexts. Compares the different systems with each other and with that of the United States. Inquires into the reasons for the past successes and recent problems of these systems.
PLCY 474. Innovation for Competitive Advantage (3)
In this course, we will develop frameworks to identify new value propositions for the customer. We will then apply these frameworks to three types of innovations that we see in practice--incremental, disruptive and white space--and more importantly understand business model innovations that go beyond just a product or process innovation. The course will also explore techniques of focused brainstorming and creative problem solving techniques. Prereq or Coreq: MGMT 499.

PLCY 490. Corporate Strategy (3)
This course is an advanced strategy course that explores the determinants of successful corporate strategy. In Strategy Issues and Applications you were exposed to the basic frameworks for developing successful competitive or business unit level strategy. Corporate strategy takes you to the next level and provides the frameworks you need to be able to be successful in multiple businesses. At its core corporate strategy constitutes any and all decisions that change the core business model of a firm. Examples are vertical integration, new but related product lines, entering new markets with existing products and entering new or existing markets with unrelated products. The fundamental premise of the course is that successful corporate strategy is rooted in competitive advantage arising from capabilities residing at the business unit level. Starting from analyzing business level strategies of very simple firms, the course successively builds frameworks towards more complicated business level strategies. Next, the course develops frameworks to discuss corporate strategy based around the concept of core competencies and market entry strategies. Finally, the course develops the concepts that are useful in greenfield entries, alliances and acquisitions as part of an overall corporate strategy. Prereq: MGMT 499.

PLCY 494. Managerial Consultancy (3)
Students will learn to match consulting methodologies with client needs and employ a step by step strategy development process applied to actual companies which are semester-long clients of the class. Accelerated career strategies in the consultancy business are featured as well as tactics for getting hired in the first place. The course views consultancy as a role rather than career and conceptualizes consultancy as a process of optimizing an organization's value creation potential and competitive advantage. Students should be able to apply the concepts regardless of career choice. Exposure to senior practicing consultants is featured.
PLCY 495. Industry and Competitive Analysis for Strategic Planning (3)
This course introduces methods of industry and competitive analysis. Industry structure and firm competitive behavior are studied with a view to develop business strategies for securing and preserving competitive advantage. Emphasis is placed on understanding industry dynamics and the processes by which industries undergo change and evolution. Emphasis is also placed on firms' capabilities and core competencies and their capacity to implement major strategic changes in their industries. Readings and cases are the principal pedagogical tools utilized in this course. Students are required to analyze an industry of their choice in small project teams and present their analyses in class.

PLCY 496. Strategic Planning and Control Systems for Strategy Implementation (3)
This course introduces the principal tools of strategy implementation, namely the design of organization structures, the use of formal planning and control systems, and the design of measurement and reward systems. The importance of organizational context (small vs. large, for profit vs. not-for-profit, manufacturing vs. service, etc.) and the need to tailor systems to the context of the organization are emphasized. New and emergent organizational forms and their role in strategy development and implementation are reviewed. Cases and readings are the principal pedagogical methods utilized. Students work in small project teams, study the operation and effectiveness of systems for strategic control in organizations, and present the results of their analysis in class presentations.

PLCY 501. Special Problems and Topics (1 - 18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

PLCY 601. Special Problems and Topics (1 - 18)
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

PLCY 701. Dissertation Ph.D. (1 - 18)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DIVISION OF MARKETING
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(Texas Tech University)
Professor of Marketing, H. Clark Ford Professorship
Walter Sokira, MBA
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Senior Lecturer, Marketing

MARKETING (MKMR)

MKMR 301. Marketing Management (3)
This course covers key concepts and practices of marketing with emphasis on analysis and development of integrated marketing plans and programs that create customer value and competitive advantage in the world-wide marketplace. Prereq: ACCT 202 or ACCT 303.

MKMR 304. New Product Development and Marketing (3)
This course focuses on preparing students to manage the marketing processes that are essential to extract and make useful to the marketplace and society the commercial and social values embedded in new product and process ideas. All levels of technology and of innovativeness are addressed, including breakthrough technologies and radical innovations. The objective function for the organization is to create commercial and/or social value. Students will discuss the role of product development in achieving and sustaining competitive advantage, the structure and dynamics of managing development from concept to successful commercialization, and the marketing management concepts and tools required to manage the process. A variety of exercises, cases and projects will allow students to practice the idea. Prereq: MKMR 301.

MKMR 307. Marketing Through the Supply WEATHERHEAD SCHOOL OF MANAGEMENT

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MKMR 310. Marketing Research for Decision Making (3)

This course will introduce students to marketing research, its applications to managerial decision-making and emphasize research as an aid to problem solving in marketing management. Students will go through the steps of conducting marketing research, which include problem definition, research design (exploratory, descriptive and causal), data collection methods, questionnaire design, attitude measurement, sampling and data analysis. The course will be based on lecture, discussion, individual problem solving analytical assignments, case analyses, and a semester-long team-based marketing research project. Students will also learn to use the SPSS software for solving specific research problems through data analysis. Prereq: STAT 207 or STAT 243 or STAT 312 or PSCL 282 or consent of instructor.

MKMR 311. Consumer Behavior (3)

This course focuses on human decision-making processes and how they influence purchase and consumption behavior. Drawing on psychology and sociology it examines a wide variety of topics including motivation, attribution, decision-making, reference group influence, and information processing with an emphasis on the practical application of these theories into actionable marketing strategies. An understanding of the factors that drive consumers’ purchase and consumption decisions is critical to predicting or influencing their behavior. Although we will focus on consumer behavior, much of the content is basic human behaviors and so is also applicable in business-to-business and not-for-profit settings. Prereq: MKMR 301 or consent of instructor.

MKMR 312. Selling and Sales Management (3)

Selling and sales management are keys to implementing an organization’s marketing program and customer relationships. This course emphasizes developing an understanding of basic marketing concepts, selling principles, interrelationships among sales force management and other business functions, appropriate strategy for managing a sales force and measurement of sales force productivity. We will use theories of work motivation and explore how individual difference variables influence the choices of sales managers. This course uses a synthesis of sales research and leading practices to focus on both a strategic and a tactical perspective. Strategic issues include: entrepreneurial strategy, the sales force’s role in company strategy, customer relationship and strategic account management, sales force size and organization and career paths to sales management. Tactical issues include: effective approaches to selling, finding and retaining top sales talent, motivating and compensating the field force, evaluating performance, and aligning sales territories. Prereq: MKMR 301 or consent of instructor.

MKMR 360. Independent Study (1 - 3)

This course is offered, with permission, to students undertaking reading and research in an area of their special interest.

MKMR 403. Managerial Marketing (3)

This course focuses on managing marketing as a process of creating value and mutually desirable exchanges of values. That is the foundation of a customer orientation and a central theme of market-driven management. Methods for strategic marketing planning, understanding buyer behavior, market analysis, segmentation and devising integrated marketing programs are introduced. Creating customer value and competitive advantage in worldwide markets is the central theme. Prereq: ACCT 401.

MKMR 403A. Marketing (1)

This course is designed to refresh and enhance student familiarity with fundamental concepts in marketing management, and with how those concepts are applied to solve realistic business problems. The course exposes students to basic marketing theory in the areas of consumer behavior and decision making (both individual consumers and organizational buyers), pricing strategies, channel management and its importance to marketing strategy, new product development and management, and promotion management. Equal emphasis is given to analyzing business cases that deal with realistic situations where the theories described above can be applied. Considerable emphasis is also given to learning analysis techniques and back-of-the-envelope calculations that can be applied to case data (financial, market research results, industry reports, etc.) to gain further insights. Prereq: Open to ACL-MBA students.

MKMR 405. Industrial/New Technologies Marketing (3)

This course focuses on concepts and practices of business-to-business marketing of products and services. It also examines how rapid technological change impacts industrial markets. Topics covered include: buyer-seller relationship building, competitive bidding, developing markets for new materials and value-based pricing strategies. Marketing to the government, marketing of intellectual property and marketing-R&D-manufacturing interface issues will also be explored. Prereq: MKMR 403.

MKMR 406. Sales Force Management (3)

Selling and sales management are keys to implementing an organization’s marketing program and customer relationships. This course emphasizes developing an understanding of basic marketing concepts, selling principles, interrelationships among sales force management and other business functions, appropriate strategy for managing a sales force and measurement of sales force productivity. We will use theories of work motivation and explore how individual difference variables influence the choices of sales managers. This course uses a synthesis of sales research and leading practices to focus on both a strategic and a tactical perspective. Strategic issues include: entrepreneurial strategy, the sales force’s role in company strategy, customer relationship and strategic account management, sales force size and organization and career paths to sales management. Tactical issues include: effective approaches to selling, finding and retaining top sales talent, motivating and compensating the field force, evaluating performance, and aligning sales territories. Prereq: MKMR 403.

MKMR 407. Marketing Through the Supply Chain (3)

This course views the supply chain (including the distribution channels) as a multi-organization business system that enables customers at all points in the system to acquire the benefits/value they want in the way they want.
MKM 410. Marketing Research for Decision Making (3)
This course stresses the generation and use of marketing information for a range of managerial decisions, including identifying and defining marketing performance and improving understanding of marketing as a process. This course discusses contemporary approaches for defining marketing information needs, designing methods for information collection and making sense of obtained results. The course utilizes lecture/discussion, case analysis, and a field project to develop skills in defining and solving marketing problems. Prereq: MKMR 403 and QUMM 414.

MKM 411. Consumer Behavior (3)
This course addresses micro and macro issues in consumer behavior which are essential for managers seeking to analyze and influence consumer decision making. The course focuses on how consumer behavior analysis can be used to develop effective marketing techniques and strategies. This involves developing an understanding of consumer behavior from a variety of perspectives, identifying the major factors that influence how consumers process and learn, marketing communications, managing consumer satisfaction, and developing an understanding of purchase decision making and its implications for marketing strategy. Emphasis is placed on designing persuasion strategies, enhancing brand memory, consumer profiling, analyzing consumer trends, and customer relationship management. Prereq or Coreq: MKMR 403.

MKM 412. E-Marketing (3)
Using a combination of lectures, cases, and hands-on projects, the course examines how the Internet influences all the key aspects of marketing, including marketing strategy, pricing, advertising, segmentation, marketing research, retailing, distribution channels, and international marketing. Additionally, the course will cover more Internet specific topics such as privacy, wireless web, sales force automation, and emarketplace models. The course incorporates both business-to-business and business-to-consumer outlooks.

MKM 421. Product and Brand Management (3)
Established products and brands typically provide the majority of firms’ earnings. If carefully managed, these products also are a significant source of growth and future earnings. This course focuses on the role of a Product/Brand Manager in profitably managing a firm’s existing offering. Students identify areas for growth (or decline) within a firm’s mature product lines, devise ideas to capitalize on growth potential or address decline, develop and assess concrete marketing initiatives, and determine the financial impact of alternative plans. The course uses a combination of case analysis, lecture/discussion and guest speakers, allowing students to develop their repertoire of quantitative and qualitative marketing decision skills. Prereq: MKMR 403.

MKM 430. Marketing Problem-Solving (3)
The objective of this course is to build skills for effective problem solving in practical, real-world marketing situations. Utilizing case studies, online databases and secondary data, the course focuses on contemporary analytical approaches that provide insights into, and clarify the underlying dynamics of marketing phenomenon. Marketing decisions discussed cover consumer and industrial marketing problems. This course is intended for students who are interested in data-based-decision-making tools for solving marketing problems.

MKM 450A. Entrepreneurial Marketing-E.M.B.A. (2)
This course addresses the entrepreneurial/intrapreneurial process of commercializing an idea for a market opportunity. Students select an opportunity and develop a deployable, one-year market entry program and a five-year strategic marketing program. Emphasis is on the entrepreneurial marketing decision process, including defining the business, defining the market, specifying customer perceived value, assessing competitive capability and advantage, identifying and properly using secondary and primary information, and deploying marketing programs throughout the organization and the supply chain. Offered as ENTP 450 and MKMR 450B. Prereq: MKMR 403.

MKM 460. Marketing Communications Management (3)
This course provides a sound understanding of marketing’s total organization and the supply chain. Offered as MKMR 475 and OPMT 475.

MKM 475. Supply Chain Logistics (3)
The focus of this course is on the effective management of a firm’s downstream processes in the supply chain that deliver goods and services to customers. Concepts, methods, and strategies are presented that can lower supply chain costs while maintaining or improving customer service. In addition, ideas for using the supply chain for competitive advantage leading to revenue enhancement are discussed. Adding value for customers is the objective. Key topics include transportation planning, inventory management, network design, and customer service goal setting. Offered as MKM 475 and OPMT 475.

MKM 476. Supply Management in the Supply Chain (3)
The focus of this course is on the effective management of a firm’s upstream supply
chain processes that provide it with the services and physical goods needed for product and service creation and distribution. The primary objectives of the course are: 1) to understand the complexity of inter-firm and intra-firm coordination in implementing cutting-edge supply chain programs such as vendor managed inventories, third-party logistics, mass-customization, quick response, and strategic alliances; 2) to develop the ability to design efficient supply systems and formulate integrated supply strategies so that all components are synchronized to fit a firm’s competitive environment, market needs, and overall corporate strategies; and 3) to impart analytical skills necessary to develop effective solutions for a variety supply management problems. Offered as MKMR 476 and OPMT 476.

**MKMR 501. Special Problems and Topics (1 - 18)**
This course is offered, with permission, to students undertaking reading or a project in a field of special interest.

**MKMR 601. Special Problems and Topics (1 - 18)**
This course is offered, with permission, to Ph.D. candidates undertaking reading or a project in a field of special interest.

**MKMR 701. Dissertation Ph.D. (1 - 18)**
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

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Associate Professor Emeritus of Information Systems

**Adjunct Faculty**

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Adjunct Professor of Information Systems

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**INFORMATION SYSTEMS (MIDS)**

**MIDS 301. An Introduction to Information Systems (3)**
The focus of this course is information, the design of systems used to manage it, and the benefits that can be derived from it in an organizational context. Topics include interface design, design standards and tools, networks, infrastructure use, software applications and implementation, data collection, storage and retrieval, and web systems. The course balances organizational issues illustrated through readings, and hands-on development, through assignments and projects.

**MIDS 310. Technology of Information Systems (3)**
Review of present day computing systems and function of modern computer technology. Computer systems architecture, file structures, operating systems, compilers and assemblers, and telecommunications. Prereq: MIDS 309.

**MIDS 315. Multimedia Systems (3)**
Current practices and future directions of multimedia systems are discussed. Special attention is given to management issues involved in specifying, designing, developing, and assessing multimedia systems and to design principles that can be used to improve the quality of multimedia. This is a project-based course in which students gain experience in developing websites, CD-ROMs, and films. Description for MIDS 415: As information becomes more abstract and therefore more difficult to perceive directly with one’s sense, sonic and visual presentation become more important than ever. Designing systems that take advantage of people’s aesthetic sensibilities is an area wide open to the enterprising and inventive entrepreneur. This course will interest those who think that artists have a say about how sound and graphics and words might be put together. The course examines aesthetic issues that arise in the development of multimedia. It focuses on creative integration of video, audio, and graphics particularly for the web, interactive CDs, and virtual reality. Offered as MIDS 315 and MIDS 415. Prereq: Not open to first-year students.

**MIDS 326. Systems Analysis and Design (3)**
This course investigates concepts and techniques for analyzing organizational systems in order to identify opportunities for redesigning the organization, its work practices and/or its information systems. It emphasizes creativity in diagnosing organizational problems and opportunities. You will learn consultation and intervention strategies for moving to a consensus on problem definition and a vision of desired changes. You will learn both soft and structured object-oriented methods for performing systems analysis. In addition you will learn the process of documenting new organizational and information system requirements in a form suitable for detailed system design and implementation. Prereq: MIDS 309.

**MIDS 327. Database Management (3)**
From large-scale business systems to on-line shopping carts, databases are the engines of contemporary business. This is a course on the design and development of database management systems with an emphasis on the business processes that these databases are created to support, as well as methods for extracting powerful information from databases. Students will learn to apply a broad range of tools, including various data and process modeling techniques. Different database systems will be employed during the semester, and there will be introductions to web integration, business applications, and data mining. The final project puts it all together in a real-world database development project. Prereq: MIDS 309 and MIDS 310.

**MIDS 329. Design of Object-Oriented Systems (3)**
This course provides an opportunity to gain an understanding of the concepts and technology of object-oriented systems and learn system design techniques that take full advantage of this technology. Students also develop competence in programming in an object-oriented language. Recommended preparation: Ability to program in Pascal or C, or consent of the instructor.

**MIDS 360. Independent Study (1 - 18)**

**MIDS 385. Web Systems Integration (3)**
Standards-based technology is used to help solve complex information system problems in modern organizations. This course brings together component-based development approaches in the context of doing business on the global Internet and on corporate intranets. Enabling technologies are based on published and de facto Internet standards including HTTP and HTML, CGI/API and Perl.
CSS, JavaScript, ActiveX, XML, CORBA/DCOM, and SSL/SET. Students are encouraged to contribute to a team effort to design, implement, and integrate an appropriate solution to a selected business problem in electronic commerce or distance learning. They will also develop competency in the foundation technologies. Offered as MIDS 385 and MIDS 485.

MIDS 409. System and Design Thinking (3)
For over a half-century, the field of information systems has been learning about the design, development, testing, and use of complex systems. Computers are just the start. The networks that connect them to create a massive communications grid, the software that runs on them, and the impact of these artifacts on organizations have all generated large bodies of knowledge. Two modes of thinking have proven particularly valuable in making sense of these developments—system thinking and design thinking. While this course applies concepts from system thinking and design thinking to problems related to using information in organizations, the techniques are widely applicable to managing.

MIDS 409A. System and Design Thinking (1)
For over a half-century, the field of information systems has been learning about the design, development, testing, and use of complex systems. Computers are just the start. The networks that connect them to create a massive communications grid, the software that runs on them, and the impact of these artifacts on organizations have all generated large bodies of knowledge. Two modes of thinking have proven particularly valuable in making sense of these developments—system thinking and design thinking. While this course applies concepts from system thinking and design thinking to problems related to using information in organizations, the techniques are widely applicable to managing. Prereq: Open to ACL-MBA students.

MIDS 410. Information Technology Architectures (3)
Just as a crafts person needs an intimate understanding of the tools of a trade, the information professional must understand the architecture of hardware, telecommunication facilities, operating systems, applications and networks. This course covers how prioritization, security, sharing and distribution can be improved by parallelism and how required synchronization can be safely and efficiently implemented across an essentially layered architecture that extends from the chip to the user-friendly application. Prereq: MIDS 409.

MIDS 413. Managing Large Systems (3)
This course will help you understand the complex nature of the selection, implementation and management of large enterprise business systems (such as Enterprise Resource System, Customer Relationship Management systems and Supply Chain Management systems). It is no secret that many companies have publicly, and privately, struggled with large enterprise business systems projects which ended up millions of dollars over budget, many years behind schedule, or worse, crippling the companies’ operations by failing to meet the day-to-day demands of the business. During this course, we will examine case studies of successful, and unsuccessful, projects and organize the common themes into a framework applicable to the successful navigation of the life cycle of large enterprise business systems. Prereq: MIDS 409.

MIDS 415. Multimedia Systems (3)
Current practices and future directions of multimedia systems are discussed. Special attention is given to management issues involved in specifying, designing, developing, and assessing multimedia systems and to design principles that can be used to improve the quality of multimedia. This is a project-based course in which students gain experience in developing websites, CD-ROMs, and films. Description for MIDS 415: As information becomes more abstract and therefore more difficult to perceive directly with one’s sense, sonic and visual presentation become more important than ever. Designing systems that take advantage of people’s aesthetic sensibilities is an area wide open to the enterprising and inventive entrepreneur. This course will interest those who think that artists have a say about how sound and graphics and words might be put together. The course examines aesthetic issues that arise in the development of multimedia. It focuses on creative integration of video, audio, and graphics particularly for the web, interactive CDs, and virtual reality. Offered as MIDS 315 and MIDS 415.

MIDS 420-1. Identifying Design Opportunities (0)
Designing is giving form to an idea to conceive of a more desirable product, service, process or organization and refining the idea into something that can be delivered reliably and efficiently. Good design integrates these evolving ideas with the day-to-day realities of a firm’s operations, systems, marketing, economics, finance and human resources. Designing is thus a unique managerial activity that brings together changing technologies, capabilities, relationships, activities and materials to shape an organization’s plans and strategies. It combines analysis and synthesis in ways that are integrative and inventive, and through it managers create opportunities and means of attaining them. Viewed this way, designing is a core competence of a successful entrepreneur or innovative leader. This course is the first in a two-semester sequence. Design analysis is the systematic review of the four orders of design...
found in every firm—namely, the firm’s communications, products, interactions and environments—and the creation of opportunities to increase firm value by improving each. Students will identify ill-defined, ill-structured problems within organizations. Such problems are ones for which there are no definitive formulations and for which the formulation chosen affects the solutions available. For such problems, there is no explicit way of knowing when you have reached a solution, and solutions cannot necessarily be considered correct or incorrect. But finding innovative solutions to such problems can provide unique opportunities to distinguish organizations and to create exceptional value. A major outcome of the semester’s inquiry is a presentation of the challenges and opportunities discovered during the design analysis of the client organization. The presentation will include a conceptualization of the client’s current situation and opportunities, along with a statement of their design requirements. It is successful to the extent that it demonstrates learning by creating unexpected value to the client.

MIDS 426. Designing Successful Systems (3)
One of the greatest challenges organizations face is creating information systems that work. Not only must you be able to diagnose problems, envision new possibilities, and design solutions, you must also be able to communicate your ideas to the technologists who will build and support the systems you need. In this course we will investigate concepts and techniques for analyzing systems and processes in order to identify opportunities for improving the organization, its work practices and its information systems. We will emphasize creativity in diagnosing organizational problems and opportunities. We will explore consultation and intervention strategies for moving to a consensus on problem definition and a vision of desired changes. We will investigate strategies for documenting organizational and information system requirements that both managers and information technology professionals can understand and act on. Finally, we will discuss project management approaches that keep development efforts in time and under budget.

MIDS 427. System Development and Data Management (3)
Information drives modern organizations. From ERP systems to on-line shopping carts, databases are the engines of contemporary business applications. Managers who possess a fundamental understanding of databases have an advantage. These managers appreciate the potential of the data at their fingertips, and they know how to improve the business processes that databases support. This is a course on the design and development of database management systems with an emphasis on the role of databases in business processes. Students will learn the tools of data and process design, and will learn how to extract powerful information from databases. The final project puts it all together in a real-world database development project.

MIDS 432. Health Care Information Systems (3)
This course covers concepts, techniques and technologies for providing information systems to enhance the effectiveness and efficiency of health care organizations. Offered as HSMC 432, MIDS 432, and MPH 532.

MIDS 438. Digital Law and Business (1)
The course provides Law and MBA students with an understanding of legal issues that need to be addressed in the development of digital business at the level of website management and transactions. The course also highlights the critical role of technology as a source of new legal requirements, and also as a means to address and enforce legal requirements that are critical in conducting on-line business (e.g. demand for authenticity, or non-repudiation). The course is organized as a series of topics that focus on critical aspects of e-business development and related contractual issues, business transactions and their enforcement, security, privacy, intellectual property rights, consumer protection, international legal issues and e-business regulation. Specific legal topics include: a). Copyright, trademark, and (to a lesser extent) patent issues (web development, content management), b). Contract law in the e-business context (formation, repudiation, E-sign, UETA, UCITA, etc.) (B2B, B2C transactions, financial transactions), c). On-line privacy law and privacy policies (marketing topics), d). DMCA, ACPA, ECPA and the Patriot Act, COPPA, e). Website Terms of Use (web development), f). Website affiliate agreements (web development), g). Website development and maintenance agreements (web development), h). Web product distribution agreements. i). Shrinkwrap, clickwrap, and EDI agreements (B2B). j). Various IP-related licensing, confidentiality, development, and assignments, agreements, domain naming (Internet). Offered as LAWS 438 and MIDS 438.

MIDS 447. Chief Officer Dialogues on Information and Management (3)
Each week, Chief Level Officers (CIO, CEO, CFO, CMO, CTO, etc.) from major corporations present the class with live problems in which technology, strategy and operational issues must be integrated in a coherent organizational course of action. Students work in teams to design courses of action in response to those problem situations, which Chief Level Officers then review, critique and discuss. Offered as MGMT 447 and MIDS 447. Prereq: MIDS 409.

MIDS 461. Change Management (3)
Change is an inherent dimension of organizational life-new policies, regulations, technologies, people, products, competitors, markets, processes, physical facilities...the list goes on. Consequently, the abilities to adapt to and manage technical and organizational changes are critical managerial competencies. This course aims to provide a framework for planning, analyzing, and managing those changes over which you as a manager will have some control. Though our discussions will focus on technology-enabled and technology-related change, the intention is to equip you with a process model, tools, and guiding principles that can be applied more generally to other change processes.

MIDS 470. Analyzing Mobility and Mobile E-Business (3)
Pervasive digital services and mobile computing applications, and intelligent and ubiquitous computing environments will change the landscape of organizational computing and business applications in the next decade. They will also change how we work and how business is conducted. There are technological, business, and regulatory challenges that must be addressed in shifting organizational approaches and technological solutions to this new environment. The goal of this course is to examine state-of-the-art solutions to this new arena, explore business opportunities and analyze research themes and issues that are emerging in this new arena. The course is meant for Ph.D. students studying pervasive computing, advanced M.S.M. students who are interested in this new area, technologically savvy M.B.A. students who want to explore and expand their knowledge in the leading edge technologies and for students in the engineering school who want to study business applications of telecommunication and agent-based technologies.

MIDS 485. Web Systems Integration (3)
Standards-based technology is used to help solve complex information system problems in modern organizations. This course brings together component-based development ap-
proaches in the context of doing business on the global Internet and on corporate intranets. Enabling technologies are based on published and de facto Internet standards including HTTP and HTML, CGI/API and Perl, CSS, JavaScript, ActiveX, XML, CORBA/DCOM, and SSL/SET. Students are encouraged to contribute to a team effort to design, implement, and integrate an appropriate solution to a selected business problem in electronic commerce or distance learning. They will also develop competency in the foundation technologies. Offered as MIDS 385 and MIDS 485.

MIDS 501. Special Problems and Topics (1 - 18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

MIDS 527. Seminar in MIDS (3)
This seminar addresses topics of current interest with a strong emphasis on research. It is intended primarily for the faculty and doctoral students of the MIDS Department.

MIDS 601. Special Topics in MIDS (1 - 18)
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

MIDS 701. Dissertation Ph.D. (1 - 18)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF OPERATIONS

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FACULTY

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(Stanford University)
Professor of Operations; William E. Unsworth
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Electrical Engineering and Computer Science

Daniel Solow, PhD (Stanford University)
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George Vairaktarakis, PhD
(University of Florida)
Associate Professor of Operations

Ronald Ballou, PhD
(The Ohio State University)
Professor Emeritus of Operations

Hamilton Emmons, PhD
(Johns Hopkins University)
Professor Emeritus of Operations

Secondary Appointment

Peter Ritchken, PhD
(Case Western Reserve University)
Professor of Operations; Kenneth Walter Haber
Professor of Finance

OPERATIONS MANAGEMENT

OPMT 360. Independent Study (1 - 18)

OPMT 390. Special Problems and Topics in Operations Management (1 - 18)
Undergraduate student pursues a special topic or problem, with agreement of operations management instructor.

OPMT 405. Operations Management (3)
Operations management deals with the design of products and processes, the acquisition of resources, the conversion of inputs to outputs, and the distribution of goods and services. It is central to a firm’s ability to compete effectively. As global competition in both goods and services increases, the management of operations is becoming more and more important. This course provides a broad overview of the managerial issues associated with production and delivery of goods and services. It includes the use of quantitative modeling using computers as a central methodology. Prereq: QUMM 414.

OPMT 405A. Operations Management (1)
In recent years, a changing competitive landscape has highlighted the critical role of the operations function in ensuring business success. In this course, we treat business as a value-added chain of processes that supply and convert disparate inputs into products and services and distribute these outputs. We examine how to best design, run and improve these processes. A variety of manufacturing and service sector settings will be used as examples to illustrate the concepts. It is assumed that the student is familiar with the material covered in a basic undergraduate course in operations management. Specifically, a vocabulary of operations management terminology and proficiency in basic tools and techniques of operations management are expected. Prereq: Open to ACL-MBA students.

OPMT 407. Marketing Through the Supply Chain (3)
This course views the supply chain (including the distribution channels) as a multi-organization business system that enables customers at all points in the system to acquire the benefits/value they want in the way they want to acquire them. It is a collaborative human network creating customer and shareholder value throughout the system. Strategic and tactical management topics include specifying customer desired value, assessing network members’ (suppliers, producers, distributors, and customers) abilities to create it, and consequently allocating decisions, tasks, and rewards to members. Emphasis is on structure, communication, motivation, and control/discipline to encourage effective implementation throughout the supply chain system. Offered as MKMR 307 and MKMR 407 and OPMT 407.

OPMT 420. Managing Quality with Six Sigma (3)
This course provides an introduction to managing quality throughout the supply chains in both manufacturing and service organizations, utilizing the popular Six Sigma approach. The familiar DMAIC (define, measure, analyze, improve, control) problem solving approach will be emphasized. Students will learn the basic tools of quality (such as cause-and-effect diagrams for brainstorming), quality processes (such as benchmarking), and quality management including quality planning, quality control, and quality improvement. The course will include the subject of statistical process control, an integral component of Six Sigma.

OPMT 422. Service Operations Management with E-Commerce (3)
This course concerns the management of operations in e-commerce and other kinds of services. E-commerce absorbs more course time than any other type of service, but we also examine other settings such as financial services, health care, information systems, and transportation. There are modules on the similarities and differences of operations in e-commerce versus other service industries, structures of service industries, design of services, profitably utilizing service capacity, enhancing the quality of services, and managing service projects. Topics in capacity manage-
ment include revenue management, queuing models, and simulation. A recurring theme is the integration of service operations with marketing, finance, and information systems. Prereq: OPMT 405.

**OPMT 450. Project Management (3)**

Project management is concerned with the management and control of a group of interrelated tasks required to be completed in an efficient and timely manner for the successful accomplishment of the objectives of the project. Since each project is usually unique in terms of task structure, risk characteristics and objectives, the management of projects is significantly different from the management of repetitive processes designed to produce a series of similar products or outputs. Large-scale projects are characterized by a significant commitment of organizational and economic resources coupled with a high degree of uncertainty. The objective of this course is to enhance the ability of participants to respond to the challenges of large-scale projects so that they can be more effective as project managers. We study in detail up-to-date concepts, models, and techniques useful for the evaluation, analysis, management, and control of projects. Prereq: QUMM 414.

**OPMT 475. Supply Chain Logistics (3)**

The focus of this course is on the effective management of a firm's downstream processes in the supply chain that deliver goods and services to customers. Concepts, methods, and strategies are presented that can lower supply chain costs while maintaining or improving customer service. In addition, ideas for using the supply chain for competitive advantage leading to revenue enhancement are discussed. Adding value for customers is the objective. Key topics include transportation planning, inventory management, network design, and customer service goal setting. Offered as MKMR 475 and OPMT 475.

**OPMT 476. Supply Management in the Supply Chain (3)**

The focus of this course is on the effective management of a firm's upstream supply chain processes that provide it with the services and physical goods needed for product and service creation and distribution. The primary objectives of the course are: 1) to understand the complexity of inter-firm and intra-firm coordination in implementing cutting-edge supply chain programs such as vendor managed inventories, third-party logistics, mass customization, quick response, and strategic alliances; 2) to develop the ability to design efficient supply systems and formulate integrated supply strategies so that all components are synchronized to fit a firm's competitive environment, market needs, and overall corporate strategies; and 3) to impart analytical skills necessary to develop effective solutions for a variety supply management problems. Offered as MKMR 476 and OPMT 476.

**OPMT 477. Enterprise Resource Planning in the Supply Chain (3)**

Enterprise resource planning is the dominant system by which companies translate the needs from their customers into the detailed plans that the company must perform to meet the customer needs, and the resulting support the company will need from its suppliers. Both quantitative and qualitative techniques for performing all the functions involved in this process provide the focus for this course. The quantitative analysis will be supported by microcomputer software available in the Weatherhead computer lab.

**OPMT 479. International Operations Management (3)**

The main objective of this case-based course is to help prospective operations managers to overcome national and cultural myopia, identify cultural and contextual differences in operations management practice, describe successful operations management approaches in other countries and examine reasons for their success as well as the viability of transferring them to significantly different operating environments, and finally address the impact of the global scope of operations on the usual operating decisions (production planning, quality control, etc.). Topics to be covered include organization of global operations, production strategies in entering foreign markets, development of a global manufacturing strategy, international facilities location, offshore manufacturing, global sourcing and logistics, global transfer of technology, risk management on global operations, cultural and national comparisons of operations management practices, and successful global service operations. Prereq: OPMT 405.

**OPMT 480. Operations Strategy and Technology (3)**

This course discusses the process of developing an operations strategy for competitive advantage. A number of strategic issues are studied from a manufacturing perspective, including: product development, introduction of new technologies, managing multiple plant operations, flexibility, and financial control systems. Prereq: OPMT 405.

**OPMT 490. Independent Study in Operations Management (1 - 15)**

This course is offered, with permission, to students undertaking reading in a field of special interest.

**OPMT 501. Special Problems and Topics (1 - 18)**

This course is offered, with permission, to students undertaking reading in a field of special interest.

**OPMT 504A. Research in Operations Management I (1.5)**

The material in this introduction to the research literature in operations management consists of several research papers on supply chains for goods and services. Although specific topics and papers vary from year to year, representative topics include manufacturing, logistics, design of service networks, and revenue management. Prereq: OPRE 412A, OPRE 419, OPRE 426, and OPRE 513A, or consent of instructor.

**OPMT 504B. Research in Operations Management II (1.5)**

Seminar continuation OPMT 504A's introduction to the research literature in supply chains for goods and services. Specific topics and papers vary from year to year, but representative topics include manufacturing, logistics, service networks, and revenue management. Prereq: OPMT 504A or consent of instructor.

**OPMT 601. Special Problems and Topics (1 - 18)**

This is a course of flexible design in which a student, with the agreement of an instructor in operations management, may pursue a special topic or problem. M.B.A. students should enroll in OPMT 501.

**OPMT 701. Dissertation Ph.D. (1 - 18)**

This course is open to Ph.D. candidates who are preparing dissertations in some field of operations management. Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

**OPERATIONS RESEARCH (OPRE)**

**OPRE 300. Undergraduate Projects in Operations Research (1 - 18)**

Individual operations research projects are carried out by qualified students.

**OPRE 301. The Science of Business Decision Making (3)**

The science of decision making, also called operations research (OR) or management science, is the discipline of applying advanced quantitative methods to make better decisions. By using mathematical models to analyze complex situations, decision science gives
managers the power to make more effective decisions and build more productive systems. Techniques covered include linear programming, networks, project management, inventory, queuing and simulation. Recommended preparation: one semester of statistics or consent of instructor. Prereq: STAT 207.

OPRE 345. Decision Theory (3)
This course provides an understanding of the principles, basic concepts, and methodology of engineering economics. It develops proficiency with these methods and with the process for making rational decisions regarding situations likely to be encountered in professional practice.

OPRE 348. Personal Investment Strategies (3)
This course is an introduction to the world of personal investing. In the framework of personal investment objectives and alternatives, topics included are: stocks, bonds, convertibles, warrants, options and mutual funds. Discussions of contemporary factors driving stock and bond prices such as international currency and interest rate implications are also discussed. Practical money management programs to meet different investment objectives and levels of wealth are explored. Prereq: ACCT 202.

OPRE 402. Stochastic Models with Applications (1.5)
This course surveys fundamental methods and models in operations research and operations management that incorporate random elements. Topics discussed will include basic results from the theory of stochastic processes, especially Markov chains; an introduction to stochastic dynamic programming; and models in the control of queues and inventories. Prereq: OPRE 433A and OPRE 433B.

OPRE 411A. Linear Programming (1.5)
The objective of this course is to enable the student to formulate deterministic (linear, nonlinear, integer and network) models. The simplex algorithm for solving linear programming problems is presented geometrically, algebraically and economically. The role of duality theory is also discussed. Case studies are used to teach the student how to formulate, use computer packages, and prepare managerial reports for solving deterministic (linear, nonlinear, integer, network, and goal programming) problems that arise in business operations as well as project management problems (using PERT/CPM techniques). Conceptual and mathematical ideas of the various methods for solving such problems are presented. Prereq: OPRE 411A or QUMM 414. Coreq: OPRE 411A or QUMM 414.

OPRE 413. Business Applications of Decision Models (3)
The objective of this course is to expose the students to situations from various business disciplines (e.g., finance, marketing, information systems, supply chain management, etc.) where quantitative models effectively address the decision problems. This course will also integrate these business disciplines. The course will also prepare students for action learning projects where quantitative tools may be appropriate. The course will apply tools and techniques learned in QUMM 414. Other quantitative tools will be introduced "just-in-time" in context to particular application area. Prereq: QUMM 414. Coreq: OPMT 405.

OPRE 419. Game and Decision Theory (1.5)
Most of this course is an introduction to game theory; the remainder is a brief introduction to Bayesian analysis of decision problems including decision trees and conjugate pairs of distributions. The game theory portion consists of an axiomatic approach to utility theory, noncooperative solution concepts emphasizing equilibrium points, and cooperative solution concepts. Examples are drawn from economics, marketing, and operations research. Coreq: OPRE 411A.

OPRE 424. Scheduling Theory (3)
Combinatorial and implicit search techniques are developed and applied to scheduling problems, including sequencing on a single and on parallel processors, scheduling in flow shops, open shops and general job shops, and resource-constrained project scheduling, to satisfy various objectives. Topics in the complexity of algorithms and worst-case analysis of heuristics are discussed. Stochastic extensions, manpower scheduling or other special topics may be considered. Prereq: OPRE 425A.

OPRE 427. Convexity and Optimization (3)
Introduction to the theory of convex sets and functions and to the extremes in problems in areas of mathematics where convexity plays a role. Among the topics discussed are basic properties of convex sets (extreme points, facial structure of polytopes), separation theorems, duality and polars, properties of convex functions, minima and maxima of convex functions over convex set, various optimization problems. Offered as MATH 327, MATH 427, and OPRE 427. Prereq: MATH 223 or consent of instructor.

OPRE 432A. Simulation Models with Applications (1.5)
This course covers the modeling and analysis of business systems using computer simulation. The focus of the course is the introduction of simulation as a modeling tool with emphasis on understanding the structure of a simulation model and how to build such models with the help of popular simulation software(s). Some fundamental statistical concepts behind simulation modeling will also be discussed. Prereq: OPRE 433A and OPRE 433B or consent of instructor.

OPRE 432B. Simulation Design (1.5)
This course covers the statistical design and analysis of simulation models. The topics include random number generation, input data analysis, statistical analysis of simulation outputs, variance reduction techniques, and design of simulation experiments. Prereq: OPRE 432A. Coreq: OPRE 434 or consent of instructor.

OPRE 433A. Probability and Statistics for Management Science I (1.5)
This course introduces the basic tools of probability. Topics include elementary probability theory, conditional probability, Bayes Theorem, commonly encountered distributions including binomial, Poisson, uniform, exponential, and normal (univariate and bivariate), organizing and summarizing data—mean, variance, moments, and other descriptive statistics. Examples are given of business applications in operations, finance, and marketing. Recommended preparation: A semester of calculus or consent of instructor.

OPRE 433B. Probability and Statistics for Management Science II (1.5)
This course covers the foundations of statistical analysis, with an emphasis on applications of confidence intervals and hypothesis testing for a wide array of experimental designs. Topics include: sampling, comparison of means, medians and proportions through interval estimation and hypothesis testing, and an introduction of regression analysis. Prereq: OPRE 433A or consent.

OPRE 434. Regression and Forecasting (1.5)
The first part of this course covers the funda-
mentals of multiple linear-regression analysis and logistic regression models emphasizing understanding and forecasting relationships between variables in a variety of data settings. The second part includes time series analysis and forecasting. Using case studies and commonly used state-of-the-art statistical software (e.g., SPSS, SAS, etc.) students learn to summarize relationships and measure how well these relationships fit data, and how to make meaningful statistical inferences and forecasts. Prereq: OPRE 425B or QUMM 414.

OPRE 435A. Computer Programming (1.5)
The objective of this course is to provide the student with the ability to write object-orient ed computer code in C++ for solving problems that do not involve complex data structures. Topics include the use of variables and pointers, built-in functions, input and output, selection statements, loops, functions, and classes.

OPRE 435B. Integrated Problem Solving in OR and OM (1.5)
This project-oriented course uses a variety of software to involve the student in the complete problem-solving process in OR and OM. This process includes problem definition and formulation, data collection, and storage in a database, connecting the database to the solution algorithm, designing and implementing an appropriate user interface, and presenting the final solution. Prereq or Coreq: OPRE 411B.

OPRE 435C. Data Structures (1.5)
The objective of this course is to provide the student with the data structures (arrays, files, linked lists, trees, and so on) and the numerical methods (differentiation, integration, and solving linear equations) needed for implementing algorithms that solve operations research and operations management problems. These topics are illustrated with C++ and object-oriented programming. Emphasis is given to ensuring that the programs are robust and usable by nontechnical people. Prereq: OPRE 435A.

OPRE 448. Personal and Institutional Money Management (3)
This course is an introduction to contemporary portfolio management. In addition to introductory material on securities, options and security markets, topics include contemporary equity and debt management models, hedging strategies, program trading, portfolio insurance, arbitrage programs, mergers and acquisitions, international investing and intermarket influences, and other contemporary factors driving stock and bond prices. Prereq: BAFI 402.

OPRE 454. Analysis of Algorithms (3)
This course presents and analyzes a number of efficient algorithms. Problems are selected from such problem domains as sorting, searching, set manipulation, graph algorithms, matrix operations, polynomial manipulation, and fast Fourier transforms. Through specific examples and general techniques, the course covers the design of efficient algorithms as well as the analysis of the efficiency of particular algorithms. Certain important problems for which no efficient algorithms are known (NP-complete problems) are discussed in order to illustrate the intrinsic difficulty which can sometimes preclude efficient algorithmic solutions. Recommended preparation for EECS 454: MATH 304 and (EECS 340 or EECS 405). Offered as EECS 454 and OPRE 454. Prereq: OPRE 435A and OPRE 435C.

OPRE 490. Independent Study in Operations Research (1 - 15)
This course is offered, with permission, to students undertaking reading in a field of special interest.

OPRE 501. Special Problems and Topics (1 - 36)
This course is offered, with permission, to students undertaking reading in a field of special interest.

OPRE 504A. Research in Mathematical Finance I (1.5)
The course introduces the basic principles of discrete time financial markets. The focal points are the method of no arbitrage asset pricing, its relationship with equilibrium investment strategies of individuals in a market of financial securities, and its applications in valuation of contingent claims. Specific topics include basic utility theory, single and multiple period investment models, complete and incomplete markets, risk neutral probability measures, pricing of European and American stock options, and introduction to bonds and interest rate derivative models. Prereq: OPRE 411A, OPRE 433A and OPRE 433B.

OPRE 504B. Research in Mathematical Finance II (1.5)
The course introduces the mathematical models of financial analysis in continuous time. Topics include diffusion processes, stochastic differential equations and Ito’s lemma martingales, equivalent martingale measures for risk neutral valuation, Girsanov’s theorem, the Black-Scholes model of European option pricing, American options in continuous time, and introduction to the Heath-Jarrow-Morton model of interest rate claim valuation. Prereq: OPRE 504A.

OPRE 505. Theory of Linear Programming (1.5)
This course presents the theory of linear programming, including the formal development and proofs of (a) the geometry of linear programming problems (convex sets, extreme points and extreme rays), (b) the steps of the simplex algorithm and their relationship to the geometry, and (c) duality theory and its uses in sensitivity and post-optimality analysis. Prereq: OPRE 411A and OPRE 510.

OPRE 506. Theory of Nonlinear Programming (1.5)
This course presents the algorithms and theory for solving nonlinear programming problems. Problems that do not have constraints include: (a) solving nonlinear systems of equations with Newton’s method, (b) finding fixed points of functions using the Brouwer and contractive fixed-point theorems, and (c) optimizing nonlinear functions of a finite number of variables using gradient and conjugate-gradient algorithms with line searches. Problems that have constraints include: (a) solving the linear complementarity problems, (b) solving optimization problems with methods of feasible directions that use the Karush-Kuhn-Tucker conditions and also with methods that use penalty functions. Throughout, the role of convexity in establishing convergence of algorithms is explained. Prereq: OPRE 505.

OPRE 510. Math Foundations for Advanced Studies (1.5)
This course enhances the ability to use mathematics in advanced studies. In addition to learning such elementary ideas as the difference between closed-form and numerical-method solutions, a systematic approach is used to learn how to read, understand, think about, and do proofs. Specifically, it is shown how all proofs, regardless of subject area, can be explained as a sequence of individual proof techniques. The following mathematical skills are also taught: translating visual images to symbolic form using quantifiers; classifying mathematical objects into groups having similar properties; creating and working with mathematical definitions; unification; generalization.

OPRE 513. Stochastic Optimization (3)
This course concerns optimization of stochastic models, it emphasizes models of sequential decisions, and it includes some topics in stochastic processes. It includes the formulation of Markov decision processes and their optimization with various algorithms (often
called dynamic programming). Other topics include stochastic order relations and other aspects of lattice programming, adaptive control, and stochastic programming. General results are employed to elicit the structure of optimal policies in areas such as inventory, finance, maintenance, and queueing. Prereq: OPRE 411A. Coreq: OPRE 526.

OPRE 515A. Combinatorial Optimization (1.5)
This course provides the ability to recognize, formulate, and solve (or determine how difficult it is to solve) combinatorial optimization problems. Mathematical programming and network/graph-theory problems are used to illustrate the art of problem formulation. The individual components of combinatorial optimization are identified and presented in a unified framework. The two standard search strategies for finding an optimal solution—namely, the greedy approach and the finite-improvement approach—are illustrated with numerous examples. Conditions are presented under which these search strategies provide an optimal solution. Prereq or Coreq: OPRE 510.

OPRE 515B. Graph Theory (1.5)
This course provides the ability to use graph theory as a problem-solving tool. The student is taught to recognize, formulate, and solve graph theory problems. Numerous examples from Operations Research, Computer Science, and related areas are used to illustrate the art of problem formulation. Appropriate theory and algorithms are then developed for solving these problems using the two basic search strategies of the greedy algorithm and the finite-improvement algorithms. Prereq: OPRE 515A.

OPRE 516. Discrete Optimization (3)
This course is an introduction to optimization problems involving a finite number of alternatives. Applications include problems in network flows (distribution systems, project scheduling, production planning, routing etc.) and integer programming (scheduling, location, sequencing, capital budgeting, etc.). Numerous algorithms and heuristics are presented for solving these problems (shortest path, maximum flow, cutting plane, enumerative and partitioning algorithms). Computational complexity of these algorithms is also emphasized. Prereq: OPRE 411A and OPRE 509.

OPRE 526. Stochastic Processes (3)
This course analyzes probabilistic models of phenomena which evolve over time. Modules include birth-and-death processes (including the Poisson process), renewal theory, regenerative processes, Markov chains (discrete- and continuous-time), semi-Markov processes, system properties of queueing models, martingales, and Brownian motion. The course frequently explores the queueing theory consequences of general stochastic processes. Prereq: OPRE 433A and OPRE 433B.

OPRE 601. Advanced Readings in Operations Research (1 - 18)
Students report on recent literature and review selected topics in the various areas of operations research. Students also perform detailed studies of special topics in operations research under the guidance of a faculty member. M.B.A. students should enroll in OPRE 501.

OPRE 602. Predissertation Research (3)
The objective of this course is to introduce the student to the process of doing research. Students work with a faculty member on a research topic of mutual interest. The student presents the results in a written report and an oral presentation open to all faculty and students. The work is evaluated by a committee of three faculty members.

OPRE 701. Dissertation Ph.D. (1 - 18)
This course is limited to candidates for the Ph.D. degree who are preparing dissertations under the guidance of three faculty members. Students work with a faculty member on a research topic of mutual interest. The student presents the results in a written report and an oral presentation open to all faculty and students. The work is evaluated by a committee of three faculty members.

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Harlow Cohen, PhD
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(University of Pittsburgh)
Faculty of Executive Education, Professor for the Practice of Organizational Behavior

Eric Neilsen, PhD
(Harvard University)
Professor Emeritus of Organizational Behavior

Suresh Srivastva, PhD
(University of Michigan)
Professor Emeritus of Organizational Behavior

SECONDARY APPOINTMENTS
David Aron, MD
(Columbia University)
Professor of Medicine, School of Medicine and Sr. Staff Physician, Cleveland VA Medical Center; Professor of Organizational Behavior

Duncan Neuhauser, PhD
(University of Michigan)
Professor of Epidemiology and Biostatistics, School of Medicine; Professor of Organizational Behavior

James Stoller, MD, MSODA
(Case Western Reserve University)
Director Leadership Development, Cleveland Clinic Foundation

Peter Whitehouse, MD, PhD
(Johns Hopkins University)
Professor of Bioethics, Neurology, Neuroscience, and Psychiatry, School of Medicine; Professor of Organizational Behavior

ORGANIZATIONAL BEHAVIOR (ORBH)
ORBH 303. Leadership and Personal Development (3)
This is an experience-based course designed for increased integration of cognitive and emotional processes, greater awareness of one’s behavior and impact on others, and greater opportunity for behavioral change in interpersonal relations. Several Saturday classes.

ORBH 304. Advanced Workshops in Personal Development (3)
This is an experience-study course offered for groups of interested and qualified individuals. This course concentrates on an affective theme: conflict and power, intimacy, aggression, etc. There is an effort to combine experience-based learning with conceptual understanding. Prereq: ORBH 303.

ORBH 370. Women in Organizations (3)
The purpose of this course is to explore the unique challenges of life for women in their twenties as they increase understanding of the issues surrounding women, ambition, and success in a variety of organizations and professions. At this stage of life there are many choices women can make regarding careers and relationships. This course will broaden understanding of the context of work in women’s lives and help women and men understand the leadership and managerial issues that will surround them in organizations. Offering more complex understandings of issues women face in the workplace related to race and gender, the course will help increase self-knowledge about personal identity and direction, values, and abilities including the enhancement of leadership capabilities. It will also facilitate career development, improving the ability of individual women to be choiceful about the quality of integration of both a personal and professional life.

ORBH 390. Special Topics (1 - 18)
This course is offered for candidates undertaking reading in a field of special interest.

ORBH 403. Developing Interpersonal Skills for Managers (3)
This course is intended to sharpen students’ skills in the art of relating successfully to other individuals and groups. The course uses an intensive group experience to make students more aware of how their actions affect others, more capable of giving and receiving interpersonal feedback, and more cognizant of processes through which groups work. Several Saturday classes.

ORBH 412. Organizational Analysis (3)
This course studies organizational analysis through appreciative inquiry. It explores multiple frameworks for understanding the complexity of organizational life. Students form teams and conduct appreciative studies across industries. This course also addresses questions of organizational change (how to move from theory/ideal to practice). Learning is experiential in nature.

ORBH 413. Foundations of Positive Organization Development and Change (4)
This course explores and develops the art of reading and understanding social systems in ways that help us imagine, design and develop organization excellence. First it seeks to show how many of our conventional ideas about organizations are based on discourse and metaphors that lead us to see and understand organizations in partial and often limiting ways. Growing research from the domains of Positive Psychology and Positive Organization Scholarship and the theory and practice of Appreciative Inquiry will be explored to show how we can create new and more positive, strength-based ways of designing and developing social systems. Includes presentations, guest lectures and panel discussions on current topics of interest for the Master in Positive Organization Development and Change (MPOD) candidates. Led by a faculty member of the Department of Organization Behavior, these dialogues and seminars will be presented in several of the six main residencies of the MPOD program. Reflective essays and integrative papers will enable participants to explore their practice of OD, leadership capacity, application of learnings from the program and deeply held values related to current issues and opportunities in the domain of human systems change and development. Prereq: Open to MPOD candidates only.

ORBH 414A. Organization Design for a Knowledge World (1)
The objective of this course is to familiarize participants with the theory and technique of organization design and corporate change with particular emphasis on helping leaders understand and implement the latest forms of organizing in a customer-focused, electronically mediated and knowledge-driven world. Frameworks presented will be used to explore the impact of the information revolution on organization design and change, and the evolution of traditional vertically integrated and multi-divisional enterprises toward spider web structures, trans-organizational networks and communities of practice. (Part-one of a two-section course.) Prereq: Open to MPOD candidates only.

ORBH 414B. Organization Design for a Knowl-
effective leaders? Are they different from effective managers? How do they think and act? What makes us want to follow them? How are leaders developed? What and how can people (you) help/coach others develop their competencies to become more effective leaders? (Part two of a three-section course.) Prereq: ORBH 416A.

ORBH 416C. Coaching Leadership and Executive Assessment and Development (1)
Leadership with emotional intelligence will be examined by studying a number of topics and applying them to two major case studies: 1) a CEO; and 2) yourself. In this context, coaching the development of leadership will be a major topic throughout the course. This course will explore questions such as: Who are effective leaders? Are they different from effective managers? How do they think and act? What makes us want to follow them? How are leaders developed? What and how can people (you) help/coach others develop their competencies to become more effective leaders? (Part three of a three-section course.) Prereq: ORBH 416B.

ORBH 417. Managing Organizational Change (3)
This course focuses on change as an inescapable fact for organizations and societies of the present and future. Given the existence of such change, how may individuals charged with managing or facilitating an organization’s response to change deal with their task, and what conceptual or technical tools will help them cope with the challenges of the unpredictable? The course examines social and organizational change to provide a base for considering the future and the demands it is likely to pose. Strategies and tactics used in organizational and social developments in the past are critically examined for their relevance to the future.

ORBH 418. Systems Thinking, Action Research and Sustainability (2)
Sustainability is introduced as a movement in business to create value by responding to social and environmental problems in ways that meet current needs without reducing future capacity. Students are introduced to systems thinking skills, such as whole system mapping, causal loop modeling, emergent hypotheses, stakeholder analysis and engaging productive dialogues. Emphasis is placed on use of these skills as methods for working with clients to create actionable knowledge, thereby integrating reflection with action to leave the client system stronger. Prereq: Open to MPOD candidates only.

ORBH 419A. Building the Sustainable Enterprise (2)
In this course, participants will build on skill developed in ORBH 418 by working in the field with a client system to build a sustainable enterprise. Emphasis is on clarifying what sustainability means for a successful enterprise, the advantages to stakeholders of working as action researchers and the use of systems tools to foster generative dialogue. Professional presentations and papers are developed to advance a collaborative learning network among participants and clients. (Part one of a two-section course.) Prereq: Open to MPOD candidates only.

ORBH 419B. Building the Sustainable Enterprise (2)
In this course, participants will build on skill developed in ORBH 418 by working in the field with a client system to build a sustainable enterprise. Emphasis is on clarifying what sustainability means for a successful enterprise, the advantages to stakeholders of working as action researchers and the use of system tools to foster generative dialogue. Professional presentations and papers are developed to advance a collaborative learning network among participants and clients. (Part two of a two-section course.) Prereq: ORBH 419A.

ORBH 425. Developing Emotional Intelligence (3)
Although helping or stimulating individuals to change, learn, and develop is considered a responsibility of the human resource function in an organization, every professor, manager, consultant, and helping professional spends most of their time trying to provoke, evoke, or catalyze a change in others. This course will examine the processes by which individuals change and the methods often used to facilitate this change. How and what a person chooses to change (i.e., select their change goals) will be explored, as well as factors affecting the extent to which he/she changes. The efficacy and ethics of various approaches to individual change as part of human resource and organization development efforts will be discussed. Prereq: MGMT 403.

ORBH 430A. MBA Institute In Sustainable Value and Social Entrepreneurship I (0)
The MBA Institute in Sustainability and Social Entrepreneurship involves 6 credits divided up into two ‘courses’. The first course --- phase one --- creates a foundational platform featuring key models and managerial tools for the building sustainable value and “turning the social and global issues of our day into business opportunities.” The second course in an applied sustainability field experience where teams work with companies and communities or real-life sustainability and social entrepreneurship opportunities. The foundations course is a prerequisite to the applied field project phase.

ORBH 430B. MBA Practicum in Sustainable Value and Social Entrepreneurship II (6)
The MBA Institute in Sustainability and Social Entrepreneurship involves 6 credits divided up into two “courses”. The first course---phase one--- creates a foundational platform featuring key models and managerial tools for the building sustainable value and “turning the social and global issues of our day into business opportunities.” The second course is an applied sustainability field experience where teams work with companies and communities or real-life sustainability and social entrepreneurship opportunities. The foundations course is a prerequisite to the applied field project phase. Prereq: ORBH 488.

ORBH 431. Experiential Learning for Individuals, Teams, and Organizations (3)
This course focuses on the theory of experiential learning and its application at the individual, team, and organizational levels of analyses. This course offers the chance for students to gain insight into their individual learning & adaptive styles, and how such styles impact the way they interact and have consequence for team. The course also explores how teams and organizations learn, and the effect that cultural determinants have on learning and adaptability. In addition, the course examines how learning theory can be applied to focused institutional development projects and educational processes. The course uses presentations, lectures, research findings, interactive activities, and class discussion. The current topics of interest are for the Masters in Positive Organization and Development (MPOD) candidates. It is led by a faculty member of the Department of Organization Behavior. Reflective essays and integrative papers will enable participants to explore their learning styles and that of their organizations and teams to strengthen the practice of OD and human systems change and development. Prereq: MPOD students only.

ORBH 432A. Relational Skills Laboratory (2)
The objective of this course is to hone the participant’s abilities to use themselves as instruments of change and development in relationships with colleagues and clients. Participants will explore theories of adult development along with interpersonal and group dynamics, write and analyze autobiographies, diagnose
interpersonal needs and styles, and practice techniques for developing generative relationships with clients during an OD intervention, or as process consultants in group/team settings. (Part one of a two-section course.) Prereq: Open to MPOD candidates only.

ORBH 432B. Relational Skills Laboratory (2)
The objective of this course is to hone the participant’s abilities to use themselves as instruments of change and development in relationships with colleagues and clients. Participants will explore theories of adult development along with interpersonal and group dynamics, write and analyze autobiographies, diagnose interpersonal needs and styles, and practice techniques for developing generative relationships with clients during an OD intervention, or as process consultants in group/team settings. (Part two of a two-section course.) Prereq: ORBH 432A.

ORBH 435. Practicum in Appreciative Inquiry and Positive OD (4)
This course develops participants’ consultative skills. Competence in role entry and development, data collection, intervention and evaluation is gained through class exercises and field projects. The focus is on developing a problem-centered approach to intervening in organizations that minimizes reliance on programmed techniques and maximize collaborative innovation and learning between client and consultant. Prereq: Open to MPOD candidates only.

ORBH 438. Design of Organizational Development and Analysis Projects (4)
This course has two objectives: (1) to learn to design and deliver training workshops; and (2) to plan and execute organizational change and/or analysis projects that are consistent with their current skills, career plans and developmental needs, and with the opportunities, strategic needs and organizational problems of their client organizations. This course is limited to candidates for the MSODA program.

ORBH 439A. Individual Field Project (2)
The objective of this course is to plan and execute a significant organization development, change and/or analysis project with an ongoing client or employer. Emphasis is placed on the craft of developing projects that are consistent with one’s current skills, career plans and developmental needs, combined with the needs, opportunities, readiness, and resources of the client organization. This course is limited to candidates for the MPOD program. (Part one of a two section course.) Prereq: Open to MPOD candidates only.

ORBH 439B. Individual Field Project (2)
The objective of this course is to plan and execute a significant organization development, change and/or analysis project with an ongoing client or employer. Emphasis is placed on the craft of developing projects that are consistent with one’s current skills, career plans and developmental needs, combined with the needs, opportunities, readiness, and resources of the client organization. This course is limited to candidates for the MPOD program. (Part two of a two-section course.) Prereq: ORBH 439A.

ORBH 450. Executive Leadership (3)
This course explores answers to questions such as: Who are leaders? Are they different than managers, heroes and heroines? How do the effective ones think and act? What situations create leaders, foster their emergence or provide opportunities? What makes us want to follow them? What are the personal pits of being a leader (i.e., sex, drugs, alcohol, insomnia, ulcers, etc.)? How are leaders developed? Case studies, self-study and at-work projects will be the primary methods used in the course.

ORBH 460. Women in Organizations (3)
This course addresses important leadership and management issues concerning women in organizations. The course provides complex understandings of issues pertinent to professional women and work such as sex role typing, sex-based discrimination, equal pay, sexual harassment, work-family balance, women’s leadership and women’s career issues and development. The course helps students increase self-knowledge about their own values and practices as well as enhance their capabilities as leaders and managers. We will examine the opportunities, challenges, trade-offs, and organizational dynamics experienced by women in work settings, as well as the interpersonal, organizational, and societal structures and processes impacting women in organizations. Through a variety of course methods, students gain greater awareness of the gendered nature of work and organizations and learn effective strategies for women’s career progress and effective participation in organizations.

ORBH 470. Leading Change from a Complexity Perspective (3)
In this course, we will continuously attempt to answer two questions: (1) What is the process of sustained, desirable change? and (2) What is the role of a leader? Concepts from complexity theory will be used, including understanding the multilevel nature of SDC at the individual, dyad, team, organization, community, country, and global levels. Intentional Change Theory (ICT) will be used as the organizing concept for the changes studied. Prereq: MGMT 403.

ORBH 478. Organization and the Environment (3)
This course focuses on ways of looking at the interface between organizations and their environments that have important implications for organizational development activities and the people who design and implement them. The first part of the course reviews several conceptual approaches to assessing this interface. The second part involves the application of these approaches to a series of organizational/environmental problems that members of the class perceive their organizations as currently experiencing. Limited to MSODA candidates.

ORBH 479A. Foundations of Strategic Thinking (1)
This course will define what constitutes strategic change and what does not. Students will be introduced to a variety of strategic interventions and models from which to interpret, understand and achieve positive organizational change. Opportunity will be provided to apply selected models to the student’s organization and other cases in order to gain insight and appreciation for financial and non-financial factors that influence fundamental organizational growth and development. (Part one of a two-section course.) Prereq: Open to MPOD candidates only.

ORBH 479B. Foundations of Strategic Thinking (2)
This course will define what constitutes strategic change and what does not. Students will be introduced to a variety of strategic interventions and models from which to interpret, understand and achieve positive organizational change. Opportunity will be provided to apply selected models to the student’s organization and other cases in order to gain insight and appreciation for financial and non-financial factors that influence fundamental organizational growth and development. (Part two of a two-section course.) Prereq: ORBH 479A.

ORBH 480. The Dynamics of Effective Consulting Strategies (3)
This course will: 1) highlight the major current trends and changes that affect the nature of managerial work; 2) describe how OD practitioners and consultants need to factor such trends into their consulting strategies; 3) differentiate between types of interventions, the circumstances in which they apply and their
unique strengths; 4) provide background theories that explain the challenges inherent in mobilizing positive change; 5) describe ways to bridge the gap between knowing and doing in order to build organization resilience; and 6) introduce a variety of consulting techniques and skills that the students can add to their repertoire. Prereq: Open to MPOD candidates only.

ORBH 488. Leadership and the Global Agenda (3)
This course will attempt to develop leadership values and competencies in Organization (OD) within the global arena. Objectives for the course include: (1) developing an executive view of the state of the world; (2) building skills in appreciative inquiry for researching best practices of organizations to maintain sustainable economic development; (3) learning how to build organizational capacities for responding to the global agenda for change; and (4) developing a global consciousness to a larger set of global values to provide a vision for a better world and the potentials of our organizations to assist in realizing such a vision.

ORBH 490. Special Topics (1 - 18)
This is a seminar course led by a member of the faculty of the Department of Organizational Behavior. Specific topics are announced at the start of each semester. This course is intended also for independent study.

ORBH 491. Managing Diversity and Inclusion (3)
This course addresses workforce diversity issues from individual, group, and organizational perspectives. The focus is on innovative ways of utilizing today’s culturally expanding workforce. Emphasis is on the “what and how” for managers in developing a corporate culture that embraces diversity, helping them in learning to work with, supervise and tap the talent of diverse employees within their organizations. Included are methods for modifying systems to attract, retain, develop, and capitalize on benefits of the new workforce demographics. A retreat experience is part of this course and is required of all participants.

ORBH 497. Development of Executive Leadership Skills (3)
The objective of this course is the development of skills in effective human interaction, with emphasis on the pragmatics of working with people in organizations. The focus is on learning by doing through the use of applied behavioral science methods of simulation, role plays and structured exercise. Leadership topics covered include decision management, problem management, motivation, planned change, teamwork, and the language of leaders. Designed for MSODA students. M.B.A. students admitted upon consent of instructor.

ORBH 498. Global Citizenship and Multi-Cultural OD: International Study Tour (4)
This course will broaden perspectives and knowledge of how OD principles and technologies are generated and applied in contexts and cultures outside of North America. Selected literature representing global perspectives on the practice of OD and field experiences will provide support and background for personal experience and reflection on cross-cultural issues in organizing. The primary learning context will be an intense, 10-day study tour to some country outside of North America to provide the participants with opportunities for: 1) comparative studies of OD practices in different cultural settings; 2) in-depth experiences with OD practitioners and students in a different national, regional and cultural context; 3) co-inquiry with non-North American students also involved in developing OD knowledge and skills; and 4) on-site organization visits outside of North America to observe and learn about on-going dynamic change efforts. Prereq: Open to MPOD candidates only.

ORBH 501. Special Problems and Topics (1 - 18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

ORBH 510. Organizational Behavior Department Seminar (3)
The OB Department Seminar is organized and managed by the first year PhD students. Seminar sessions will alternate between first year meetings and gatherings of the ORBH community of students, faculty and friends. Community sessions will be organized around research presentations of PhD Qualifying Papers, Dissertation Proposals and Dissertation Defense. Seminar Objectives: 1. To create and sustain an appreciative, intellectually nourishing learning space for the ORBH community that will support, inspire and empower us to explore the frontiers of scholarship in our field; 2. To provide a forum for sharing the ongoing research and scholarship of the department; 3. To develop productive collaborative research relationships; 4. To increase our collective knowledge of the current state of the art in OB and to develop productive collaborative research relationships; 4. To increase our collective knowledge of the current state of the art in OB and related fields.

ORBH 511. Micro Organizational Behavior (1)
Examines the field of micro-organizational behavior. Specifically, the study of individuals and groups within an organizational context and the study of internal processes and practices as they affect individuals and groups. Major topics include individual characteristics such as beliefs, values and personality. Individual processes such as motivation, emotions, commitment, group and team processes, such as decision-making; organizational processes and practices such as goal setting, performance appraisal and rewards, and the influence of all of these on such individual, group and organizational outcomes as performance, job satisfaction, citizenship behaviors, turnover, justice, absenteeism and employee engagement.

ORBH 513. Appreciative Inquiry and Strength-Based Change (1)
This course explores and develops the art of understanding social systems in ways that help us imagine, design and develop organizational excellence. It seeks to show how many of our conventional ideas about organizations are based on discourse and metaphors that lead us to see and understand organizations in partial and often limiting ways. Growing research from the domains of Positive Psychology and Positive Organization Scholarship and the theory and practice of Appreciative Inquiry will be explored to show how we can create new and more positive, strength-based ways of designing and developing social systems.

ORBH 520. Group and Interpersonal Analysis (1)
This course is a review of major concepts and research in group dynamics and interpersonal relations. Topics concern face-to-face social interaction such as communication patterns, power, hierarchy, leadership, norms, goals, productivity, social theories of personality, and personal change through group methods. The course combines cognitive emphasis and personal experience-based learning.

ORBH 525. Developing Emotional Intelligence (1)
This course will examine the process by which individuals change and the methods often used to facilitate this change. How and what a person chooses to change (i.e., select their change goals) will be explored, as well as factors affecting the extent to which he or she changes. The efficacy and ethics of various approaches to individual change as part of hu-
man resources and organization development efforts will be discussed.

**ORBH 530. Social Analysis (1)**

This course is an introduction to major themes and concepts in sociology that influence the field and to sociological analysis as it relates to the careers of behavioral science practitioners. Students are exposed to major theoretical orientations as well as to summaries of current thinking in several major topic areas in sociology. The studies of sociology, sociologists and the self are combined to help students develop a sociological perspective of their own potential roles in the applied behavioral sciences.

**ORBH 540. Social Exchange, Social Networks, and Social Capital in Organizations (1)**

In this course we will examine the nature of social exchange relationships in organizations. We will explore how individual perceptions regarding the quality of the relationship they have with their immediate supervisor, their work group, and the organization as an entity can impact their workplace attitudes and behaviors. Additionally, we will learn how the examination of networks of relationships can enhance our understanding of how individuals experience organizational life. The course will also provide a brief introduction to the theory, methods and procedures of social network analysis with an emphasis on applications to individual and organizational social capital.

**ORBH 541. Organizational Systems (1)**

This course covers the use of general systems theory as a conceptual base for examining organizations from the macro-perspective. The course examines organizational structure and technology, organizations and interorganizational networks in interaction with their societal environments, and large-scale problems of organizational and social power, conflict and change. It is designed to present a large-scale perspective on organization theory and behavior that is complementary to the micro-perspective of organizational behavior.

**ORBH 560. Research Methods I (3)**

This course concerns itself with issues associated with the conduct of social research. The primary focus is on learning the "craft" of research and its associated technologies. Among the topics that are addressed are: scientific method; research terminology and definitions; search design; laboratory experiments; simulations; field experiments; field studies; measurement, reliability and validity; and sampling. This course is intended to help students acquire the skills necessary in undertaking dissertation-related research.

**ORBH 561. Research Methods II: Theory Building (3)**

This course is designed as a methodological practicum in theory building through qualitative methods. The process of good theory construction is portrayed as the discovery of theory from data, resulting in the construction of knowledge of consequence. The course asserts, in Lewinian fashion, that "there is nothing so practical as good theory." It then focuses on the methods, personal disciplines, and perspectives needed to bring this dictum alive. Individual research proposals are developed throughout the semester.

**ORBH 565. Research in Gender and Diversity in Organizations (1)**

Examination of full range of feminist research methods exploring relationships between feminism and methodology involving a plurality of perspectives for conducting research and creating knowledge with an emphasis on collecting and interpreting qualitative materials. Particular attention is paid to understanding gender and diversity-related phenomenon that occur in the workplace. Classic feminist research from a variety of historical, societal, economic, interpersonal, and organizational paradigms are incorporated. Coreq: ORBH doctoral students only.

**ORBH 570. Learning and Development (1)**

This course provides an exploration of the learning and development paradigm underlying the human potential development approach to human resource development. The origins of this approach in the naturalist epistemologies John Dewey’s pragmatism, Kurt Lewin’s gestalt psychology, the work of James, Follett, Emerson, Piaget, Maslow, Rogers, and others and current research in adult development, biology and brain/mind research, artificial intelligence, epistemology, moral philosophy and adult learning will be considered. The course will focus on applications of these ideas to current issues in human resource development such as adult learning in higher education, advanced professional development, and large system learning and development. Coreq: ORBH doctoral students only.

**ORBH 572. Thematic Analysis (1)**

This course will help students develop the ability to sense themes, or patterns, the ability to apply coding systems in a reliable manner, the ability to develop a coding system, and the ability to design research studies for developing or using codes. Participants will develop and practice these abilities on four types of data which are: conscious and unconscious thought; an individual’s behavior; interaction among people; and historical documents such as speeches, myths, ballads, etc. Assignments will involve reading, practice coding material provided, developing preliminary codes from material selected, and a research project in which development and/or use of a code is required. Appropriate for doctoral students in behavioral or social sciences (Mini-Course, Occasional Offering). Prereq: Doctorate students only.

**ORBH 575. Theory and Research in Small Groups (3)**

The course is designed to provide doctoral students with broad exposure to the theoretical foundations of research in the area of groups and teams in organizations, and to current and emerging trends in the research within this area. The ultimate objective is to enable students to conduct independent research on topics relevant to groups and teams within organizations. The primary focus will be on task-oriented groups and teams, and in the organizational context. It will draw from basic research in social psychology and sociology in addition to organizational behavior.

**ORBH 601. Special Problems and Topics (1 - 18)**

This course is offered, with permission, to candidates undertaking reading in a field of special interest.

**ORBH 660. Methods of Applied Behavioral Science (3)**

This course includes laboratory methods of learning, techniques of design and operation in human relations training, and trainer behavior in group settings. The course is aimed at conceptualizing learning and influence processes in training laboratory settings as well as providing opportunities for the practice of design and operating skills.

**ORBH 701. Dissertation Ph.D. (1 - 18)**

Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

**OTHER COURSE OFFERINGS**

**MANAGEMENT COURSES (MGMT)**

**MGMT 001. Supervised Professional Practicum - Semester 1 (0)**

A professional practicum is a workplace experience, the primary goal of which is the intellectual, personal and professional growth of the student. It occurs under the sponsorship or supervision of a mentor in the workplace.
who is committed to seeing that it is an educational as well as a work venture. It requires skills appropriate to the student’s year in college and provides students with new skills, insights and experiences that are transferable back to the academic setting and/or to a future position in the workplace. (Only available to declared Weatherhead Accounting or Management majors.) Prereq: Junior standing.

MGMT 250. Managing Organizations and People I (3)
The principal goals of this course are to help students understand: 1) The context in which they, as managers, will function; the options they have for careers in management based on their own aptitudes and orientations; and how they can develop the skills they need for success in their chosen fields; and 2) How the effective strategic management of people contributes to organizational performance and the production of value, and that for many organizations, the effective management of people has been the driver of competitive advantage. This is the first course in a two course sequence.

MGMT 251. Managing Organizations and People II (3)
The principal goals of this course are to help students understand: 1) The context in which they, as managers, will function; the options they have for careers in management based on their own aptitudes and orientations; and how they can develop the skills they need for success in their chosen fields; and 2) How the effective strategic management of people contributes to organizational performance and the production of value, and that for many organizations, the effective management of people has been the driver of competitive advantage. This is the second course in a two course sequence. Prereq: MGMT 250.

MGMT 315. International Management Institute (3)
The course provides undergraduate students with a unique overseas visitation, language orientation, and management subject experiences during periods such as spring break, or during internships immediately following the end of the semester. Opportunities for diverse cultural and language experiences which result from the institute are added benefits of these programs. Prereq: ECON 102, ECON 103, ACCT 101 and BAFI 355.

MGMT 360. Special Topics and Issues in Management (1 - 9)
This course option is available to qualified students who are undertaking special projects in a management related field.

MGMT 395. Advanced Seminar (1)
This seminar, for undergraduate students with junior class standing or above, provides an opportunity to consider topics of importance in the community of ideas and activities related to the professional and managerial world. The development of writing and communication skills and in-depth discussion are expected attributes of seminar activity. The topic and scope of the coverage will be defined by the course instructor as consistent with the seminar approach to learning of the university. MGMT 395a, 395b, 395c

MGMT 395. Advanced Seminar (1)
This seminar, for undergraduate students with junior class standing or above, provides an opportunity to consider topics of importance in the community of ideas and activities related to the professional and managerial world. The development of writing and communication skills and in-depth discussion are expected attributes of seminar activity. The topic and scope of the coverage will be defined by the course instructor as consistent with the seminar approach to learning of the university.

MGMT 398. Action Learning (6)
This is an experiential course built around a live project in a local organization. The project-based course is focused on improving business process. Students will work in teams to analyze the current situation and diagnose its problems or opportunities, creatively envision new possibilities, evaluate potential improvements and recommend appropriate solutions. Students will be evaluated by the professor and the project managers at the client organizations. Prereq: ACCT 202, BAFI 355 and MKMR 301. Coreq: Senior standing, SAGES Senior Cap

MGMT 400-TR. MGMT 400 Level Transfer Course (3 - 99)

MGMT 403. Leadership Assessment and Development (3)
This course is designed to increase competitive attractiveness in the marketplace and maximize the added value of the M.B.A. program. The objective of the course is to have students learn a method for assessing and developing in themselves the knowledge and abilities relevant to management throughout their careers. This is accomplished by helping students develop an individualized learning plan to enhance their level of knowledge in 11 fields and 22 abilities. Students engage in a number of assessment activities, then receive feedback and interpret it. This occurs in the context of an Executive Action Team (i.e., students and a facilitator) in which students help each other assess their current capability and future development needs. This course is limited to students in the M.B.A. program.

MGMT 413. Human Value in Organizations (3)
Examines the behavioral sciences relevant to the effective management of people and the effective design of human resources system, structure and policies. Topics include leadership, change management, motivation and pay systems, team dynamics, staffing, decision making, organizational communications, employee participation, performance appraisal, conflict management, negotiation, work design, organizational design, and organizations culture. A variety of methods, including experiential and interactive learning methods, are used to study these topics.

MGMT 413A. Human Values in Organizations (1)
Classes will explore research in the fields of organizational behavior and human resource management and apply this knowledge in actual situations and cases. They will learn
about how to learn from experiences they have in class and in their EATs. Students will be able to directly apply skills learned in class to leadership, project management, task force management, team development, staff meetings, decision making, problem solving, interpersonal relations, environmental analysis, job redesign, organizational change, and labor and human resource policy. Prereq: Open to ACL-MBA students.

MGMT 419. Corporate Field Research (1)
This course is intended for the graduate business student who wishes to gain applied/practical business experience based on his/her intended career path and/or with an organization. This course will assist building required skills and bridge the gap between the classroom and real world application.

MGMT 420A. Dialogues in Top Management I (1.5)
MGMT 420A and MGMT 420B Dialogues in Top Management I and II. Students must take the two courses in sequence. The courses comprise a series of dialogues with teams of top-echelon managers of pre- and post-dialogue student groups; analytic papers based on the content of the dialogues, class discussions, and readings. Readings and class discussions address both the character and dynamics of complex, enterprise-wide management problems and processes of effectively managing them. In open dialogues with practicing top-echelon managers students explore the practice and theory of effective top-echelon/general management. That is management that involves applying concepts and skill across all functional areas of management. Student groups’ analytical essays after each dialogue stimulate in-depth discussion both of possible conceptual models of the management process and of the relationships to it of the course materials in the graduate programs.

MGMT 420B. Dialogues in Top Management II (1.5)
MGMT 420A and MGMT 420B Dialogues in Top Management I and II. Students must take the two courses in sequence. The courses comprise a series of dialogues with teams of top-echelon managers of pre- and post-dialogue student groups; analytic papers based on the content of the dialogues, class discussions, and readings. Readings and class discussions address both the character and dynamics of complex, enterprise-wide management problems and processes of effectively managing them. In open dialogues with practicing top-echelon managers students explore the practice and theory of effective top-echelon/general management. That is management that involves applying concepts and skill across all functional areas of management. Student groups’ analytical essays after each dialogue stimulate in-depth discussion both of possible conceptual models of the management process and of the relationships to it of the course materials in the graduate programs.

MGMT 433. Starting and Managing a Successful Startup Through Critical Phases (1.5)
This course focuses on the key issues in starting and managing a successful startup through the critical phases of growth: Birth, Funding, Pre-Product Launch, Product Launch, Rapid Growth and Exit Strategy. Students will be exposed to prominent alumni who have multiple entrepreneurial experiences enabling future entrepreneurs to avoid pitfalls and communication mistakes that could doom their fledgling company.

MGMT 440. Leadership Assessment and Development II (0)
The exit assessment course (MGMT 440) is aimed at assessing how students’ career goals, values and abilities may have changed since the program began. The course meets for one mandatory half day seminar in the Spring Semester and carries 0 units of credit. In the MGMT 403 course, students were provided the tools and opportunities for self-assessment and career planning. In the very first semester, they completed several assessment instruments (LSI, POQ, 360-Feedback (ECI-U), ASI, My Values, Career Anchors and others). They had to identify their top values, set a career vision and created an individualized learning plan. The ultimate goal was to assure that their personal development and preparation was relevant to, and in alignment with, the relevant requirements of today’s business management careers. This course is specifically designed to identify if a student’s prior learning plan (completed in the MGMT 403 course) still fits with his/her current career reality and to also identify what has changed for him/her. The activities in the course will include: Viewing the current reality of today’s business environment; Revisiting their experience in the MBA program including any internships/jobs; Determining if a student’s values, vision and learning plan still fit; Retaking the 360-Feedback (Emotional Intelligence Competencies) to identify development of competencies; Identifying relevant areas of personal development; Committing to a refined learning plan and goals. Through a highly interactive and team based process, students will be able to reflect on their current reality, get feedback on your personal growth and discover what changes would enhance their professional career journey.

MGMT 447. Chief Officer Dialogues on Information and Management (3)
Each week, Chief Level Officers (CIO, CEO, CFO, CMO, CTO, etc.) from major corporations present the class with live problems in which technology, strategy and operational issues must be integrated in a coherent organizational course of action. Students work in teams to design courses of action in response to those problem situations, which Chief Level Officers then review, critique and discuss. Offered as MGMT 447 and MIDS 447. Prereq: MIDS 409.

MGMT 460. Managing in a Global Economy (3)
Managers need new skills to enable them to manage effectively in what is increasingly a global economy. They need a deeper understanding of cultural differences and how these differences may influence communications with foreign employers, employees, customers, suppliers or partners. They need a better understanding of the economic and political mechanics of the world business system. They need to learn how to find out more about potential opportunities and threats that lie outside the United States. This course is designed to address these needs.

MGMT 464. Business Ethics (3)
This course is built around two core learning tracks. The first is extended analyses of case studies, which identifies ethical problems, diagnoses import, and develops strategic programs to address them. The second learning track uses short pieces of fiction to explore issues of ethical character, leadership, and organizational responsibility. Each student keeps an ethics journal over the course of the semester to reflect on ethical issues, both inside and outside the classroom. In addition, small student groups are formed to write case studies focusing on a business ethics problem.

MGMT 465. Perspectives in European Management (3)
The European Summer Institute provides an introduction to international business through a unique combination of class meetings on campus and a two-week excursion to central Europe. While in Europe, students meet with local business people, consulate officials, and university professors to learn the prerequisites for doing business in the region. The trip features a number of site visits to local companies. (This course may be used for...
of topics, including principles of intellectual property and intellectual property management, business strategies and modeling relevant to the creation of start-up companies and exploitation of IP rights as they relate to biomedical-related inventions. The goal of this two-semester course is to address issues relating to the commercialization of biomedical-related inventions by exposing law students, MBA students, and Ph.D. candidates (in genomics and proteomics) to the challenges and opportunities encountered when attempting to develop biomedical intellectual property from the point of early discovery to the clinic and market. Specifically, this course seeks to provide students with the ability to value a given technological advance or invention holistically, focusing on issues that extend beyond scientific efficacy and include patient and practitioner value propositions, legal and intellectual property protection, business modeling, potential market impacts, market competition, and ethical, social, and healthcare practitioner acceptance. The course will meet over two consecutive semesters—fall and spring—and is six credit hours (three credits each semester). During these two semesters, law students, MBA students, and Ph.D. candidates in genomics and proteomics will work in teams of five (two law students, two MBA students, and one Ph.D. candidate), focusing on issues of commercialization and IP management of biomedical-related inventions. The instructors will be drawn from the law school, business school, medical school, and technology-transfer office. To be eligible for this course, law students must also have a B.S. or equivalent in the life sciences, such as biology, biochemistry, genomics, molecular biology, etc. Offered as MGMT 467, LAWS 367, and GENE 467.

MGMT 495-2. Ames Advanced Business Plan Seminar (0)
This two-semester 6 credit hour course teaches students to write a strategic business plan. Working in teams, students study a Cleveland area business through meetings with company executives, including the CEO, under the supervision of a faculty member and outside planning expert. In Semester One, multiple leading faculty members will conduct classes which focus on key components of a business plan, including marketing, strategy, finance, supply chain and leadership. Semester One will culminate with a case study of an assigned company written by each team. Semester Two is a practicum experience during which student teams write a strategic business plan for their assigned company, once again under the supervision of faculty and outside mentors. Plans will be presented by teams to a Business Plan Competition jury composed of leading private equity executives, investment bankers and/or corporate CEOs.

MGMT 496. Action Learning Preparation: Introduction to Systems Thinking (1)
In preparation for MGMT 497, Action Learning for M.S.M. students, M.S.M. students, assigned to teams, will participate in intensive seminars to learn strategies to organize the projects for MGMT 497 and work effectively with their client organizations.

MGMT 497. Action Learning Project (3)
This course allows teams of students to integrate functional, core knowledge and apply analysis and strategic management skills in a real-world setting. Students will be evaluated by the instructor and the project managers at the client organizations.

MGMT 498. Action Learning (3)
This course allows teams of students to integrate functional core knowledge from the first year of the M.B.A. program and apply analysis and strategic management skills in a real-world setting. Students will be evaluated by the instructor and the project managers at the client organizations. Recommended preparation: Second year full-time M.B.A. status.

MGMT 499. Strategic Issues and Applications (3)
This course wraps up the M.B.A. core by providing an integrative experience of applying the full range of managerial skills addressed throughout the core in a comprehensive case exercise. Students develop, document, and
present comprehensive, implementable strategic and tactical actions programs in groups. Prereq: ACCT 401 and BAFI 402.

MGMT 501. Special Problems and Topics (1 - 18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

MGMT 560. Theoretical Perspectives in Management (3)
This seminar exposes students to management theories from a variety of disciplines. The goal of the course is to help students learn to synthesize and contrast theories to develop hypotheses of their own. Prereq: Ph.D. standing or consent of instructor.

MGMT 570. Research Theory and Method (3)
This seminar explores pertinent issues in the philosophy of social sciences and in the use of quantitative and qualitative research methods. It seeks to clarify pivotal issues in scientific enterprise like the nature of scientific knowledge, the nature of scientific methods, their grounding, issues of ontology and epistemology, rhetoric, and how scientific knowledge relates to the organization of scientific communities. The seminar's objective is to prepare students to think critically about the underlying assumptions and their day-to-day research practices. Prereq: Ph.D. standing.

MGMT 575. Doctoral Research Project (3)
The objective of the course is to produce a stand-alone piece of scholarship in the academic discipline pursued by the student. The paper or project should be of publishable quality as judged by the instructor. The work of the student is to be accomplished on the independent study basis under the direction of a faculty member. Although there are no specific course prerequisites, the understanding is that all other course work should have been completed to be admitted into the class. Prereq: Ph.D. standing.

MGMT 601. Special Topics (1 - 18)
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

MGMT 602. Advanced Topics (1 - 18)
This is a course of flexible design to meet advanced theoretical and/or methodological needs of doctoral students. Approval is needed from the instructor, and it requires a letter grade.

HEALTH SYSTEMS MANAGEMENT COURSES (HSMC)

HSMC 406. Innovation and Entrepreneurship (2)
The purpose of this module is to acquaint and ultimately engage clinical researchers with the business of innovation and entrepreneurship. Goals include: (1) to provide researchers with many of the skills that they would need to translate academic research into commercial uses; (2) to sensitize clinical researchers to the goals of the business community and facilitate their ability to work with the private sector on technology development; and (3) to make clinical researchers aware of the processes of academic technology development and transfer. Sessions consist of lectures and case discussion facilitated by the instructor. Some sessions include members of the business community as guest lecturers. As an example, students will discuss the financing of new companies with local venture capitalists. Student products include the evaluation of the commercial potential of a university technology in which they apply their new knowledge about commercialization of scientific discoveries. Offered as CRSP 503, ECON 406, and HSMC 406.

HSMC 420. Health Finance (3)
Exploration of economic, medical, financial and payment factors in the U.S. healthcare system sets the framework for the study of decisions by providers, insurers, and purchasers in this course. The mix of students from various programs and professions allows wide discussion from multiple viewpoints. Offered as BAFI 420 and HSMC 420. Prereq: ACCT 401.

HSMC 421. Health Economics and Strategy (3)
This course has evolved from a theory-oriented emphasis to a course that utilizes economic principles to explore such issues as health care pricing, anti-trust enforcement and hospital mergers, choices in adoption of managed care contracts by physician groups, and the like. Instruction style and in-class group project focus on making strategic decisions. The course is directed for a general audience, not just for students and concentration in health systems management. Offered as ECON 421, HSMC 421, and MPHP 421.

HSMC 427. Health Law (3)
The course examines the nature and structure of the health care system; the relationship between patient, provider, and payer; private legal controls on health care delivery such as malpractice and informed consent law; and public controls in the form of government regulatory and payment programs. Offered as HSMC 427 and LAWS 227.

HSMC 432. Health Care Information Systems (3)
This course covers concepts, techniques and technologies for providing information systems to enhance the effectiveness and efficiency of health care organizations. Offered as HSMC 432, MIDS 432, and MPHP 532.

HSMC 446. Models of Health Care Systems (1.5)
This course is for professionals who will pursue their careers in, or associated with, the health care industry; and therefore, need to understand the structure, operations and decision influences in the health care delivery system. The course is intended to develop competence and confidence in the participant's ability to understand and operate in the industry. the largest and, perhaps, the most complex in the United States. It is applicable to the private and public, profit and non-profit sectors. In this course students are introduced to: the different systems of care delivery; their organization and operations; their markets and the nature of the demand for their services; and the dynamics of their interaction among themselves and with other entities in the industry (e.g., payors/insurers, regulators and accreditation, technology and pharmaceutical suppliers). Offered as HSMC 446 and IIME 446.

HSMC 447. Regulatory Affairs for the Biosciences (1.5)
This mini-course introduces students to the Food and Drug Administration (FDA) and the laws and regulations it enforces. A scientific regulatory agency with far reaching enforcement authority. FDA is the most powerful consumer protection agency in the world. This course will familiarize students with FDA's mission, philosophy and organizational structure, as well as policy and procedure it uses to ensure the safety and effectiveness of the food, drugs, biologics, cosmetics, medical devices and radiation-emitting products it regulates. Recommended preparation: Enrollment in the MEM Biomedical Entrepreneurship Track. Offered as BIOS 447, HSMC 447, and IIME 447.

HSMC 448. Engineering Statistics for Biosciences (3)
This course provides an introduction to bio-statistics, emphasizing experimental design, analysis of data, and special emphasis on statistical and financial aspects of randomized clinical trials for biomedical applications. There will be a final project involving development of a clinical trial protocol including the experimental design, recruitment and
retention strategy, analysis plan and budget. Offered as BIOS 448, HSMC 448, and IIME 445.

HSMC 450. Health Care Economics for the Biosciences (1.5)
This course utilizes economic principles to explore such issues as health care pricing, anti-trust enforcement and pharmaceutical economics, choices in adoption of managed care contracts by physician groups, and the like. Instruction style and in-class group project focus on making strategic decisions. The course is directed for a general audience, not just for students and concentration in bioscience or health systems management. Offered as BIOS 450, ECON 450, and HSMC 450.

HSMC 456. Health Policy and Management Decisions (3)
This seminar course combines broad health care policy issue analysis with study of the implications for specific management decisions in organizations. This course is intended as an applied, practical course where the policy context is made relevant to the individual manager. Offered as HSMC 456 and MPHP 456.

HSMC 501. Special Problems and Topics (1 - 18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

HSMC 502. Health Care Executive Education Series (1 - 3)
Students may choose six out of eight all day Friday seminars in the Health Care Executive Education Series, plus completion of a paper covering an aspect of the management of health care systems. Registration is 1 credit for fall semester and 2 credits for the spring semester as seminars begin in the fall and continue through the spring semester. Limited to students admitted to the Health Systems Management Certificate program and those with approval from Mindy Kinnard at 216-368-6405.

HSMC 601. Special Problems and Topics (1 - 18)
This course is offered, with permission, to Ph.D. candidates undertaking reading in a field of special interest.

EXECUTIVE DOCTOR OF MANAGEMENT (EDMP)

EDMP 610. Culture and World Politics (3)
Religion, ethnicity, and nationalism have assumed major political significance in the post Cold-War and post-9/11 eras. The course examines ideas of political democracy and economic liberalism in relation to different cultural and religious ideas and explores relationships among social values, political structures, and economics.

EDMP 611. Theory and Practice of Collective Action (3)
The ability of autonomous and interdependent parties to coordinate actions, or to act cooperatively, affects a wide range of organizational and social problems. This course addresses the theory and practice of collective action in local, national and global contexts. Case studies of collective action problems, such as environmental protection, community revitalization, and the mobilization of interest groups will be discussed.

EDMP 612. Identifying a Personal Research Domain (3)
The first course in the E.D.M. inquiry sequence provides an introduction to practitioner scholarship and an opportunity for participants to identify and develop their personal research domains. Participants gain skills in inductive, interpretive modes of research, in literature searching and synthesizing, and in conceptualizing. These skills are put to use by interacting with practitioners and literature in order to conceptualize a research question or issue. This work specifies an “action” or “practice” problem to be addressed during the three years of the program, and it serves as a first draft of a more thorough conceptual model to be completed in the second semester of the first program year. The preliminary conceptual model includes rich narratives and the identification of casual relationships among relevant constructs.

EDMP 613. Leading Change (3)
Sustained, desirable change (SDC) drives adaption, growth and life itself. In this course, we will attempt to answer two questions: (1) What is the process of sustained, desirable change? and (2) What is the role of a leader? Concepts from complexity theory will be used, including understanding the multilevel nature of SDC at the individual, dyad team, organization, community, country, and global levels. Intentional Change Theory (ICT) will be used as the organizing concept for the changes studied.

EDMP 614. Business as a Dynamic System (3)
This course examines the evolution of large-scale business firms as a result of technological and organizational change. It deals with the role of history, culture and finance in generating business organizations in various countries. This course also studies regional innovation systems, as well as the digital economy: what its main features are, what is genuinely new, and what the implications are for business organizations and industry clusters.

EDMP 616. Global Economic Systems and Issues (3)
This course provides a framework and analytical tools for understanding globalization and international economic relations in the context of the global political system. It analyzes the economic and political forces that are shaping global cooperation on economic matters, the role and impact of international economic institutions such as the World Bank, the International Monetary Fund, and the World Trade Organization, and evolving forms of regional governance, such as the European Union. It covers national and international policies and development and the causes and cures of international financial crises. The course revolves around concepts of efficiency, equality, power, and institutions in the making of public policy towards globalization of communications and transportation.

EDMP 617. Technology and Social System Design (3)
Managers are designers who shape the social and technical world we inhabit. This course explores the process of design and asks how managers can become better designers who anticipate and evaluate the social, economic, and political consequences of existing and emerging products, processes organizational forms.

EDMP 620. Synthesis and Application of Knowledge (3)
This capstone inquiry seminar focuses on how different methodological techniques complement and conflict with each other and how they may be used in concert. The seminar emphasizes understanding findings from a variety of studies and translating them into common language, thus permitting decision making and action.

EDMP 621. Applied Research I (3)
The Applied Research component of the E.D.M. Program integrates conceptual analysis with managerial and social policy. This seminar is dedicated to writing the proposal for students’ applied research projects, which are undertaken as independent work during the third year.

EDMP 622. Thematic Elective I (1 - 3)
Participants in the E.D.M. Program take a selected sequence of two coordinated elective courses that provide opportunities for advanced study in topic- or sector-specific ar-
and ethical questions pertaining to the definition of research is evaluated and length, intensity and complexity of research reports at the end of the first year of the program. The course conveys how to generate research ideas by critically reviewing literature and developing ideas that contribute to a problem or issue of interest by working with theory and extending previous research. The practicality of conducting certain kinds of research is evaluated and length, intensity and ethical constraints of different research efforts are examined. Each student produces a report communicating and supporting a conceptually sound and pragmatically useful model of some real world phenomenon. The paper defines a problem of interest and its research design, and fieldwork for data collection. The purpose of these courses is to recognize the work the students are doing to conduct and present their individualized research at a high quality level. Activities conducted under the Directed Studies courses are dedicated to the collection of qualitative or quantitative data and the preparation of research reports. 

EDMP 643. Foundations for Quantitative Inquiry (3) This course aims to develop the basic foundation of statistical concepts and skills for designing and executing generalizable studies. It focuses on building competence in model building, construct measurement, research design, data collection methodologies, and application of analytical software commonly involved in quantitative inquiry. Covered topics include framing research questions, reliability ad validity of measurement, quasi-experimental research design, and fieldwork for data collection. Classes are designed to balance between the theory and practice of quantitative research design, and will be linked to the participant’s own research projects. Prereq: EDMP 641.

EDMP 644. Multivariate Data Analysis (2) Building on instruction in univariate statistics, this course covers the fundamental assumptions, principles, and applications of multiple regression and structural equation modeling methodologies for analyzing quantitative data. It focuses on building competence in analytical skills for testing hypotheses guided by a conceptually sound and pragmatically useful model of some real world phenomenon. Analytical software used include SPSS and AMOS. Prereq: EDMP 641.

EDMP 645. Critical Applications and Research Project Issues (4) Using the multivariate and research design toolkit developed in related courses, this course focuses on critically analyzing selected pieces of published applied and policy research to develop a critical appreciation of issues and debates that have wide applicability and relevance. In addition, this course addresses common application issues that may arise during the participants’ execution of individual research projects. Application of critical analysis and appreciation approach to the participant’s own research work is encouraged and supported by sharing and discussing common themes and problems.

EDMP 646. Advanced Analytical Methods for Generalizable Studies (3) This course addresses advanced topics in regression and structural equation modeling such as confirmatory factor analysis, mediator/moderator analysis, multiple-group analysis, management of missing data, and analyzing qualitative/categorical data. These analytical methods are intended to enhance the participant’s toolkit to facilitate a strong bridge to the academic literature and the application to specific data based problems that arise in applied research. 

EDMP 647. Introduction to Statistics (1) This course introduces basic statistical concepts and their application in social research building, elementary statistical methods and applications, descriptive statistics, random variables, sampling distribution, estimation, hypothesis tests. The course also provides an introduction to data analysis using SPSS computer software.

EDMP 660. Directed Studies: Qualitative Fieldwork (1 - 3) This course is part of the qualitative research sequence which began with EDMP 638: Qualitative Research Methods I. In this qualitative fieldwork course, students will conduct a series of interviews based on the research proposal and interview guide which they de-
veloped in EDM 638. Students are expected to complete their interviews and work with faculty to begin initial analysis of the interview data.

EDMP 661. Directed Studies: Qualitative Research Report Preparation (1 - 3)
This course is dedicated to individualized student research. Student research objectives and plans are implemented through qualitative and quantitative fieldwork, report preparation, and manuscript development and submission.

EDMP 662. Directed Studies: Quantitative Fieldwork (1 - 3)
This course is dedicated to the design, development and execution of the student’s individualized research work. Each student will be expected to develop a proposal for research work that aims to empirically test a conceptual model to address a significant substantive problem. Following faculty approval and feedback, each student will be expected to conduct field work for data collection in accord with a research design that yields high quality data. Completion of the course requirements will rest on the satisfactory completion the fieldwork as per guidelines provided in the course.

EDMP 663. Directed Studies: Quantitative Research Report (1 - 3)
This course is dedicated to the execution and completion of student’s individualized research work. Each student will be expected to execute a research study to provide reliable and valid conclusions using rigorous quantitative methodologies and write a publishable quality paper for submission to faculty for approval. It is highly desired that student papers be submitted for presentation and publication at appropriate academic and/or practitioner outlets. Completion of the course requirements will rest on the satisfactory completion and submission of the research paper as per guidelines provided in the course.

EDMP 664. Research Dissemination (3)
This course prepares students to publish their work in academic journals as well as in high quality practitioner outlets.

EDMP 665. Research Methods (3)
This course addresses key conceptual and practical issues in the conduct of both qualitative and quantitative inquiry. These issues include identifying a specific topic of research interest, strategies for literature review, and developing plans and procedures for preliminary data collection from the field. The objective is to prepare students for more advanced theoretical projects as well as actual fieldwork and research projects in later stages of the E.D.M. Program.

EDMP 667. Frontiers of Management Research I (3)
The purpose of this seminar introduces students to a variety of topics in the various fields of management, presents issues at the frontiers of knowledge in each field, and discusses methodological issues as well as the implications of the research for practice/policy. This course draws on expertise from faculty in the Weatherhead School, the university, and EDM alumni.

EDMP 668. Frontiers of Management Research II (3)
This seminar is a continuation of Frontiers in Management I and introduces students to further disciplines in the field of management. Issues at the frontiers of knowledge in a variety of fields are presented and methodological issues as well as the implications of the research for practice/policy are discussed. This course draws on expertise from faculty in the Weatherhead School, the university, and EDM alumni.

EDMP 669. Applied Research Project Continuation (1 - 9)
Program participants who have not successfully completed their Applied Research Projects before the start of the fall semester following their third year of enrollment in the E.D.M. Program will have seven years from the date of their initial matriculation into the Program to complete degree requirements. If their work continues beyond the normal 54 credit hours of designed courses, they will register for Applied Research Project Continuation. Continuation credits may also be used for students enrolling in the Program after August 2000, who have not completed their required course work and research requirements within the Program’s required 54 semester credit hours.

ENTREPRENEURIAL STUDIES (ENTP)
ENTP 301. Entrepreneurial Strategy (ENTP)
This course is designed to show students how to identify potential business opportunities, determine what constitutes a good business model, and to strategically implement a business proposal. Topics of focus include an overview of the entrepreneurial process, determinants of venture success in high tech and other business environments, and strategies for industry entry and venture growth.

Prereq: ACCT 101 or ACCT 303. Coreq: At least sophomore standing.

ENTP 310. Entrepreneurial Finance - Undergraduate (3)
This course explores the financing and financial management of entrepreneurial new ventures. The course will focus on issues of financial management of new ventures (forecasting cash flows, cash flow management, capital budgeting, valuation, capital structure) and the various financial methods and mechanisms available to entrepreneurs (bootstrapping, angel investors, venture capitalists, IPOs). Prereq or Coreq: ACCT 101 or ACCT 303 or consent of instructor.

ENTP 311. New Venture Creation (3)
This course explores all aspects of the creation of a new venture from idea through startup, growth, and beyond. Students will learn how to evaluate opportunities, develop strategies, create a business plan and acquire financing for a new venture. In this course students will develop a business plan for a new venture.

ENTP 312. Senior Seminar in Entrepreneurship (3)
The main objective of this course is to meet the advanced needs of our students in honing their entrepreneurial skills. This objective will be achieved through readings and case instruction, presentations by entrepreneurs who are actively engaged in starting new ventures and the commercialization of new technologies, and the successful completion of a research project for an entrepreneurial venture. These projects will be graded by the professor and presented to the class and to the client entrepreneur. Prereq: ENTP 310 and ENTP 311.

ENTP 418. Enterprise Development (3)
Course features new product launch by students and new business idea competition judged by actual venture capitalists. Students will also learn how to acquire control of an existing company, including valuation methods, sources of funding, tactics for finding companies to buy, and how to negotiate the purchase of a business. Also includes actual student negotiation with sellers of a company. Course is designed to accelerate career success through bold entrepreneurial strategies. Offered as ENTP 418 and PLCY 418.

ENTP 419. Entrepreneurship and Personal Wealth Creation (3)
Course explores the accumulation of personal wealth utilizing entrepreneurial strategies. The underlying competencies of successful entrepreneurs are identified and applied to
individual lives of students. Active entrepreneurs will be studied, and original case studies of start-ups and acquisitions provide the basis for class exercises. Offered as ENTP 419 and PLCY 419.

**ENTP 420. Managing the Family Firm (3)**
The vast majority of U.S. firms are family controlled and present special problems in strategic management including the interaction of family and firm objectives, executive succession, management development and motivation, finance, estate planning, etc. This course explores solutions to these problems in the context of guiding the firm’s growth through the threshold between personal and professional management. The course pedagogy is participative and experiential. Offered as ENTP 420 and PLCY 420.

**ENTP 422. Managing an Emerging Growth Enterprise (3)**
Students are exposed to what it is like to work in an emerging growth company with sales under $100 million. Prospective students might be individuals who are considering employment with middle market company, entrepreneurs who may start a company, or business persons who may buy a middle market company. The learning experience will stem from participating in an actual semester-long project. In-class discussions include: business planning, selling, managing technology transfer, and creativity/innovation, and guest presentations by CEOs from middle market companies. Offered as ENTP 422 and PLCY 422. Prereq: ACCT 401, BAFI 402, MKMR 403 and MIDS 409.

**ENTP 424. Management of Research and Development (organization, strategy, finance) as they apply to new venture creation and growth. While most of the examples in class will be drawn from new venture formations, the principles also apply to new business development in corporate settings and to non-profit entrepreneurship. Offered as ENTP 424 and PLCY 424.**

**ENTP 427. Entrepreneurial Strategy (3)**
Creating and managing a new venture inside or outside a corporation is a task that few individuals are able to accomplish, even though many profess the desire. The primary goal of this course is to provide an understanding of entrepreneurship and the entrepreneurial process. The course will broaden a basic understanding obtained in the functional areas (organization, strategy, finance) as they apply to new venture creation and growth. While most of the examples in class will be drawn from new venture formations, the principles also apply to new business development in corporate settings and to non-profit entrepreneurship. Offered as ENTP 427, PLCY 427.

**ENTP 429. New Venture Creation (3)**
The primary goal of this course is to provide an understanding of entrepreneurship and the entrepreneurial process. The course will broaden a basic understanding obtained in the functional areas as they apply to new venture creation and growth. Offered as ENTP 429 and PLCY 429.

**ENTP 439. Entrepreneurship - Entrepreneurship within the Corporation (3)**
Intrapreneurs are the entrepreneurs within corporations who combine innovation, creativity and leadership to develop and launch new products, new product lines, and new business units that grow revenues and profits from within. Intrapreneurial innovation and creativity have never been needed more by U.S. corporations than they are today. Numerous corporations have been increasing revenues through mergers and acquisitions, rather than through internal product innovation and new business creation. Today, many companies are returning to their entrepreneurial roots. Revitalizing existing companies through intrapreneurial activity creates new capital, retains and increases jobs, and creates exciting places to work and achieve. The purpose of this course is to encourage students to research and understand the theories, principles, concepts, and practices of entrepreneurship within organizations—Intrapreneurship. Students will become acquainted with trends, expectations, organizational challenges to innovation, and opportunities in today’s corporate America. Offered as ENTP 439 and PLCY 439.

**ENTP 444. Entrepreneurial Finance (3)**
The objective of this course is to introduce students to the issues of financial management and capital formation in new ventures. The course will address issues of estimation of cash requirements, development of pro forma financial plans, firm valuation and the process and tools used in raising debt and equity financing. Bootstrapping, angel investing, venture capital, strategic alliances and initial public offerings will be covered. The emphasis is on the entrepreneur and how he/she can assess financial needs and develop a sensible plan for acquiring financial resources in a manner that is consistent with their financial needs and other strategic goals. Offered as BAFI 444 and ENTP 444. Prereq: BAFI 402.

**ENTP 446A. Venture Law (2.5)**
This course will provide an overview of the legal issues associated with venturing in the life sciences. The course will cover the legal aspects of company formation, management of intellectual property, strategic alliances, compensation, and securities laws. Recommended preparation: Full time M.B.A. status. Offered as BIOS 446A and ENTP 446A.

**ENTP 446B. Venture Law (3)**
This course will provide an overview of the legal issues associated with venturing in the life sciences. The course will cover the legal aspects of company formation, management of intellectual property, strategic alliances, compensation, and securities laws. Recommended preparation: Evening M.B.A. status. Offered as BIOS 446B and ENTP 446B.

**ENTP 450. Entrepreneurial Marketing-M.B.A. (3)**
This course addresses the entrepreneurial/intrapreneurial process of commercializing an idea for a market opportunity. Students select an opportunity and develop a deployable, one-year market entry program and a five-year strategic marketing program. Emphasis is on the entrepreneurial marketing decision process, including defining the business, defining the market, specifying customer perceived value, assessing competitive capability and advantage, identifying and properly using secondary and primary information, and de-
The course will provide an overview of the legal issues associated with venturing in the life sciences. The course will cover the legal aspects of company formation, management of intellectual property, strategic alliances, compensation, and securities laws. Recommended preparation: Full time M.B.A. status. Offered as BIOS 446A and ENTP 446A.

BIOS 446B. Venture Law (3)
This course will provide an overview of the legal issues associated with venturing in the life sciences. The course will cover the legal aspects of company formation, management of intellectual property, strategic alliances, compensation, and securities laws. Recommended preparation: Evening M.B.A. status. Offered as BIOS 446B and ENTP 446B.

BIOS 447. Regulatory Affairs for the Biosciences (1.5)
This mini-course introduces students to the Food and Drug Administration (FDA) and the laws and regulations it enforces. A scientific regulatory agency with far reaching enforcement authority, FDA is the most powerful consumer protection agency in the world. This course will familiarize students with FDA’s mission, philosophy and organizational structure, as well as policy and procedure it uses to ensure the safety and effectiveness of the food, drugs, biologics, cosmetics, medical devices and radiation-emitting products it regulates. Recommended preparation: Enrollment in the MEM Biomedical Entrepreneurship Track. Offered as BIOS 447, HSMC 447, and IIME 447.

BIOS 448. Engineering Statistics for Biosciences (3)
This course provides an introduction to bio-statistics, emphasizing experimental design, analysis of data, and special emphasis on statistical and financial aspects of randomized clinical trials for biomedical applications. There will be a final project involving development of a clinical trial protocol including the experimental design, recruitment and retention strategy, analysis plan and budget. Offered as BIOS 448, HSMC 448, and IIME 445.

BIOS 450. Health Care Economics for the Biosciences (1.5)
This course utilizes economic principles to explore such issues as health care pricing, anti-trust enforcement and pharmaceutical economics, choices in adoption of managed care contracts by physician groups, and the like. Instruction style and in-class group project focus on making strategic decisions. The course is directed for a general audience, not just for students and concentration in biosciences or health systems management. Offered as BIOS 450, ECON 450, and HSMC 450. Prereq: ECON 403.

EXECUTIVE MBA (EMBA)

EMBA 412. Stakeholder Management - Leadership (2)
Participants will be challenged to enhance their leadership capacity by assessing and analyzing the knowledge, abilities, values and interests relevant to executives. The course will also explore issues of ethical character, leadership, and organizational responsibility as well as corporate governance. Prereq: E.M.B.A. candidates only.

EMBA 415. EMBA Execution - Leadership (4)
The modules in this course will prepare executives to lead their organizations by understanding how to “execute” their plans. Participants will complete the LEAD module. Advanced negotiations will also be covered in this course. The focus is on enhancing individual as well as organizational performance and competitive advantage through “principled negotiation,” “win-win” bargaining and collaborative approaches to bargaining. Prereq: E.M.B.A. candidates only.

EMBA 417. TEAMS (1)
This course enables the formation of E.M.B.A. study groups and classroom learning environment by introducing participants to their adult learning styles, models of group decision-making, theories of team development and rules of engagement for effective learning teams. Prereq: E.M.B.A. students only.

EMBA 425. EMBA Execution - Management (4)
The modules in this course will prepare executives to manage their organizations by understanding how to “execute” their plans. Participants will focus on the role of a Product/Brand Manager in profitably managing a firm’s existing offerings and identify areas for growth. The course also presents first-hand issues in international management. It accomplishes this by means of readings, a written assignment and, most importantly, an international trip designed to witness different management cultures, styles and environments for business in the international community. Prereq: E.M.B.A. candidates only.

EMBA 431. Application Project I (5)
The first year application project is built around a live situation in your organization enabling you to apply the concepts and skills you are learning in the E.M.B.A. program immediately. The project should focus on an important opportunity or issue. In undertaking the project, you will learn the generic problem solving approach and how to apply it in your organization. You will also investigate techniques for process analysis and project management. The outcome of your work will be a concrete result for your organization that should provide a return at least equal to the cost of your degree. Prereq: E.M.B.A. candidates only.

EMBA 432. Application Project II (5)
This is an experiential course built around a live project in the student’s organization. The project will focus on improving a business process or making a challenging strategic decision. Students must lead a team to do this project. The team will analyze the current situation and diagnose its problems or opportunities, creatively envision new possibilities, evaluate potential improvements and recommend and begin to implement appropriate solutions. Students will learn the generic problem solving approach used by many major consulting firms and how to apply it in their organizations. They will also investigate techniques for process analysis and project management. The outcome of the project will be a concrete result for the organization. Prereq: E.M.B.A. candidates only.
EMBA 434. EMBA Process - Application Project II (.5)
This is an experiential course built around a live project in the student’s organization. The project will focus on improving a business process or making a challenging strategic decision. Students must lead a team to do this project. The team will analyze the current situation and diagnose its problems or opportunities, creatively envision new possibilities, evaluate potential improvements and recommend and begin to implement appropriate solutions. Students will learn the generic problem solving approach used by many major consulting firms and how to apply it in their organizations. They will also investigate techniques for process analysis and project management. The outcome of the project will be a concrete result for the organization. Students will also serve as coaches for other classmates and practice their consultative skills. Prereq: E.M.B.A. candidates only.

EMBA 435. EMBA Execution - Application II (1)
This is an experiential course built around a live project in the student’s organization. The project will focus on improving a business process or making a challenging strategic decision. Students must lead a team to do this project. The team will analyze the current situation and diagnose its problems or opportunities, creatively envision new possibilities, evaluate potential improvements and recommend and begin to implement appropriate solutions. Students will learn the generic problem solving approach used by many major consulting firms and how to apply it in their organizations. They will also investigate techniques for process analysis and project management. The outcome of the project will be a concrete result for the organization. Students will also serve as coaches for other classmates and practice their consultative skills. Prereq: E.M.B.A. candidates only.

EMBA 436. Accounting for Business Executives (2.5)
This course is an introduction to financial and managerial accounting, rather than a course in introductory accounting. This course is designed for the business professional and is intended to prepare the student to use the information prepared by accountants. It will not dwell in detail on the technical aspects of accounting or bookkeeping. In addition, this course is designed to help the student become an effective user of cost information, from the perspective of parties internal to the firm. This aspect of accounting is a compilation of techniques rather than a set of rules. Since the information is for private use, the goal is to create the most meaningful and useful data for use by managers. Assignments will be designed to develop the student’s ability to analyze and interpret accounting data and to more effectively utilize accounting data in day to day business decisions. Finally, this course is intended to strengthen abilities to identify problems and opportunities, to search out and analyze desired information leading to a well-reasoned conclusion, and to perform sensitivity analysis around that conclusion, using financial information. Prereq: E.M.B.A. candidates only.

EMBA 437. Economic Analysis for Managers (2)
This course, which is limited to students in the Executive M.B.A. program, explores the basic elements of the economic system which the executive needs to know in order to understand how the firm interacts with the system and how economic factors affect decision making. Prereq: E.M.B.A. candidates only.

EMBA 438. Business Statistics And Quantitative Analysis (2)
In this course, students study the use of modern quantitative and business statistics to support the executive decision-making process. With the help of computer software, the models examined assist in describing and analyzing problems and suggesting possible managerial actions. The techniques discussed include tools for decision making under uncertainty including regression analysis. Prereq: E.M.B.A. students only.

EMBA 439. Corporate Finance (3)
The central organizing principle of this course is to familiarize the class with the basics of valuation. This first course in finance introduces the tools and methods employed in valuation of projects and corporate securities. Valuation involves the determination of (i) cash flows of the firm, project or financial assets and (ii) the discount rates that are used to compute the present values of the cash flows. Asset pricing models provide the underpinnings for the development of the discount rates. The material is synthesized in capital budgeting exercises which are cost-benefit analyses of capital project cash flows to evaluate whether they are value enhancing. Prereq: E.M.B.A. candidates only.

EMBA 440. System Thinking (1)
The need to deal with ever more complex systems became apparent during the two world wars. Many of the systems developed to aid in the war effort, particularly those that integrated people and technologies, could not be completely understood using the tools of analysis. Breaking a complex system down into its components—which we have been taught to do since childhood—only takes us so far. To understand a system’s purpose and the dynamics that keep it functioning requires another kind of thinking. Drawing on ideas from biology and holistic psychology, systems thinking provides principles and tools to aid in understanding such purposeful systems. Prereq: E.M.B.A. candidates only.

EMBA 441. Leadership Assessment and Development (1)
The primary objective of Leadership and Executive Assessment and Development (LEAD) is to learn a method for assessing your knowledge, abilities, values, and interests relevant to leadership and executive management so that you will be able to develop and implement a plan for enhancing your leadership and executive capability throughout your career and life. The enabling objectives are: (a) To systematically identify your current and desired capability (i.e., knowledge, abilities, values, and interests); (b) To develop an individualized learning agenda and plan for the next 3-5 years; and (c) To explore techniques to assist others in doing the same. In this first module of the three-module series you will learn about the concepts of resonant leadership and emotional/social intelligence. You will also draft a personal vision statement, as well as write an essay on your vision and values. Prereq: E.M.B.A. candidates only.

EMBA 442. Innovation (1)
Organizations are under constant pressure to be efficient and productive in order to generate (often short-term) profit. At the same time they must innovate to remain competitive in the long-term. Innovation involves the generation, development, and delivery of new products, processes, or businesses. Intrapepreneurs are those who can successfully bring new ideas to fruition in established organizations. Innovation in the context of an established organization requires that intrapreneurs fundamentally understand the dynamics of innovation and innovation management. This course introduces fundamental concepts associated with innovation in the context of an established organization. Prereq: E.M.B.A. candidates only.

EMBA 443. Managing Operations (2.5)
This course is a broad-spectrum course with emphasis on Lean production techniques helpful to the practice of management in general
and at any level. We will discuss commonly occurring application problems in quality management, just-in-time production, operational flexibility and project management. The methodologies presented are applicable to manufacturing as well as service organizations like health care, insurance, hotel-management, airlines and government related operations. The emphasis will be on the fundamentals of the operations function in an organization but we will explore the interface of operations management with other functional areas such as marketing, finance, accounting, etc. This course is not oriented toward specialists in operations management. Its goal is to introduce students to the environments and help them appreciate the problems that operations managers are confronted with. Prereq: E.M.B.A. candidates only.

EMBA 444. Execution/Change (1.5)
The global business landscape is littered with expansive, well intended strategies that failed. Why? Often because leaders fail to identify and invest in the full range of the projects required to support those strategies. Even as strategists break their plans into doable chunks, they seldom work with project leaders effectively. Many leaders neglect to revise their company’s strategic portfolio to fit the demands of the dynamic environment and they lose touch with strategic initiatives long before all ports are transferred and outcomes are realized in operations. In this course, we will expose you to concepts and tools by which you can set the purpose, communicate goals, carved the goes out into discrete projects with measurable outputs that will give clear line of sight or people lower in the organizational hierarchy about what the purpose is. This clarity about the purpose and goal congruence is the critical elements of successful execution. Prereq: E.M.B.A. candidates only.

EMBA 445. Corporate Strategy (2)
Topics covered in this course are as follows: Concepts that underlie corporate-wide success; discerning the inimitable capabilities of your organization; recognizing synergies across a firm’s multiple lines of business and leveraging these capabilities in new businesses; developing new markets; identifying markets that have a high probability for success; how to choose between Greenfield entries, joint ventures and acquisitions; techniques for managing acquisitions. Prereq: E.M.B.A.

EMBA 446. Managing Risk (2)
Some of the most profound developments in finance have been in the area of financial engineering and risk management. Financial engineering has resulted in an explosion of new securities, trading strategies, and in risk management programs. Indeed, in today’s economy over two thirds of large U.S. corporations use one type of financial engineering, namely derivatives, as part of their risk management program. The course seeks to help corporate managers understand how financial engineering can be used to advance the goals and strategies of the firm. This class provides an introduction to the basic building blocks of financial engineering, namely call and put options. These products are to finance, what the periodic table is to chemistry. By meshing options together, the financial engineer can create a financial product that exactly meets specific risk management needs. The course focuses on using derivatives to change a firm’s risk profile with respect to equity, interest rate, foreign exchange, and commodity risks. The ideas here extend to all areas of finance including mergers and acquisitions, international finance, capital budgeting and strategic planning. Prereq: E.M.B.A. candidates only.

EMBA 447. Leadership Assessment and Development (1.5)
The primary objective of Leadership and Executive Assessment and Development (LEAD) is to learn a method for assessing your knowledge, abilities, values, and interests relevant to leadership and executive management so that you will be able to develop and implement a plan for enhancing your leadership and executive capability throughout your career and life. The enabling objectives are: (a) To systematically identify your current and desired capability (i.e., knowledge, abilities, values, and interests); (b) To develop an individualized learning agenda and plan for the next 3-5 years; and (c) To explore techniques to assist others in doing the same. In this third module of the three-module series you will pull together elements from the first two modules to construct an individualized learning plan for your future growth and development. Prereq: E.M.B.A. candidates only.

EMBA 450. Managerial Marketing (2)
This course is designed with three overarching objectives. The first is an emphasis on decision making in a broad range of market contexts. The second objective builds on the notion that decision making is dynamic; that is, market situations demand not just one good decision but a series of them as a situation unfolds (providing new and varied information for each subsequent decision). Integrating concepts from a number of the courses that you are taking concurrently into decision-making about markets is a final objective. Coreq: E.M.B.A. students only.

EMBA 451. Competitive Strategy and Integrated Case (2.5)
This course will help you understand the keys to successful strategic planning - the capabilities needed for competitive advantage in each and every business of a firm. In particular, the course will help you understand the following. Critical capabilities vs. table stakes, how to position the firm in a market segment to maximize the chance of success and the limits to growth of the core business. All of the analysis will be done within a framework that integrates the core concepts developed in the other functional courses. Coreq: E.M.B.A. students only.

EMBA 452. Supply Chain and LEAN (1)
SC and Lean Operations managers are responsible for designing, running, controlling and improving the systems that accomplish production. This course is a broad-spectrum course with emphasis on techniques and information that are helpful to the practice of management in general and at any level. We will discuss commonly occurring application problems such as process analysis, inventory control, quality management, just-in-time concepts, etc. with applications in manufacturing, health care, insurance, hotel-management, airlines and government related operations. The emphasis will be on the fundamentals of the operations function in an organization. Also we will explore the interface of operations management with other functional areas such as marketing, finance, accounting, etc. Coreq: E.M.B.A. students only.

EMBA 453. Leadership Assessment and Development - II (1)
The primary objective of Leadership and Executive Assessment and Development (LEAD) is to learn a method for assessing your knowledge, abilities, values, and interests relevant to leadership and executive management so that you will be able to develop and implement a plan for enhancing your leadership and executive capability throughout your career and life. The enabling objectives are: (a) To systematically identify your current and desired capability (i.e., knowledge, abilities, values, and interests); (b) To develop an individualized learning agenda and plan for the next 3-5 years; and (c) To explore techniques to assist others in doing the same. In this second module of the three-module series you will receive 360-degree feedback on your emotional/social intelligence competencies. You will also
participate in a one-on-one executive coaching session with the instructor. Additionally, working with your group, you will apply the course concepts to the analysis of a current CEO. Coreq: E.M.B.A. students only.

EMBA 454. Cultural Challenges for Global Managers (1)
This course addresses some of the critical cultural issues faced by managers doing business in the global economy, such as: What is Culture? How does it impact business? What opportunities does it present for managers of local, as well as global organizations? Results of cross-cultural research are considered, but the course relies primarily on case analysis and class discussion to engage participants in creating solutions for the thorny issues presented. Prereq: E.M.B.A. candidates only.

EMBA 455. Managing in an Emerging Economy (1.5)
This course will prepare executives to add value to their organizations by understanding how to strategically position an organization for global success. Prereq: E.M.B.A. candidates only.

EMBA 456. Managing in the New Global Economy (1)
This course focuses on how aspects of today’s globalization (especially the reduction of trade barriers, rise of BRIC economies, and globally distributed product development) are impacting company strategies and operations. Prereq: E.M.B.A. candidates only.

EMBA 457. International Trade and Finance (2)
This course consists of two parts. The first part deals with the global trade and direct investment environment. It covers the theories as well as the political economy of international trade and foreign direct investment. Its aim is twofold: (i) to enable an understanding of such technical issues as to how the effects of tariffs and quotas differ or how free trade areas and customs unions differ; and (ii) to provide a systemic view of how government policies and corporate strategies interact in changing the global trade and investment environment of business. The second part of the course deals with regional economic integration and the global monetary system. Its aim is twofold (i) to enable an understanding of such technical issues as to how different stages of economic integration such as free trade areas and customs union differ; how the foreign exchange market functions in terms of different hedging instruments in the context of the international monetary system; and (ii) to provide a systemic view of how government policies and corporate strategies interact in changing the global trade and financial environment of business. Prereq: E.M.B.A. candidates only.

EMBA 464. Legal Environment (2)
This course provides a brief overview of the legal system that managers face, with an emphasis on contracts, corporate law, property rights and the modern regulatory apparatus of government. Prereq: E.M.B.A. candidates only.

QUANTITATIVE METHODS IN MANAGEMENT (QUMM)

QUMM 414. Statistics and Decision Modeling (3)
This course provides the foundations of statistical and operations research methodologies for managerial decision-making. Business statistics focuses on statistical thinking as one of the fundamentals of effective management. Topics covered include sampling and the normal distribution, making inferences from data via confidence intervals and hypothesis tests, and analyzing relationships between samples. Decision modeling of organizational systems uses mathematical and computer models to provide a quantitative perspective on identifying, analyzing and solving complex decision problems. This course includes an introduction to linear programming models and applications, simulation techniques in decision-making, and project management.

QUMM 414A. Statistics and Decision Modeling (1)
This class provides a brief look at management science and selected key tools and applications. Topics include modeling, linear programming, simulation and linear regression. Students should have a background in statistics and college-level algebra. Just-in-time statistics review workshops will be available at the beginning of the semester. Prereq: Open to ACL-MBA students.

QUMM 501. Special Problems and Topics (1 - 18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

QUMM 601. Special Problems and Topics (1 - 18)
This is a course of flexible design in which a student, with the agreement of an instructor in quantitative methods, may pursue a special topic or problem. M.B.A. students should enroll in QUMM 501.
The mission of the Case Western Reserve University School of Medicine is to advance the health of humankind through four interrelated components:

1) Education: To provide the highest-quality humanistic and scientific education for students pursuing the doctor of medicine degree, advanced degrees in the biomedical sciences, and graduate and continuing medical education.

2) Research: To lead in the development of new knowledge in the biomedical sciences, the clinical disciplines, and areas of inquiry that examine the organization and provision of health care services.

3) Clinical care: To deliver excellent clinical care through faculty members and bring leading-edge treatments from the laboratory to practice.

4) Public service: To contribute to the public good -- locally, nationally and globally -- in activities related to health and health care.

Since its founding in 1843, the Case Western Reserve University School of Medicine has been an innovator in medical education and a leader in pioneering research.

The school was one of the first medical schools in the country to employ instructors devoted to full-time teaching and research. Six of the first seven women to receive medical degrees from accredited American medical schools graduated from Western Reserve College (as it was called then) between 1850 and 1856.

Already a leading educational institution for more than a century, in 1952 the School of Medicine initiated the most advanced medical curriculum in the country, pioneering integrated education, a focus on organ systems and team teaching in the preclinical curriculum. This curriculum instituted a pass/fail grading system for the first two years of medical school to promote cooperation among students instead of competitiveness, introduced students to clinical work and patients almost as soon as they arrived on campus, and provided free, unscheduled time in an era when doing so seemed unthinkable. Many other medical schools followed suit, and these components remain at the core of the medical school’s curriculum today.

At least eleven Nobel Prize holders have ties to the School of Medicine:
- John J.R. Macleod, M.B., Ch.B., D.P.H., physiology professor at Case from 1903 to 1918, shared the 1923 Nobel Prize in Physiology or Medicine for the discovery of insulin. Dr. Macleod completed a considerable amount of the groundwork that furthered his understanding of diabetes in Cleveland.
- Corneille J.F. Heymans, M.D., who was a visiting scientist in the Department of Physiology in 1927 and 1928, received the Nobel Prize in Physiology or Medicine in 1938 for work on carotid sinus reflexes.
- Frederick C. Robbins, M.D., shared the 1954 Nobel Prize in Physiology or Medicine for his work on the polio virus, which led to the development of polio vaccines. He received the award two years after joining the medical school. Dr. Robbins was active at the school until his death in 2003, at which time he held the titles of medical school dean emeritus, University Professor emeritus, and emeritus director of the Center for Adolescent Health.
- Earl W. Sutherland Jr., M.D., who had been professor and director of pharmacology from 1953 to 1963, won the 1971 Nobel Prize in Physiology or Medicine for establishing the identity and importance of cyclic adenosine monophosphate (AMP) in the regulation of cell metabolism.
- Paul Berg, Ph.D., who earned his biochemistry degree at the university in 1952, received the 1980 Nobel Prize in Chemistry for pioneering research in recombinant DNA technology.
- H. Jack Geiger, M.D., a 1958 alumnus of the medical school, is a founding member and past president of Physicians for Social Responsibility, which shared the 1985 Nobel Peace Prize as part of International Physicians for the Prevention of Nuclear War, and Physicians for Human Rights (PHR), which shared the 1997 Nobel Peace Prize as part of the International Campaign to Ban Landmines.
- George H. Hitchings, Ph.D., who had been a biochemistry instructor from 1939 to 1942, shared the 1988 Nobel Prize in Physiology or Medicine for research leading to the development of drugs to treat leukemia, organ transplant rejection, gout, the herpes virus and AIDS-related bacterial and pulmonary infections.
- Alfred G. Gilman, M.D., Ph.D., a 1969 graduate of the medical school, shared the 1994 Nobel Prize in Physiology or Medicine for identifying the role of G proteins in cell communication.
- Ferid Murad, M.D., Ph.D., a 1965 graduate of the medical school, shared the 1998 Nobel Prize in Physiology or Medicine for discoveries concerning nitric oxide as a signaling molecule in the cardiovascular system.
- Paul C. Lauterbur, Ph.D., a 1951 graduate of the engineering school and a visiting professor of radiology at Case in 1993, shared the 2003 Nobel Prize in Physiology or Medicine for pioneering work in the development of magnetic resonance imaging.
- Peter C. Agre, M.D., who completed a fellowship in hematology at Case while a medical student at Johns Hopkins, shared the 2003 Nobel Prize in Chemistry for discoveries that have clarified how salts and water are transported out of and into the cells of the body, leading to a better understanding of many diseases of the kidneys, heart, muscles and nervous system.

Two other distinguished alumni have served as U.S. surgeon general: Jesse Steinfeld, M.D., a 1949 graduate, was surgeon general from 1969 to 1973, and David Satcher, M.D., Ph.D., graduated in 1970 and was surgeon general from 1998 to 2002.

Dr. Satcher also served as director of the Centers for Disease Control and Prevention from 1993 to 1998, and another medical school graduate, Julie Gerberding, M.D., M.P.H., followed in his footsteps, in 2002 becoming the first woman to be named CDC director.

The school is very proud of the contributions made by its educators and graduates but doesn’t rest on its laurels. Today, the Case School of Medicine is among the top medical schools in the enrollment of minority students, and each class contains a high percentage of women. The curriculum responds to the latest findings in education and medicine and sets the pace for other schools.

The Case School of Medicine was the first
medical school to provide laptop computers to all its students. Today, students use their laptops to access the entire syllabus as well as numerous electronic resources deemed essential by faculty. Students have access to the WiFi network at the medical school and across campus. The wireless network also brings the latest technological resources to the fingertips of faculty during classroom time and facilitates interactive education through video conferencing among many learning sites. But technology is used to enhance, not replace, the faculty-student interaction that occurs in the classroom, the laboratory and small group discussions.

The School of Medicine is the largest biomedical research institution in Ohio, as measured by funding received from the National Institutes of Health, the world’s largest funding agency of biomedical research. The medical school receives more NIH funding than all the other Ohio medical schools combined and is in the top tier of medical schools nationally.

U.S. News and World Report repeatedly has ranked the Case Western Reserve School of Medicine as one of the top research medical schools in the country.

In 2002, the school became only the third institution in history to receive the best review possible from the body that grants accreditation to U.S. and Canadian medical schools, the Liaison Committee on Medical Education. Also in 2002, the school built on its tradition of innovation in education when the university and the Cleveland Clinic Foundation entered into an agreement to form the Cleveland Clinic Lerner College of Medicine at Case Western Reserve University, with the first class matriculating in 2004.

HISTORY

Founded in 1843 as the Medical Department of Western Reserve College (and popularly known then as the Cleveland Medical College), the school moved into its first permanent home, in downtown Cleveland, in 1846. In 1915, a 20-acre site was secured for a medical center in University Circle, the current home of Case Western Reserve University, its School of Medicine, and two of the school’s affiliated hospitals, University Hospitals of Cleveland and the Louis Stokes Cleveland Department of Veterans Affairs Medical Center. University Circle also is home to many of the country’s outstanding cultural and educational institutions.

In 1924, the School of Medicine moved into the most modern and best-equipped preclinical science building in the country at that time. That building, donated by Cleveland industrialist Samuel Mather, remains an integral part of the medical school complex. It was named the Harland Goff Wood Building in 1993 in honor of the late chair and professor of biochemistry and former provost of the university.

In 1971, the Health Sciences Center was completed to house the university’s medical, dental and nursing schools, as well as the Health Center Library. In 1994, the health sciences complex was named for now-retired U.S. Congressman Louis Stokes. The proximity of these excellent research and educational centers to other prestigious university departments, including science, engineering and social sciences, stimulates uniquely creative interaction among researchers and educators.

Another giant leap in research capabilities came in the early 1990s, when the Richard F. Celeste Biomedical Research Building, named for the former Ohio governor, was opened. The $70 million building, attached to the Wood Building, added 154,000 square feet of research space and includes conference spaces, a lecture hall, public spaces and a cafeteria.

Recent boosts in research capabilities came with the spring 2003 dedication of a new, eight-floor addition to the School of Medicine’s Wood Building, which added more than 40,000 square feet to the medical school, primarily for research laboratories. Also as part of the project, 30,000 square feet of existing laboratory space in the Wood Building was renovated. And in the fall of 2003, the School of Medicine and University Hospitals of Cleveland dedicated the new, eight-floor Iris S. and Bert L. Wolstein Research Building, adding 320,000 square feet of space for up to 700 researchers.

FACULTY

The university’s medical school educators have received four Abraham Flexner Awards for Distinguished Service to Medical Education, more than have educators at any other medical school in the country, from the Association of American Medical Colleges.

The School of Medicine has 1,670 full-time and 2,104 part-time faculty members who teach in classroom, laboratory, small group and clinical settings. These faculty members work in the medical school’s fifteen preclinical departments, twenty clinical science disciplines, and numerous centers.

EDUCATION

In 2002, the School of Medicine became only the third institution in history to receive the best review possible from the body that grants accreditation to U.S. and Canadian medical degree programs, the Liaison Committee on Medical Education. School of Medicine faculty lead two programs leading to the M.D. at the School of Medicine (the longstanding School of Medicine program, also known as the University Program, and the Cleveland Clinic Lerner College of Medicine at Case Western Reserve University, also known as the College Program, which is scheduled to open in academic year 2004-2005), and one program resulting in an M.D. through the University Program and a Ph.D. in a basic science discipline through the School of Graduate Studies (the Medical Scientist Training Program or MSTP and the M.D./Ph.D. program offered through the Department of Epidemiology and Biostatistics). Also, through the School of Graduate Studies, School of Medicine faculty lead programs resulting in Ph.D. and master’s degrees in basic science disciplines. All of these degree programs are detailed in this School of Medicine section of this General Bulletin.

RESEARCH

As a research institution, the School of Medicine also has a tradition of national leadership. The National Institutes of Health (NIH) is the country’s largest funding source for biomedical research, and the School of Medicine consistently has ranked in the top tier of the nation’s medical schools for federal research funding from the NIH. In fact, fiscal year 2002 (at press time the latest year for which figures were available) marked the 16th consecutive year that NIH funding to the medical school had increased. In fiscal year 2002, the school received more than $239 million in grants from the NIH, including funds to the school’s newest affiliate, the Cleveland Clinic Foundation. The school ranked first among Ohio’s six medical schools, receiving more NIH funding than all the other Ohio schools combined.

CLINICAL CARE

The School of Medicine provides world-class clinical care through full-time faculty at its major affiliates, including the Cleveland Clinic Foundation, Louis Stokes Cleveland Department of Veterans Affairs Medical Cen-
ter, MetroHealth Medical Center, and University Hospitals of Cleveland. Their positions on faculty ensure the transition of leading-edge treatments from the laboratory to the clinical setting.

PUBLIC SERVICE

The School of Medicine also serves the northern Ohio community in many ways. The school’s faculty provide 90 percent of the indigent health care in Cuyahoga County and a majority of the care for indigent patients in Ohio. The School of Medicine’s commitment to the community also is illustrated by a number of programs that link researchers and medical students to the community. These include the Center for Science, Health and Society, the Office of Urban Health, the Center for Adolescent Health, the Center for Health Promotion Research, the Primary Care Track, and the Institute for Public Health Sciences, involving the MetroHealth System and the School of Medicine. This latter program includes research into the prevention, diagnosis and treatment of health problems in groups and communities, as well as educational programs for medical and graduate students, physicians and other health care personnel.

Current community-based programs, including the Urban Area Health Education Center (AHEC) and the award-winning Cleveland Health Education Program, offer opportunities for students from several of the university’s undergraduate and professional schools, especially the medical school, to interact with students in the Cleveland public schools and with the community at large. Also, through the master of public health degree program, students complete a public health field practicum in which they work on a project for a public agency and produce a report for the agency. M.P.H. graduates are qualified to work in local and state health departments, universities and colleges, hospitals, ambulatory medical centers, non-profit organizations, and the insurance and pharmaceutical industries.

A major economic influence on the northern Ohio area, the School of Medicine and its affiliated hospitals are among the largest employers of personnel in the area and further stimulate the economy by providing concepts for technology transfer to the business sector.

On the international level, the School of Medicine has a global health and diseases program focusing on AIDS, parasitic diseases, tuberculosis, malaria and other diseases that directly threaten world health.

ADMINISTRATION

The dean of the School of Medicine, who reports to the president of the university, also is vice president for medical affairs at Case Western Reserve University. The dean is responsible for the administration of the school and for the university’s relationships with affiliated hospitals; medical health-related agencies and institutions; and community health care, education and research programs involving the faculty of the School of Medicine. One of the dean’s newest education-related responsibilities is the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, a program within the School of Medicine that was announced in mid-2002. The dean of the School of Medicine also is the director of the Case Research Institute, a joint, virtual research enterprise of Case Western Reserve and University Hospitals of Cleveland, announced in late 2002, that brings together the strategic planning, operational aspects and financial support of all research initiatives of the clinical and translational departments of the School of Medicine and University Hospitals of Cleveland.

The chairs of university departments are delegated administrative responsibility in their respective areas and report to the dean.

The faculty of the School of Medicine, through the Faculty Council, plan and implement educational programs and formulate general policies and those regarding student affairs.

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Irwin Kornbluth, M.D.
I. Seniorael Henig, M.D.
Judith A. Evans, M.D.
Laura J. David, M.D.
Nancy J. Cosller, M.D.
Richard E. Holzheimer, M.D.
Robert L. Hinnes, M.D.
Sangithan Moodley
William Kenneth Hahn, M.D.
Yogesh G. Shah, M.D.

Clinical Associate Professor
Jacob F. Palomaki, M.D.
Michael T. Gyves, M.D.
Milton Linden, M.D.
Thomas I. Janicki, M.D.

Clinical Instructor
Alane Haney, M.D.
Amanda Catherine Ferry, M.D.
Ann Campbell
Barbara Shagawat, M.D.
Bradley A. Dennis, M.D.
C.K. Woo, M.D.
Caroly Lin B. Moes
Celina del Carmen Cunanan, M.S.,N.
Dan Lazarescu, M.D.
Daniel Rzepka, M.D.
David Vexler, M.D.
Deborah Genson, M.D.
Deborah Lane Freeman, M.D.
Robert R. Shenk, M.D.
Robert Tracy Ballock, M.D.
Roy Kenneth Greenberg, M.D.
Sharon Grundfest Broniatowski, M.D.
Terry A. King, M.D.
Thomas L. Steinemann, M.D.
Timur Paul Sarac, M.D.
Vikram S. Kashyap, M.D.

Assistant Professor
Alberto Iglesias, M.D.
Alon S. Aharon, M.D.
Amy McDonald, M.D.
Ari Blitz, M.D.
Bonnie J. Nicklas, Pod.D.
Bram R. Kaufman, M.D.
Brian L. Cmolik, M.D.
Christopher A. Haas, M.D.
Christopher Thomas Siegel, M.D., Ph.D.
Daniel A. Medalie, M.D.
Daniel W. Van Heecherken, M.D.
David Magnuson, M.D.
Diana Whittlesey, M.D.
Gilles Pinault, M.D.
Harry L. Reynolds, M.D.
Henry R. Baele, M.D.
Howard B. Goldman, M.D.
James S. Anderson, M.D.
Jason Corey Ganz, M.D.
Jason Michael Robke, M.D.
Jean T. Stevenson, M.D.
Jeffrey Claridge, M.D.
Jeffrey M. Marks, M.D.
Jeffrey Max Hardacre, M.D.
Jeffrey Nathan Lawton, M.D.
Jessie Jean-Claude, M.D.
John A. Moawad
John Pakiela, O.D.
Jonathan David Emery, M.D.
Juan Sanabria, M.D.

Judith A. White, M.D., Ph.D.
Keiko Hirose, M.D.
Kurt H. Dinchman, M.D.
Margaret McKenzie, M.D.
Margaret Verrees, M.D.
Mark Aeder, M.D.
Matthew Jeremaih Eagleton, M.D.
Michael J. Prokopius, M.D.
Michael Joshua Rosen, M.D.
Michael Vogelbaum, M.D., Ph.D.
Nicholas Boulis, M.D.
Nina N. Desai, Ph.D.
Pete S. Batra, M.D.
Peter T. Hallowell, M.D.
Robert Geertman, M.D., Ph.D.
Robert L. Parry, M.D.
Robert Roman Lorenz, M.D.
Roderick B. Jordan, M.D.
Roseanna Marie Lechner, M.D.
Rosemary Leeming, M.D.
Ryan Carey Goodwin, M.D.
Scott M. Wilhelm, M.D.
Sean Patrick Lyden, M.D.
Stephen P. Emery, M.D.
Steven L. Bernard, M.D.
Virginia Wong, M.D.
Wael Kamal Barsoum, M.D.
Yakov Elgudin, M.D., Ph.D.

Chair of Department
Hilel Lewis, M.D.
Jeffrey L. Ponsky, M.D.
Kenneth Oriel, M.D.
Mark A. Malangoni, M.D.

Clinical Assist Professor
Ahmad H. Shatila, M.D.
Alan H. Markowitz, M.D.
Allen S. Roth, M.D.
Amitabh Goel, M.D.
Anthony Forde

Barry Peskin, M.D.
Bryan J. Michelow, M.B.B.S.
Caldwell B. Esselstyn, M.D.
Cathy White-Owen, M.D.
Chandra Roy Altemare, M.D.
Charles K. Koster, M.D.
Dennis B. Brooks, M.D.
Donald W. Lenhart, M.D.
Elmer Perse, M.D.
Frederick Alexander, M.D.
George John Picha, Jr., M.D., Ph.D.
George V. Smith Jr., M.D.
Hanna Lisbona, M.D.
Haysam El-Dalati
Henry Eisenberg, M.D.
Isadore Lidsky, M.D.
James A. Malgieri, M.D.
James F. Rambasek, M.D.
James M. Persky, M.D.
John P. Ferron, M.D.
John W. DiFiore, M.D.
Julian Peskin
Kay Ellen Frank, M.D.
Kevin L. Muiise, M.D.
Michael P. Binder, M.D.
Richard V. Dowden, M.D.
Roland S. Philip, M.D.
Ronald L. Price, M.D.
Sharom Sutherland, M.D.
Steven Goldman, M.D.
Timothy J. Pritchard, M.D.
Tom I. Abelson, M.D.
Victor Scharf, M.D.
William E. Cappaert, M.D.
Womack Charles Stokes, M.D.

Clinical Associate Professor
Cynthia M. Austin, M.D.
Fred Plecha, M.D.
George G. Goler, M.D.
Arthur Porter, M.D.
Arturo S. Basa, M.D.
David Turk, M.D.
Frederic J. Levine, M.D.
Gerard A. DeOreo, M.D.
Gregory F. Kondray, M.D.
John T. Leininger, M.D.
Julian A. Gordon, M.D.
Lawrence A. Gervasi, M.D.
Lawrence H. Wolkoff, M.D.
Melissa D. Reigle, M.D.
Michael Barkoukis, M.D.
Michael T. Berte, M.D.
Robert A. Shapiro, M.D.
Robert F. Seymour, M.D.
Rodney Jay Ellis, M.D.
S. Mahoney III, M.D.
Sanford S. Luria, M.D.
Tim A. Sidor, M.D.
Clinical Associate Professor
Layton Kest, M.D.
Professor
Allen D. Seftel, M.D.
Donald R. Bodner, M.D.
Jack S. Elder, M.D.
Mani Menon, M.D.
Nehemia Hampel, M.D.
Stanley Althof, Ph.D.

AFFILIATED HOSPITALS

The Cleveland Clinic Foundation
In 2002, the university and the Cleveland Clinic Foundation entered into an agreement to form the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, with the first students matriculating in 2004. The “College Program” is a program within the Case School of Medicine.

The Cleveland Clinic was founded in 1921 by four Case Western Reserve faculty members, three of whom are counted among the alumni of the Case School of Medicine. The clinic’s main campus, where much of the activity associated with the program will occur, is located on 130 acres adjacent to and southwest of the Case Western Reserve campus.

The clinic includes the 12-story, state-of-the-art Crile Building, a 934-staffed-bed hospital (including a children’s hospital), the Cleveland Clinic Educational Foundation and the Lerner Research Institute.

In 2001, the clinic recorded more than 2.25 million outpatient visits and 52,000 hospital admissions. Among them were patients from all 50 states and 80 foreign countries. More than 1,100 full-time physicians and scientists and 700 house staff/fellows provide patient care in 100 specialties and subspecialties.

The clinic provides health care for Cleveland-area communities through a network of family health centers and medical offices located in Beachwood, Brunswick, Chagrin Falls, Creston, Elyria, Independence, Lakewood, Lorain, Solon, Strongsville, Westlake, Willoughby Hills and Wooster. Also, community-based oncologists offer a full range of hematology and oncology services for adults at eight suburban locations: Beachwood, Chagrin Falls, Independence, Middleburg Heights, Solon, Strongsville, Warrensville Heights and Willoughby Hills.

The Louis Stokes Cleveland Department of Veterans Affairs Medical Center
The Louis Stokes Cleveland Department of Veterans Affairs Medical Center (VAMC) is a major teaching hospital of the School of Medicine and is an important site for the education of medical students. The Cleveland VAMC also supports more than 100 residency and fellowship training positions in medicine, surgery, and psychiatry and their subspecialties. Most VAMC physicians hold faculty appointments within the School of Medicine. The affiliation is overseen by the Dean’s Committee, consisting of the dean, department chairpersons from the School of Medicine, and key VAMC officials.

The Cleveland VAMC is a part of the VA Healthcare System of Ohio, linking VA health care facilities in Ohio in an integrated service network. Inpatient care is provided at the Wade Park and Brecksville divisions and includes medicine, surgery, psychiatry, spinal cord injury, neurology and rehabilitation medicine as well as a nursing home and a domiciliary. Outpatient care is delivered in primary and specialty care clinics located at Wade Park, Brecksville, Akron, Canton, Cleveland, East Liverpool, Lorain, Mansfield, New Philadelphia, Painesville, Ravenna, Sandusky, Warren and Youngstown. The medical center serves more than 82,000 individual veterans annually through approximately 8,000 hospital admissions and 780,000 outpatient visits.

An active research program includes activities funded through the Department of Veterans Affairs and other governmental and private funding sources. Total funding of approximately $21.5 million annually (from all sources) supports more than 50 principal investigators in a broad range of research endeavors.

The MetroHealth System
The MetroHealth System has been serving the medical needs of the Cleveland community for more than 160 years. Today the hospital system is one of the largest, most comprehensive health care providers in Northeast Ohio.

The MetroHealth System includes: MetroHealth Medical Center, MetroHealth Center for Rehabilitation, MetroHealth Center for Skilled Nursing Care, Elisabeth Severance Center for Skilled Nursing Care at MetroHealth, MetroHealth Clement Center for Family Care, and a dozen urban and suburban primary care sites. In addition, in 2000, MetroHealth opened an outpatient surgery center on Cleveland’s west side. Together, these units provide a complete spectrum of health care services.

As Cleveland’s first hospital and the largest on the city’s west side, the 731-bed MetroHealth Medical Center is the flagship unit of The MetroHealth System. The medical center provides a full range of general and tertiary services for the acutely ill; rehabilitation services are provided through MetroHealth Center for Rehabilitation. MetroHealth is nationally recognized for its advanced techniques in treating complex medical problems. Special interests include emergency and trauma care, surgical specialties, family health, senior health, internal medicine, oncology, dentistry, women’s and children’s services, psychiatry, rehabilitation, and subacute and long-term care.

As a principal teaching center of the School of Medicine, MetroHealth maintains a fine tradition of academics and research. All active staff physicians are full-time faculty of the School of Medicine and actively participate in undergraduate and graduate medical education. Intensive training for physicians and medical professionals is offered in more than 25 medi-
MetroHealth Medical Center provides care to more than 27,000 inpatients, including more than 3,500 newborns, annually. More than 600,000 visits are recorded each year in the medical center’s 100 outpatient clinics. In addition, patient visits to the emergency room exceed 75,000.

University Hospitals Health System

University Hospitals Health System (UHHS) is the region’s premier healthcare delivery system, serving patients at more than 150 locations throughout northern Ohio.

The system’s 947-bed, tertiary medical center, University Hospitals of Cleveland (UHC), is the primary affiliate of Case Western Reserve University (Case). Together, they form the largest center for biomedical research in the state of Ohio. The system provides the major clinical base for translational researchers at the Case Research Institute, a partnership between UHC and Case Western Reserve University School of Medicine, as well as a broad and well-characterized patient population for clinical trials involving the most advanced treatments. Included in UHC are Rainbow Babies & Children’s Hospital, among the nation’s best children’s hospitals; Ireland Cancer Center, a National Cancer Institute-designated Comprehensive Cancer Center (the nation’s highest designation); and MacDonald Women’s Hospital, Ohio’s only hospital for women.

Committed to advanced care and advanced caring, University Hospitals Health System offers the region’s largest network of primary care physicians, outpatient centers and hospitals. The system also includes a network of specialty care physicians, skilled nursing, elder health, rehabilitation and home care services, managed care and insurance programs, and the most comprehensive behavioral health services in the region. For more information, go to www.uhhs.com/.

Cleveland Health Sciences Library

The Cleveland Health Sciences Library began operating in 1966 with an agreement between the Cleveland Medical Library Association and Case Western Reserve University. CHSL operates in two locations: the Health Center Library in the Robbins Building (formerly the east wing) of the School of Medicine, and the Allen Memorial Medical Library, at the corner of Euclid Avenue and Adelbert Road. Both libraries have public computers with full Internet access, black-and-white and color photo-
copiers, and quiet study areas. There is wireless network access throughout both libraries, and electrical outlets are available at study tables. The Health Center Library, which in 2003 underwent a $2.5 million renovation, offers several group study rooms and a Level 2 Technology Enhanced Classroom.

The CHSL collection consists of books, journals, theses, government documents, audio-visual items and electronic resources. The Dittrick Medical History Center collection, located at the Allen Memorial Medical Library, also contains archives, rare books, photographs and artifacts for research in the history of medical technology. The CHSL’s total collection numbers close to 400,000 volumes. CHSL receives more than 1,500 print subscriptions and has access to approximately 7,000 electronic journals and more than 220 research databases. These resources are included in the campus-wide online catalog, EuclidPLUS (http://catalog.case.edu), which also includes materials held by the University Library branches, the Law Library, the Harris Library of the Mandel School of Applied Social Sciences, the Cleveland Institute of Music Library, the Cleveland Institute of Art Gund Library, and the Laura and Alvin Segal College of Judaic Studies Library. Classes on using these electronic resources are offered through the CaseLearns program (http://library.case.edu/caselearns/).

CHSL is a member of the statewide consortium OhioLINK (http://www.ohiolink.edu). Requests for materials not available on campus or through OhioLINK may be made online using ILLiad (http://www.case.edu/chsl/illiad.htm). Complete information about the CHSL can be found at http://www.case.edu/chsl/homepage.htm/.

ENDOWED LECTURES

The Nikaan B. Anderson Lecture

Established in 1974 by friends of the late professor of anesthesiaology (from 1969 until his death in 1974), this annual lecture is presented by teachers of the science of anesthesia.

The Claude S. Beck Scholarship Visiting Lectureship

This lecture, about cardiovascular surgery, was established in 1989. At what is now known as the Case Western Reserve University School of Medicine, Claude S. Beck, M.D., was demonstrator of surgery in 1924 to 1925; professor of neurosurgery in 1940; and the first professor of cardiovascular surgery in the United States from 1952 until 1965.

The Richard E. Behrman, M.D., Lecture In Child Development

Established in 2001 with contributions from friends of colleagues of this former School of Medicine dean (1980 to 1989), this annual lecture is delivered by distinguished scholars in child development.

The Jack H. Berman, M.D., Lecture

Established in 1999 by family, friends and colleagues of this alumnus and associate clinical professor, guest lecturers discuss the basic science behind disease and its application to patient care through this program.

The Louis A. Bloomfield Memorial Lecture

Established in 1955 in memory of the Cleveland attorney Theodore R. Bloomfield by his widow and his son, this lecture brings outstanding members of the medical profession from around this country and abroad to discuss new concepts and developments in medicine with the medical community and allied professions.

The William E. Bruner, M.D., D.SC., Lecture In Ophthalmology

This lecture was established in 2002 in memory of the father of Clark E. Bruner and grandfather of William E. Bruner II, M.D., a 1975 medical school alumnus, with gifts coming from them as well as Susan E. Bruner.

The Courtney Burton Frontiers of Medicine Lecture

This annual lecture is presented by an outstanding individual who has achieved or helped achieve a significant advance in medicine or a closely related field and whose presentation would be of great interest to members of the medical profession. It is supported by a fund established in 1993. Courtney Burton Jr., was chair of the board of Ogletree Norton Co. from 1957 until shortly before his death in 1992.

The Alfred Cahen Memorial Lecture

This lecture series in gastroenterology has been supported by a fund established in 1965 by Lottie Cahen, widow of the founder and former president of World Publishing Co., in memory of her late husband.

The Frohring Presidential Lectureship
in Medicine and Engineering
Lecturers in medicine and engineering deliver this lectureship at the discretion of the University president thanks to a fund begun in 1993 by Paul R. Frohring.

Nathan S. Greenfield Family Visiting Lecturers in Pharmacology
Through an endowment, Rosalee Greenfield Weiss, Ph.D., and Raymond A. Weiss, Ph.D., established this annual lecture in 1997 to honor her father, Nathan S. Greenfield, a pharmacist who owned Wade Park Pharmacy in Cleveland from 1914 to 1956; her mother, Corinne Sternheimer Greenfield; and Lynn Stuart Weiss, daughter of the benefactors, who died of cancer in her mid-20s in 1971.

The Zella Hall Lecture
This annual lecture or series of lectures is presented by one or more distinguished visiting researchers selected by the dean of the School of Medicine or his or her designee. It/they are made possible because of support received in 1998 by the estate of Zella Hall.

The Hanna Lectures
Founded in 1913 by G. W. Crile, 1887-0W, in honor of H. Melville Hanna, philanthropist and founder of the M.A. Hanna Co., the Hanna Lectures are delivered by distinguished basic scientists from this country and abroad.

The William D. Holden Lectureship in Surgery
Established in 1985 by the members of the Department of Surgery of MetroHealth Medical Center in honor of their former chair and Payne Professor of Surgery, this series of lectures in surgery is delivered by distinguished leaders in American surgery.

The Lorand V. Johnson Lecture
This lecture, for residents and visiting staff members in ophthalmology, was established in 1967 by the Wright Foundation.

The Lester Krampitz Lecture and Education Fund
The fund was established in 1982 by family, friends and colleagues of former faculty member Lester Krampitz, M.D., to honor him with a lecture fund in microbiology. It is intended to facilitate the interchange of ideas, a process Dr. Krampitz, who joined the faculty in 1946 and retired in 1978, believes is vital to scientific research.

The Carl H. Lenhart Surgical Lecture
Established in 1955 by friends of this alumnus of the Class of 1904, in his memory, this lecture presents outstanding speakers on clinical developments in surgery.

The Roy Scott Lecture
Established by colleagues, students, family and friends in memory of the former head of the Department of Medicine of MetroHealth Medical Center, this lecture involves an annual two-day visit of a leading cardiologist, who presents the lecture and grand rounds to house officers and students of the School of Medicine.
Medicine.

The Robert Sternlicht Visiting Lecturers in Pharmacology and Cancer Biology
Originally established in 1990 by friends and family and named the Robert Sternlicht Memorial Fund, these lectures feature distinguished experts whose presentations will advance the study of oncology at the School of Medicine. Lectures are chosen by the chair of the Department of Pharmacology and the director of the comprehensive cancer center. Robert Sternlicht was the son of Himan Sternlicht, Ph.D., associate professor emeritus of pharmacology.

The Merton F. Utter Memorial Lecture
Established in 1981 in memory of the former professor of biochemistry and chair of the Department of Biochemistry, this lecture is delivered by a scientist of the highest caliber in a field related to those in which Dr. Utter was interested. Lecturers are chosen by the chair of the Department of Biochemistry.

The Austin S. Weisberger Lecture
Established in 1972 in the Department of Medicine, this lecture honors the memory of the man who, at the time of his death in 1970, was the John Huntington Hord Professor and chair of the Department of Medicine of the School of Medicine and University Hospitals.

The Harland G. Wood Endowment Fund in the Department of Biochemistry
Established in 1994 in memory of the late chair and professor of biochemistry and former provost of the university, this fund supports an annual Page-Wood symposium, co-sponsored by the School of Medicine and the Cleveland Clinic Foundation, featuring a leader in the field of biochemistry, an annual guest lecturer in biochemistry, and an annual guest lecturer selected by faculty with the rank of assistant professor in the Department of Biochemistry.

PUBLICATIONS
Below are listed some of the many publications produced in paper form by the Office of Development, Alumni Relations, and Communications. Many of them are accessible via the Web, too; visit http://casemed.case.edu and click on “news and publications.” News articles about the School of Medicine also are accessible at this site.

Communique
Communique is the calendar of events for the School of Medicine. It is published monthly in paper form and also is updated continuously on the Web.

Medical Bulletin
The Medical Bulletin is a magazine for faculty, students, alumni, friends and media. Published three times a year, the Medical Bulletin contains feature articles highlighting research and education, as well as additional areas of interest. Articles provide a glimpse into the people behind the programs. Alumni receive an additional insert, Alumni News, which features class notes and obituaries as well as other news of special interest to alumni. A stand-alone edition of Alumni News featuring reunion coverage is published once a year for alumni.

MedLines
MedLines, a newsletter for faculty, staff, students, alumni, friends and media of the School of Medicine, is published about six times a year. It highlights news about research, education, and the people at the medical school.

Focus
Focus is a biannual tabloid produced by the Office of Development, Alumni Relations, and Communications. It provides the medical school with the chance to thank its generous individual and organizational donors and inform them, and potential donors, of additional giving opportunities. As of press time, Focus was not available online.

Admissions Brochure
The Office Development, Alumni Relations, and Communications also produce a publication for prospective medical students. The information also is available online by visiting http://casemed.case.edu and clicking on “admissions.”

Annual Report
The medical school produces an annual report highlighting accomplishments in research, education and service. It includes an “honor roll” of donors for the most recent fiscal year. It is available online.

ADMISSION TO MEDICAL SCHOOL
Those interested in obtaining a degree other than the medical degree should contact the appropriate school within the university. See individual schools’ listings elsewhere in this publication for contact information.

There are three paths to a medical degree at Case Western Reserve University School of Medicine: the University Program, the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University (College Program), and the Medical Scientist Training Program (MSTP).

All inquiries about admission and application to the University Program should be addressed to:

OFFICE OF ADMISSIONS
School of Medicine
10900 Euclid Ave.
Cleveland, Ohio 44106-4920
Phone: 216-368-3450
casemed-admissions@case.edu

All inquiries about admission and application to the College Program should be addressed to:

OFFICES FOR MEDICAL EDUCATION
Cleveland Clinic Lerner College of Medicine of Case Western Reserve University
9500 Euclid Ave., NA21
Cleveland, Ohio 44195
Phone: 216-445-7170 or 866-735-1912
ccclcm@ccf.org

All inquiries about admission and application to the Medical Scientist Training Program should be addressed to:

MSTP OFFICE
School of Medicine
Case Western Reserve University
10900 Euclid Ave.
Cleveland, Ohio 44106-4936
216-368-3404
cvh3@case.edu or djh5@case.edu

The information below pertains to prospective medical students. For additional information, visit http://casemed.case.edu and click on “admissions.”

Getting Started
Students wishing to apply to the School of Medicine, including the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, must initiate the process on the Internet through the American Medical Colleges Application Service (AMCAS). To learn more about the AMCAS application process, visit http://www.aamc.org/students/am-
Admissions Process

Here’s how the admissions process works at the School of Medicine: After AMCAS receives an applicant’s electronic application, he or she receives an e-mail directing him or her to the Case School of Medicine online secondary (final) application. Applicants should complete this application as instructed. After the applicant has submitted the secondary application and all supporting materials, the appropriate admissions committee will review the information and decide whether to invite the applicant for an interview. After the interview, the committee will decide whether to extend an offer of admission. Applicants are notified of the committee’s decision no later than May 1.

Admissions Criteria

Although the admissions committee considers grades and the score on the Medical College Admission Test (MCAT) in the admissions process, high grades and a high score on the MCAT alone are not sufficient criteria for admission (the MCAT is mandatory; however). Just as important are qualities such as integrity, interpersonal skills and leadership ability.

Academic Requirements

Applicants must have a solid foundation in the sciences needed to understand modern biomedical information. At a minimum, applicants should possess the following knowledge:

- Biology. Applicants ordinarily satisfy this requirement if they’ve taken a one-year course in biology that stressed molecular and quantitative concepts. Courses in anatomy, taxonomy, botany and ecology will not satisfy this requirement.
- Chemistry (through organic). Applicants normally meet this requirement if they’ve completed a one-year course in basic chemistry and a one-year course in organic chemistry. Other sequences, and courses that included organic/biologic chemistry content, are acceptable, too.
- Basic physics. Applicants generally satisfy this requirement if they’ve taken a one-year course in physics.
- Writing skills. Applicants typically meet this requirement if they’ve taken an introductory course in expository writing. The committee considers other courses that required extensive writing, however.
- Biochemistry. A course in biochemistry is required of all those applying to the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University and is highly recommended for those applying to the Case School of Medicine.
- Basic physics. Applicants generally satisfy this requirement if they’ve completed a one-year course in physics.
- Writing skills. Applicants typically meet this requirement if they’ve taken an introductory course in expository writing. The committee considers other courses that required extensive writing, however.

Financial Aid

About 80 percent of the university’s medical students receive some financial aid based strictly on financial need. It’s impossible to provide precise figures on financial aid before each specific situation is completely analyzed, but here is a description of the general aspects of the process:

The School of Medicine adheres to the unit loan concept used by most private medical schools. Under this concept, if a student qualifies for financial aid, he or she is expected to obtain a specific portion of his or her support from outside sources such as a Stafford Loan, savings and family. Once the student obtains this amount, the remaining aid would be provided through School of Medicine resources, up to the amount determined to be his or her reasonable need. The school’s contribution would be a combination of loan and scholarship, with the exact ratio determined by the student’s particular circumstances.

Programs such as the Medical Scientist Training Program, the M.D./Ph.D. in health services research program, and others offer financial support for participants. For more information, see other entries in this publication and contact the specific program.

Also, the medical school offers up to 17 merit scholarships annually to each class through its Dean’s Scholars program and David Satcher, M.D., Ph.D.-Rubens Parnies, M.D. Minority Student Scholarship program. These scholarships, which vary in annual amounts up to $30,000, are awarded for up to four years for selected students. The school also offers up to four merit scholarships through the Alumni Scholars and Amici Scholars programs. These scholarships are $20,000 annually for up to four years for selected students. Application for the scholarships is by invitation of the admissions committee. Recipients are students with records of exceptional academic and personal achievement.

To Those Currently in College

The admissions committee gives preference to candidates who will have completed the requirements for a bachelor of arts or bachelor of science degree before entering medical school. Most accepted candidates rank in the top one-third of their classes, and a large proportion of them have outstanding scholastic records.

The committee’s main considerations are the overall quality of college performance and general ability and potential. In most instances, applicants are given priority if they have completed all minimum academic requirements and have taken the MCAT by the time they submit their AMCAS applications. Although no special emphasis is placed on the applicant’s major / field of study, the committee strongly favors the concept of a broad, general college education.

THE SCHOOL OF MEDICINE VALUES A WIDELY DIVERSE STUDENT BODY.

Students who have been out of college a year or more:

Those who have been out of college for a year or more are encouraged to apply. Approximately half of the students at the School of Medicine have a year or more between the time they graduate from college and the time they enter medical school, and about 10 percent of them begin medical school when they are 30 years old or older.

Those two or more years removed from full-time college course work should plan to take challenging, advanced-level (junior-, senior- or graduate-level) courses in the biological sciences to prepare for entry.

PROGRAMS LEADING TO M.D.

Today, applicants can choose from three paths to obtain a medical degree at Case Western Reserve University: the University Program, the University Program, and the University Program.
Clinical experiences begin in the first week of and 5) patient-based activities.

The WR2 Curriculum also creates an independent, educational environment where learning is self-directed and where student education primarily occurs through: 1) facilitated, small-group student-centered discussions 2) large group interactive sessions such as Team Learning or didactic sessions that offer a framework or synthesis, 3) interactive anatomy sessions, 4) clinical skills training, and 5) patient-based activities.

Research and Scholarship begin early in the curriculum with weekly sessions led by faculty engaged in cutting edge research. In the summer following year one, the majority of students engage in summer research opportunities. All students participate in a mentored 16 week experience in research and scholarship and complete an MD thesis prior to graduation.

Electronic resources make the most of classroom time while improving opportunities for self-directed learning and capitalizing on the innovative technology available at Case Western Reserve University.

A key component of the University Program is the unscheduled time on Thursday mornings and weekday afternoons. Students use this time for self-directed learning as well as to pursue a joint degree, take electives, participate in interest groups, shadow a practicing physician, or become active in student organizations.

Each student in the University Program is a member of one of the following advising societies: Emily Blackwell Society, Frederick Robbins Society, David Satcher Society, or Joseph Wearn Society. Each society is headed by an advising dean, who helps the students navigate the curriculum, advises them on residency and career planning, and writes their dean's letters.

Society deans hold regularly scheduled small group and individual meetings with the students. The society deans are all members of the faculty of the School of Medicine and participate actively in the educational programs of the school. Some aspects of the curriculum are coordinated through the societies.

Please see the “Curricular structures of Case M.D. programs” chart and “The four-year University Program in detail” section on subsequent pages of this publication for additional information.

OVERVIEW OF THE COLLEGE PROGRAM

OVERVIEW OF THE UNIVERSITY PROGRAM

The University Program curriculum always has reflected the latest in educational practices and medical knowledge. In the 1950s the School of Medicine was the first to introduce the organ systems approach to teaching the basic sciences. In July 2006 the University Program launched the Western Reserve2 Curriculum (WR2) to create a system of learning that reunites the disciplines of public health and medicine into a single, integrated program of study.

The WR2 Curriculum has high expectations for self-directed learning, and seeks to train physician scholars who are prepared to treat disease, promote health and examine the social and behavioral context of illness. It interweaves four themes of research and scholarship, clinical mastery, leadership and civic professionalism to prepare students for the ongoing practice of evidence-based medicine in the rapidly changing healthcare environment of the 21st century.

Scholarship and clinical relevance are the benchmarks for learning, and clinical experiences and biomedical and population sciences education are integrated across the four years of the curriculum. The WR2 Curriculum also creates an independent, educational environment where learning is self-directed and where student education primarily occurs through: 1) facilitated, small-group student-centered discussions 2) large group interactive sessions such as Team Learning or didactic sessions that offer a framework or synthesis, 3) interactive anatomy sessions, 4) clinical skills training, and 5) patient-based activities.

Clinical experiences begin in the first week of the University Program when students participate in community-based health care field experiences. In the second month of medical school, students begin the Rotating Appren
ticeship in Medicine Program (RAMP). This program involves students in five patient care settings. In January of the first year, students begin the Community Patient Care Preceptorship (CPPC). Each student works with a community physician one afternoon a week for the next year.
ogy with emphasis on areas of relevance to human health and disease. Topics include: basic cell structure; protein structure and function; genomic organization and expression, including basic genetics, DNA repair and recombination, transcriptional regulation, RNA processing and translation; membrane structure and function, including membrane protein biosynthesis and function; cell signaling pathways, including hormone and drug action; metabolism and energetics. Prereq: Consent of department.

OVERVIEW OF THE MEDICAL SCIENTIST TRAINING PROGRAM (MSTP)

A combined M.D./Ph.D. program in biomedical sciences, the Medical Scientist Training Program (MSTP), is available for students desiring research careers in medicine and related biosciences. This program takes seven to eight years to complete, depending on the time needed to complete the Ph.D. dissertation research. Financial support includes a stipend and full tuition support.

Candidates must meet established prerequisites for admission to both the School of Medicine and the School of Graduate Studies. Criteria include demonstrated capabilities in research and superior undergraduate academic credentials. Applicants must have either U.S. citizenship or permanent residency status to be considered for admission to the MSTP. Descriptive materials and applications can be obtained by contacting the MSTP program.

The first two years of the MSTP are centered on the University Program pre-clinical core medical school curriculum, which occupies five mornings each week. Afternoons are include time for graduate courses and/or research rotations, as well as clinical training, thus integrating the medical school and graduate school experiences. The next three to four years are devoted to completion of graduate courses and Ph.D. thesis research in one of the multiple MSTP-affiliated graduate programs. During the Ph.D. phase, MSTP students can choose to participate in the MSTP Clinical Tutorial, a program designed to enhance clinical skills and allow students to develop connections between their research and clinical interests (this further addresses the goal of integrating medicine and science). After completion of the Ph.D. program, students return to medical school for two years to complete clinical clerkships and finish the M.D. curriculum.

The program is administered by the MSTP Steering Committee, which consists of faculty from both basic science and clinical departments. Its functions include selecting candidates for admission, designing and administering the program curriculum, advising students and evaluating student progress. Please see the “Curricular structures of Case M.D. programs” chart, “The Medical Scientist Training Program in detail” section, and the Medical Scientist Training Program (under Other Degree Programs) and Integrated Biological Sciences entries on subsequent pages of this publication for additional information.

CURRICULAR STRUCTURES OF CASE M.D. PROGRAMS

University Program
(4 year program with optional 5th year)

YEAR 1
Foundations of Medicine and Health, Foundations of Clinical Medicine (FCM), summer research opportunities, RAMP, clinical preceptorships

YEAR 2
Foundations of Medicine and Health, FCM, study period for National Boards examination, Basic Core clinical rotation or research block

YEAR 3
Basic Core clinical rotations, research block, Advanced Core clinical rotations, sub internships, electives

YEAR 4
Sub internships, electives, Area of Concentration, MD thesis completion, Becoming a Doctor II

YEAR 5 (OPTIONAL)
University Program students may elect a fifth year of study for research and scholarship

College Program - Basic research curriculum and experience

YEAR 1
College Program basic science and research curriculum, ICM

YEAR 2
College Program basic science and research curriculum, ICM

YEAR 3
Research thesis required for graduation

YEAR 4
Optional MSTP Clinical Tutorial

YEAR 5
Ph.D. program

YEAR 6 (IF NEEDED)
Ph.D. program

YEAR 7
Third year MD curriculum (core clinical clerkships)

YEAR 8
Fourth year MD curriculum (completion of core clinical clerkships if necessary, clinical and research electives)

THE UNIVERSITY PROGRAM IN DETAIL

The Western Reserve2 Curriculum (WR2) creates at Case a system of learning that reunites the disciplines of public health and medicine into a single, integrated program of study. The WR2 Curriculum has high expectations for self-directed learning, and seeks to train physi-
cian scholars who are prepared to treat disease, promote health and examine the social and behavioral context of illness. It interweaves four themes of research and scholarship, clinical mastery, leadership and civic professionalism to prepare students for the ongoing practice of evidence-based medicine in the rapidly changing healthcare environment of the 21st century.

Scholarship and clinical relevance are the benchmarks for learning, and clinical experiences and biomedical and population sciences education are integrated across the four years of the curriculum. The WR2 Curriculum also creates an independent, educational environment where learning is self-directed and where student education primarily occurs through: 1) facilitated, small-group student-centered discussions 2) large group interactive sessions such as Team Learning or didactic sessions that offer a framework or synthesis, 3) interactive anatomy sessions, 4) clinical skills training, and 5) patient-based activities.

EDUCATION THROUGHOUT THE FOUR YEARS IS CENTERED ON:

1. Fostering experiential and interactive learning in a clinical context;
2. Stimulating educational spiraling by revisiting concepts in progressively more meaningful depth and increasingly sophisticated contexts;
3. Promoting integration of the biomedical and population sciences with clinical experience;
4. Transferring concepts and principles learned in one context to other contexts;
5. Enhancing learning through deliberate practice, or providing learners with direct observation, feedback, and the opportunity to practice in both the clinical environment and in the Case School of Medicine’s Mt. Sinai Skills and Simulation Center.

THE WESTERN RESERVE 2 CURRICULUM HAS 10 GUIDING PRINCIPLES.

1. The core concepts of health and disease prevention will be fully integrated into the curriculum.
2. Medical education will be experiential and emphasize the skills for scholarship, critical thinking, and lifelong learning.
3. Educational methods will be chosen that stimulate an active interchange of ideas among students and faculty.
4. Students and faculty will be mutually respectful partners in learning.
5. Students will be immersed in a graduate school educational environment characterized by flexibility and high expectations for independent study and self-directed learning.
6. Learning will be fostered by weaving the scientific foundations of medicine and health with clinical experiences throughout the curriculum. These scientific foundations include basic science, clinical science, population-based science, and social and behavioral sciences.
7. Every student will have an in-depth mentored experience in research and scholarship.
8. Recognizing the obligations of physicians to society, the central themes of public health, civic professionalism and leadership will be longitudinally woven throughout the entire curriculum.
9. The systems issues of patient safety, quality medical care, and health care delivery will be emphasized and integrated throughout the curriculum.
10. Students will acquire a core set of competencies in the knowledge, mastery of clinical skills and attitudes that are pre-requisite to graduate medical education. These competencies will be defined, learned and assessed and serve as a mechanism of assessment of the school’s success.

Curricular Composition

The four years of the WR2 Curriculum is divided into four major components, each of which will focus on health as well as disease, and the health of populations in addition to the health of individual patients.

1) Scientific and Clinical Foundations of Medicine and Health: This component is made up of six blocks.

The first block – Becoming a Doctor I - is six weeks in duration, and gives students an understanding of the doctor’s role at the bedside and in society. Typically students begin their medical education by studying basic science at the molecular level, and are often not fully aware of the relevance that this knowledge has in their future education as physicians or how it relates to the actual practice of medicine. This curricular block focuses on how physicians can act as advocates for their patients in the health care system; how social and environmental factors impact health; and the importance of clinical research as the unifying principle between disease biology and the science of clinical practices. This block also has a strong emphasis on the importance of critical thinking and rigorous methodologies in the measurement of clinical phenomena.

Becoming a Doctor II – Captive Experience: During the fourth year of medical school, all students will be required to return to campus for two-three weeks of focused, shared experiences during which they revisit the social and behavioral determinants of health and disease and health system issues within the context of the basic science, clinical skills and evidence-based medicine they’ve learned since entering medical school.

The next five blocks in the Foundations of Medicine and Health are comprised of basic science education complemented by clinical immersion experiences, early contact with patients in clinical preceptorships and simulated clinical experiences. Subject matter is integrated across entire biological systems, which permits faculty in the different disciplines to leverage teaching time to convey content and concepts common to their disciplines. Content is divided into the following blocks:

• Human Blueprint: Comprised of endocrine, reproductive development, genetics, molecular biology, and cancer biology.
• Food to Energy: Encompasses gastro-intestinal system, nutrition, energy, metabolism and biochemistry.
• Homeostasis: Includes cardiovascular system, pulmonary system, renal system, cell regulation, and pharmacology.
• Host Defense and Host Response: Focuses on host defense, microbiology, blood, skin, and the auto-immune system.
• Cognition, Sensation and Movement: Comprised of neurosciences, mind, and the musculoskeletal system.

Several themes stretch longitudinally across these blocks, including anatomy, histopathology and radiology, as well as clinical mastery. Leadership, bioethics, and research methods are likewise incorporated longitudinally.

Blocks 2-6 follow a common pattern. Each block has a Clinical Immersion Week and each has a Reflection and Integration Week. During the Clinical Immersion Week, students leave the classroom and enter the clinical setting to see the relevance of the basic science they have been studying as the concepts are used in the setting of patient care.

The Reflection and Integration week is the final week of blocks 2-6. During this week, no new material is introduced. Learning activities are planned to help students spiral back to concepts introduced earlier in the block by...
presenting these concepts again, sometimes in new contexts, and now integrated with other concepts previously learned. End of block assessment takes place during the reflection and integration week.

2) Research and Scholarship: The WR2 Curriculum increases Case’s emphasis on research and scholarship to encourage student career development in the areas of clinical investigation and population research. The practice of medicine is becoming increasingly evidence and science-based, and research teaches students a way of thinking that makes them better doctors. The focus on research and scholarship provides medical students with opportunities to pursue individualized areas of interest in great depth. Through this 16-week, mentored experience in research and scholarship (which can be taken at any point from March of the second year onward), students acquire the intellectual tools needed to formulate research questions, critically assess scientific literature and continue the life-long pursuit of learning that is a critical aspect in the careers of all physicians and physician/scientists. The research project culminates in a thesis, which is written in the format of a manuscript of the leading journal in the particular area of interest.

3) Clinical Experiences: The clinical curriculum cuts across all four years of the medical school curriculum, and can be divided into three areas of involvement:

a. Foundations of Clinical Medicine: This segment of the clinical curriculum runs longitudinally through the Foundations of Medicine and Health, and is divided into three components:
   i. Foundations of Clinical Medicine Seminars: Beginning in “The Human Blueprint,” Block 2, students participate in weekly two hour Foundations of Clinical Medicine Seminars. These seminars combine small group and large group teaching methods as they continue the themes introduced in “Becoming a Doctor.”
   ii. RAMP: Beginning in September of Year 1, groups of students participate in Rotating Apprenticeships in Medical Practice (RAMP), during which they each rotate through patient care encounters in multiple settings.
   iii. Community Patient Care Preceptorship (CPCP): After completing RAMP, students select a clinical setting and a physician preceptor with whom they will work. Students meet with these preceptors every week, and have the opportunity to practice clinical and communication skills while receiving feedback from their practicing physician mentor.

b. Basic Core Clinical Rotations: Beginning in March of their second year, students undertake their core clinical rotations in 16-week blocks: Basic Core I (Family Medicine, Internal Medicine, and Surgery) and Basic Core II (Neurology, Pediatrics, OB/Gyn, and Psychiatry). Each of these clinical rotations is offered at all of the School of Medicine’s hospital affiliates (including University Hospitals of Cleveland, the Cleveland Clinic Foundation, MetroHealth Medical Center and the Louis Stokes VA Medical Center).

c. Advanced Core Rotations: These consist of 4 separate, required 4-week rotations that can be completed in any order at any of our partner hospitals listed above. The domains for these experiences are: Chronic Illness, Aging in Men and Women, Peri-operative Critical Care and Pain Management, and Undifferentiated Care. All rotations in a domain share the same learning objectives, but the specific content varies from site to site depending on clinical and educational strengths.

In all Core Clinical Rotations, students experience both breadth and depth in clinical care, and clinical experiences are developmental, with opportunities to reinforce, build upon, and transfer knowledge and skills. Clinical learning is also integrated across disciplines whenever possible, and the roles of basic science, civic professionalism, scholarship, and population health in clinical care are evident throughout the clinical curriculum. Students likewise have patient care responsibilities that are progressive in sophistication and increasing in amount as their level of clinical skill and knowledge increases, and all core clinical competencies are addressed and assessed using common methods used at each clinical site at which rotations occur.

4. Advanced Clinical and Scientific Studies: Advanced clinical and scientific studies have three components: 1) in-depth clinical preparation for internship through the selection of sub-internships; 2) in-depth scholarship through selection of areas of concentration that integrate clinical and basic science within a defined area of study; and 3) broad opportunities for further clinical and research electives. An area of concentration encompasses three to four months of study, including advanced clinical experiences and in depth study through seminars in medicine and health.

EVALUATION AND ASSESSMENT

Student assessment in the WR2 Curriculum is designed to accomplish three goals: 1) drive the types of learning and inquiry that are goals for the WR2 Curriculum; 2) ascertain whether students attain the level of mastery set as a goal for graduates of Case; and 3) prepare students for the Multiple Choice Question (MCQ) USMLE exams. These three goals are accomplished through multiple different assessment methods.

Independent student study and inquiry are hallmarks of WR2 through assessment strategies that are formative, focus on the synthesis of concepts, and promote student responsibility for the mastery of skills and material. The following assessments are used in the Foundations of Medicine and Health:

1) Assessment of students’ participation in weekly Case Inquiry (IQ) groups by faculty facilitators, utilizing observable behavior anchors and focusing on contributions to the group content, contributions to the group process, and professional behaviors.

2) Synthesis Essay Questions (SEQs). Weekly, formative, open book concept reasoning exercises in which students are given a brief written clinical scenario and asked to explain a clinical phenomenon and its basic science underpinnings. Throughout a teaching block, students complete SEQs at the end of each week. They then compare their answers to an ideal answer template as well as get feedback on their reasoning ability from their IQ group facilitator.

3) Summative Synthesis Essay Questions (SSEQs), or exercises that measure what students know at specific points in their education, are closed book exercises with approximately 5 scenarios that take 3-4 hours to complete. These SSEQs are based on the synthesis essays students have done in an open book fashion throughout the block. In the final week of the block SSEQs present concepts from previous exercises in new contexts and require a more sophisticated level of concept integration. These summative exercises are scheduled at the end of each large teaching module (every 3-4 months) and are graded by the faculty who
are content specialists.

4) Structure Practical Exercises. These assessments will occur in the final week of blocks 2-6 and will integrate anatomy, histopathology and radiology through clinical scenarios and questions that ask for anatomic localization and histo-pathologic identification.

5) Self Assessment Multiple Choice Questions (MCQs). At the beginning of each 12 week teaching block students will have access to 200 MCQs and answers drawn from the School of Medicine’s existing extensive bank of questions which will be mapped to learning objectives for the block. These questions are representative of those given during the USMLE Part I. Students can use these MCQs through the block as a study aid and method for self-assessment.

6) Cumulative Achievement Tests (CAT). At the end of each block, students will complete a secure formative MCQ achievement test, based on content covered in the current teaching block as well as on content from each previous block. These exams will be designed, utilizing test question resources available through the NBME. Tests will become progressively longer throughout the Foundations of Medicine and Health. The final CAT will reflect material across all curriculum blocks. These formative tests are for student use only, and enable students to gain perspective on their overall progress and preparedness for the USMLE.

7) Student progress in Foundations of Clinical Mastery is measured by small group facilitator assessment in the Seminars of Clinical Practice, direct observation of skills, preceptor evaluation of patient-based activities, and OSCE examinations.

8) Personal Learning Plan. During the Reflection and Integration Week, students review the learning objectives for the block and reflect on their learning, identifying their strengths and areas for further study. A reflective essay is completed that links to pieces of evidence, accumulated throughout the block, to support why areas of strength and areas for further growth have been identified. A plan for further learning is then developed.

The WR2 Curriculum provides students with a focused education that employs a limited number of classroom hours, but lays the expectation for around the clock learning by students. The content of WR2, organized across biological systems, provides students with an integrated view of medicine and health and a clearer understanding of how the basic sciences and clinical practice relate to one another. The flexibility of WR2 permits students to explore in depth an area of interest to them alongside a mentor, and the curriculum’s focus on the social and behavioral context of health and disease as well as on population medicine, will prepare students to face the emerging challenges of today’s health care system.

**Western Reserve2 Curriculum Core Clinical Rotations**

The Core Clinical Rotations, launched in July 2006, represent an integrated approach to clinical education that is shared by students from both the University and College programs of the Medical School. Students engage in clinical learning with basic science correlation through patient-based experiences that are developmental and provide opportunities to acquire, reinforce, build upon, and transfer knowledge and skills. In the Basic Cores, students are based one of the three affiliated hospital systems (UH/VA, MetroHealth, CCF) for an entire 16 week experience, facilitating meaningful educational relationships and support. The Advanced Core rotations are shared among teaching sites and are designed as 4-week modules that address areas of curricular need.

**BASIC CORE I**

Family Medicine, Internal Medicine, Surgery
Basic Science Integration
(16 weeks at one of 3 teaching sites - UH/VA, MetroHealth, Cleveland Clinic)

**BASIC CORE II**

Neurology, Pediatrics, Psychiatry, Women’s Health (OB/GYN)
Basic Science Integration
(16 weeks at one of 3 teaching sites – UH/VA, MetroHealth, Cleveland Clinic)

**ADVANCED CORE**

Undifferentiated Care, Chronic Illness, Aging in Men and Women, Peri-Operative Critical Care and Pain Management
(Each four weeks, flexible scheduling, all sites)

**Assessment for Promotion and Graduation**

The faculty of the School of Medicine is charged with assessing all aspects of student performance, including knowledge, skills and personal characteristics that are pertinent to the development of a responsible, competent and humane physician. This responsibility is delegated by the faculty to the Committee on Students, a standing committee of the faculty of medicine, with a majority of its members faculty-elected.

The Committee on Students reviews the performance of every medical student in the University Program during each of the four years, determines each student’s continuing status as a student in the school, and recommends candidates for graduation. The committee reviews a medical student’s total performance, which includes the usual indices such as formal grades and assessments, as well as the professional attitudes and behavior manifested by the student. Medical education entails the mastery of didactic, theoretical, and technical matters as well as the demonstration of appropriate professional and interpersonal behavior, sensitivity, sense of responsibility and ethics, and the ability to comport oneself suitably with patients, colleagues and co-workers. To be eligible for promotion and graduation, students must complete the requirements and perform satisfactorily in all components of the curriculum. Medical students in the University Program are graded “satisfactory” or “identified for remediation” in the first two years and as “honors”/ “commendable”/ “satisfactory”/ “unsatisfactory”/ “incomplete” in the clerkships of the third and fourth years. There is no class ranking.

In addition, medical students must obtain at least the minimum passing score as established by the United States Medical Licensing Examination Composite Committee on the U.S. Medical Licensing Examination (USMLE) Step 1, Step 2 Clinical Knowledge Examination and Step 2 Clinical Skills Examination to be eligible for graduation from the school.

**THE FIVE-YEAR COLLEGE PROGRAM IN DETAIL**

The goal of the curriculum of the five-year Cleveland Clinic Lerner College of Medicine of Case Western Reserve University (College Program) is to foster a passion for scientific inquiry and skills for critical thinking, coupled with broad-based clinical expertise, to optimally position the M.D. graduate to pursue a career as a physician-investigator. The College Program is unique in the United States in incorporating a research thread woven throughout the five-year curriculum, including two full summers focused on research training and experiences, and an additional full year to enable students to complete a substantive research thesis required for graduation. The
educational program nurtures the students’ curiosity about science and medicine and provides them with clinical skills, a substantive research experience, and core skills and knowledge about research and research careers. The relatively small class size encourages discussion and collaboration among students and faculty. Students are immersed in a supportive, integrated and richly diverse clinical and research environment, which provides each student with research and clinical knowledge and skills and a core professional network to build a strong foundation for a career as an expert clinician and researcher. The College Program holds promise of a new approach to increasing the number of M.D.s prepared to become physician-investigators.

Basic Science Curriculum
The College Program is based on a graduate education model, with active learning in teams and individually, while leaving significant time for independent study. The organ systems curriculum in the first two years uses problem-based learning (PBL), in which small groups of students work through clinical cases to identify basic science and other learning objectives and research the answers with the help of a faculty tutor. The PBL approach encourages teamwork and exploration and understanding of concepts. The PBL cases are complemented by interactive seminars, labs and problem sets in which students further develop and hone their ability to define and analyze problems, formulate answerable questions, and search for and evaluate evidence.

Discipline-based learning objectives in cell biology and biochemistry, physiology, pharmacology, anatomy, embryology, histology, pathology, oncology, and genetics are integrated as threads throughout the organ systems blocks. The goal is for students to integrate concepts in these core biomedical disciplines into their growing understanding of the function of the human body in health and disease. Anatomy is case-based and taught using projections, cross-sectional images, and interactive electronic curriculum. Electives are available for students who wish to pursue more-in-depth exposure to specific aspects of anatomy with dissection of cadavers.

Advanced basic science teaching is integrated into the clinical rotations in years three through five, with basic science “rounds” on clinical services, special basic science seminars for students, and required in-depth essays and reports on the basic science underlying problems they encounter in specific patients.

Clinical Curriculum
The Foundations of Clinical Medicine course in years one and two addresses the same core learning objectives as the FCM course for University Program students and includes interviewing skills and physical diagnosis, with patient care in the office of a longitudinal clinical preceptor for a half day every other week in year one and every week in year two. In year two, an additional half-day per week is devoted to clinical experiences that relate directly to the organ systems courses or develop special clinical skills such as the pediatric history and physical exam or experience with acute care medicine. The objective is for students to develop clinical skills, integrate clinical activities with their basic science and research learning, and become proficient in the history and physical examination before beginning inpatient rotations. College students meet with students in the University Program and the MSTP in weekly Science of Clinical Practice Seminars, facilitated by medical school faculty and leaders from the community, in a ten-session Health Policy series.

Students then move into a flexible, three-year continuum of core and elective clinical rotations, with dedicated time to complete a required research project under the guidance of a three-faculty thesis committee. Required clinical rotations are the same as for students in the University Program and are offered at all Case-affiliated hospitals in the Cleveland area. Clinical rotations at the Cleveland Clinic have the same core learning objectives as those at other hospitals, with the addition of research and basic science threads incorporated into the clinical experiences. During their research time, students spend a half day per week in a clinical experience specifically related to their area of research, which is selected with the advice of their research and physician advisors.

Research Curriculum
The research curriculum begins in the summer of year one with small group discussions, journal clubs and labs addressing basic and translational research methods coupled with hands-on experience with a research project in the lab of an established research preceptor. Students learn core principles of designing and interpreting research experiments, reading the research literature, presentation of research data in written and oral form, and the skills needed for productive interactions with all members of a basic science research team. The curriculum continues throughout years one and two, with research learning objectives emphasized during PBL cases and other activities in the basic science and clinical curricula, and weekly Process of Discovery seminars in which investigators present and discuss their latest research findings.

The summer research curriculum in the year two focuses on clinical research, with an in-depth course on applied statistical and epidemiological methods, journal clubs focusing on reading the clinical research literature, and other interactive sessions in which students learn core principles of designing and analyzing clinical research projects, human subjects protection, and ethics of clinical research. Each student also participates in a clinical research project with an established clinical researcher and writes a clinical research proposal to address a question he or she developed during the summer.

By the end of year two, each student must select a research project and advisor for his or her thesis, which is to be completed during the last three years of the program. Students may choose to conduct their research with a basic or translational researcher or with a clinical researcher and may choose from a broad range of research opportunities at the Cleveland Clinic, Case or other research facilities in Cleveland. Other opportunities, such as those offered by the Howard Hughes Medical Institute at the National Institutes of Health, also will be considered. Each student has a three-member thesis committee consisting of his or her advisor and two other faculty members, one of whom must be an expert in a related area of clinical research for students who engage in basic research, or an expert in a related area of basic research for students in engage in clinical research. The goal is for each student to understand the spectrum of potential applications of his or her own research in the understanding of human health and disease.

Assessment for Promotion and Graduation Using Learning Portfolios
Each medical student in the College Program has a close advising relationship with a physician advisor, who works with a total of six to eight students throughout all five years of the curriculum. Students build a learning portfolio that demonstrates mastery of the clinical, basic science and research objectives of the curriculum. The physician advisor reviews the student’s portfolio regularly, helps the student identify learning goals to address...
relative weaknesses or build on areas of relative strength, and assist with designing a final three-year clinical/research continuum and with career advising.

Nine learning outcomes have been identified for the College Program, and progressive levels of competency for each outcome are defined for each year of the curriculum. Ongoing assessments of competency for each outcome allow the faculty to determine students’ readiness for advancement in and graduation from the program. Assessment of College Program students is competency based; grades are not assigned for any component of the curriculum, and there is no class ranking system. The learning outcomes:

1. Research: Demonstrate knowledge base and critical thinking skills for basic and clinical research, skill sets required to conceptualize and conduct research and understand the ethical, legal, professional and social issues required for responsible conduct of research.

2. Basic, clinical and social sciences: Demonstrate and apply knowledge of human structure and function, pathophysiology, human development and psychosocial concepts.

3. Communication: Demonstrate effective verbal, nonverbal and written communication skills in a wide range of relevant activities in medicine and research.

4. Clinical skills: Perform appropriate history and physical examination in a variety of patient care encounters, and demonstrate effective use of clinical procedures and laboratory tests.

5. Clinical reasoning: Diagnose, manage and prevent common health problems of individuals, families and communities. Interpret findings and formulate action plan to characterize the problem and reach a diagnosis.

6. Professionalism: Demonstrate knowledge and behavior that represents the highest standard of medical research and clinical practice, including compassion, humanism, and ethical and responsible actions at all times.

7. Personal development: Recognize and analyze personal needs (learning, self-care, etc.), and implement plan for personal growth.

8. Health care systems: Recognize and be able to work effectively in the various health care systems, to advocate and provide for quality patient care.

9. Reflective practice: Demonstrate habits of analyzing cognitive and affective experiences that result in identification of learning needs leading to integration and synthesis of new learning.

As students progress through the curriculum, the faculty for each course identifies expected competencies to be achieved for each learning outcome. These explicit competencies provide students with a standard by which to judge their progress. The portfolio approach requires students to take an active role in assessing and directing their own learning. Regular self-assessment of strengths and weaknesses for purposes of determining learning needs is essential to becoming a lifelong learner.

The portfolio will contain evidence of the students’ work to be used for both formative and summative assessments. Formative assessments, scheduled at regular intervals throughout each year, require students to provide written self-reflections on evidence of their progress, receive feedback from their physician advisors, and develop learning plans to progressively enhance their competencies. At the end of each year, students construct a portfolio for summative assessment and meet with members of an evaluation committee who will determine their readiness to proceed to the next year or graduate from the program. The evaluation committee serves in the same capacity as the Committee on Students for the University Program and presents reports on the progress of College Program students at end-of-year meetings of the Committee on Students.

The major objective of the portfolio system is for students to assume responsibility for monitoring and directing their learning progress by becoming skilled in self-assessment, reflection, and self-directed learning. This innovative approach also will provide them with documentation of their achievements in medical school that will be useful in their applications to residency programs.

In addition to satisfactory summative assessments of the learning portfolio each year, students in the College Program must pass the U.S. Medical Licensing Examination (USMLE) Step 1 at the end of the year two to advance to year three. Students are also required to take the USMLE Step 2 by Jan. 31 in the year they intend to graduate. To be eligible for graduation from the school, students must obtain at least the minimum passing score on this examination as established by the USMLE Composite Committee. In addition to passing the written USMLE Steps 1 and 2, students must sit for the USMLE Step 2 Clinical Skills Examination before graduation.

THE MEDICAL SCIENTIST TRAINING PROGRAM IN DETAIL

General Description

The Case Medical Scientist Training Program (MSTP) provides training for future physician-scientists by combining well-developed curricula in science and medicine. Medical school and graduate school components are combined in a manner designed to optimize dual-degree training. Unique aspects of the program include the integration of graduate school and medical school in many phases of the program and a high degree of student involvement in running the program.

The MSTP includes three major phases of training.

First phase: During the first two years, each student completes the first two years of the University Program medical school curriculum, including early clinical experiences, completes at least three research rotations, takes graduate courses, and chooses his or her Ph.D. graduate program and thesis lab. During the summers before the first two years of medical school, students complete research rotations. During the fall and spring semesters of year one and the fall semester of year two, students generally take a graduate course or complete a research rotation.

Second phase: During the Ph.D. thesis phase, students complete all requirements of their Ph.D. thesis program. They also can participate in the MSTP Clinical Tutorial.

Third phase: The final phase is the return to years three and four of the University Program medical school curriculum. The focus is clinical training, but research electives can be taken for part of year four.

Although each of these three phases has a different focus, opportunities exist for students to pursue both research and clinical training in each phase. The philosophy of the Case MSTP is to integrate medicine and science throughout the program as much as possible.

The Case MSTP is run by faculty, students, and staff. The MSTP Council is a body of students that plans and runs certain aspects of the program. The program manager and program assistant have many important roles and run the day-to-day management of the program. They are often the first people students contact for advice or help. The associate director is involved in decisions at all levels of the program and is the primary advisor for students in the...
first two years of the program. The director is responsible for all aspects of the program and is available to students for advice at any stage. The MSTP Steering Committee makes decisions on MSTP policy, planning, student admissions, approval of mentors and evaluation of students.

Incoming MSTP students are expected to enter the program on July 1. The MSTP summer retreat, usually held in July, provides an important orientation to the program and includes sessions and workshops for program and professional development.

Advising System
The MSTP associate director advises students in the first two years on research rotations and course work. Students may also meet with an MSTP Steering Committee member representing an area of research interest or with the MSTP director. During the Ph.D. training period, mentoring is provided by the thesis advisor and thesis committee, which includes a member of the MSTP Steering Committee and a member with an M.D. MSTP students are full members of the medical school class and enter one of the four societies of the University Program when they matriculate in the program. The society dean provides important advice for matters concerning the MD curriculum. In addition, the MSTP provides clinical advisors to help MSTP students with issues concerning the clinical curriculum. The director provides advising to students in all phases of the program.

Classes and Research Rotations in Years One and Two
During years one and two of the University Program, MSTP students register for 9 credit hours of graduate course work.

- **Fall semester, year 1:** IBIS 401, IBIS 411 and either MSTP 400 or an appropriate graduate school course
- **Spring semester, year 1:** IBIS 402, IBIS 412 and either MSTP 400 or an appropriate graduate school course
- **Fall semester, year 2:** IBIS 403, IBIS 413 and either MSTP 400 or an appropriate graduate school course
- **Spring semester, year 2:** IBIS 404 and graduate school courses

IBIS 401, 402 and 403 (Integrated Biological Sciences I-IV) are 3-4 credits each. IBIS 404 (Integrated Biological Sciences IV) is offered as a zero-credit course. IBIS 411, 412, and 413 (Clinical Science I-III) are two credits each.

In contrast to their fellow medical students, MSTP students are graded during years one and two of the medical school curriculum for these graduate courses, which provide graduate school credit for the medical school curriculum. These grades are for graduate school purposes and do not affect standing in the medical school.

Additional credits are added for other graduate-level courses as selected by the student. Students generally take MSTP 400 (Research Rotation) or one graduate school course per semester. Graduate courses are scheduled in the afternoon to avoid conflict with the medical school curriculum. MSTP students will be registered for MSTP 400 during the summer terms before each of the first two years of medical school. Students also may complete a research rotation instead of a graduate school course during the fall or spring semester.

The Ph.D. Phase
After completion of the second year of medical school, each student chooses a Ph.D. thesis mentor, joins a specific Ph.D. program, and completes any remaining graduate school course work and other requirements for the Ph.D. degree. The following graduate programs are affiliated with the MSTP:

- Biochemistry
- Biology
- Biomedical Engineering
- Cancer Biology Training Program (through the Pathology Ph.D. program)
- Cell Biology
- Chemistry
- Developmental Biology (through the Genetics and Neuroscience Ph.D. programs)
- Genetic and Molecular Epidemiology
- Genetics: Molecular, Developmental and Human Genetics
- Immunology Training Program (through the Pathology Ph.D. program)
- Microbiology and Molecular Biology
- Molecular Virology
- Pathology (Molecular and Cellular Basis of Disease)
- Neurosciences
- Nutritional Sciences
- Pharmacological Sciences
- Physician Engineer Training Program (PETP, through the BME Ph.D. program)
- Physiology and Biophysics

All MSTP students are required to take a one-week ethics course (IBMS 500 - Being a Professional Scientist - 0 credits) during the spring semester of their third year in the program (first year of Ph.D. research).

Clinical Tutorial, Clinical Refresher Course and Years Three and Four of Medical School
During the Ph.D. thesis phase, MSTP students are encouraged to take the optional MSTP Clinical Tutorial, which provides a unique longitudinal part-time clinical experience. The MSTP Clinical Tutorial is a year-long course that enhances clinical skills for year three of medical school. It also serves a special career development objective by allowing students to balance medical and scientific interests and explore the connections between these areas. The MSTP Clinical Tutorial, offered during the Ph.D. phase, is an example of the integration of science and medicine in the Case MSTP. An alternative approach to enhancement of clinical skills is the MSTP Clinical Refresher course, which is taken before the start of year three. After completion of the Ph.D., MSTP students are enrolled in medical school to complete the requirements for the M.D. (see description provided for the University Program).

MSTP Activities
The MSTP supports several activities that enhance the scientific and professional development of students. These activities also foster a vibrant and collegial MSTP community with a strong sense of mission in the training of physician scientists.

Summer retreat: The annual MSTP summer retreat is a two-day event focusing on scientific presentations, professional development and program planning for the upcoming academic year.

Winter retreat: This retreat occurs in January or February. Students in their research years present their thesis work (completed or in progress) through a brief oral or poster presentation.

MSTP Student Council coordinates many activities of the Case MSTP. The Council meets once each month to discuss activities that are run by different student committees. The overall goals of the MSTP Student Council are to identify objectives for the program, to allow students to initiate programs to enhance the MSTP, to encourage increased student involvement in the operation of the MSTP, and to enhance development of leadership skills of MSTP students. The president, vice president and secretary are all elected for one-year terms. Committees are led by 1-3 committee chairs who take charge of committee activities...
and coordinate the involvement of other students in the committee activities. All students are welcome and encouraged to participate in the various committees and to attend the student council meetings. The MSTP Council Charter is attached as an Appendix.

Recent Council committees have included the following:

1. Monthly Dinner Meeting Committee. This committee is responsible for planning monthly dinner meetings, selecting topics, speakers, and menus. The series is organized by students and is attended by students, Steering Committee members and research mentors. Invited speakers (students, faculty, alumni and outside speakers) address issues pertinent to research, professional issues, career development or other topics of interest. The informal environment at these gatherings promotes social and professional interactions.

2. Agre Society. The Agre Society at Case Western Reserve University serves to advance understanding of biomedical research by clinical residents, fellows and MSTP students. The society's activities involve residents and fellows from clinical training programs at Case-affiliated hospitals (Internal Medicine, Pediatrics, Surgery, Pathology, and Genetics), MSTP students in all phases of the program and associated faculty. The main focus of the Agre Society is a series of informal monthly dinner meetings. The design of the Agre Society promotes interactions between MSTP students, residents and fellows with interests in biomedical research, allowing these groups to enrich each other with their different experiences and viewpoints. The program helps clinical residents and fellows to learn about research and identify potential mentors within the wider Case research community. It also helps MSTP students to understand the clinical context of their research and enables them to form contacts with people at more advanced stages of training. The society is named for Peter Agre, M.D., a medicine resident in the University Hospitals of Cleveland/VA program in the mid 1970's who won the Nobel Prize in Chemistry in 2003 for the discovery of aquaporins. The Agre Society is sponsored by the Case/ UHC Department of Medicine and is run jointly by the Department of Medicine and MSTP Council. For more information, contact the MSTP office (mstp@case.edu) or R. Tyler Miller, M.D., Department of Medicine.

3. Communications/Newsletter Committee. This committee is responsible for publishing the biannual newsletter.

4. Web Page Committee. This committee is responsible for generating content for the Case MSTP website.

5. Summer Retreat Committee. This committee plans the summer retreat.

6. Intro to MSTP: This committee is in place to help first year MSTP students adjust to the program and Case.

7. Physician-Scientist Visiting Lecturer: This committee is in charge of planning the visit of a prominent physician/scientist who will come to give a seminar and visit in depth with MSTP students in small groups to discuss the intersection of science and medicine and career development issues for physician scientists.

8. Community Service Committee: Plans events for involvement of MSTP students in community service.

9. Social Committee: This important committee plans fun events throughout the year!

10. Student Representative to Faculty Council: One student is selected to represent the MSTP on Faculty Council.

11. MSTP Women's Committee: Women in the MSTP organize luncheons or other meetings to discuss issues that face women pursuing careers in science. Members may invite a successful woman scientist who provides a role model as a physician scientist.

12. Other committees may be formed at the discretion of Council.

Scientific meetings: The program strongly encourages students to present their research at national or international meetings and provides financial support to pay for part of meeting travel expenses (other funding is obtained from the research mentor). In addition to the general meeting support for all students, each year two students are offered the opportunity to attend the annual M.D./Ph.D. national student conference in Colorado, with all expenses paid by the MSTP.

Research symposia: MSTP students are encouraged to present their research at Case student symposia, including the annual graduate student symposium and the Irwin H. Lepow Student Research Day. These symposia feature a nationally recognized keynote speaker, and students have the opportunity to interact extensively with the noted scientist. A committee awards prizes for outstanding student presentations.

Assessment of MSTP Students

Students in the MSTP are assessed for the medical school component of the program in the same manner as students in the University Program, with the exception that grades are awarded for those courses in the M.D. curriculum in years one and two that receive graduate school credit and are used to satisfy requirements for the Ph.D. degree. Students must satisfactorily complete all requirements for both the M.D. and the Ph.D.

Expectations for Personal and Professional Characteristics

Students are evaluated on knowledge base, clinical skills and professional behavior and attitudes. The following characteristics are evaluated throughout the medical curriculum, and students are expected to adhere to these standards in both their academic and personal pursuits:

Interpersonal relationships: Provides supportive, educational and empathetic interactions with patients and families, and is able to interact effectively with "difficult" patients. Demonstrates respect for and complements roles of other professionals, and is cooperative, easy to work with, commanding respect of the health care team.

Initiative: Independently identifies tasks to be performed and makes sure that tasks are completed. Performs duties promptly and efficiently, and is willing to spend additional time, assume new responsibilities, and able to recognize the need for help and ask for guidance when appropriate.

Dependability: Completes tasks promptly and well. Present on time and actively participates in clinical and didactic activities. Always follows through and is exceptionally reliable.


Integrity and honesty: Demonstrates integrity. Is honest in professional encounters. Adheres to professional ethical standards.

Tolerance: Demonstrates exceptional ability to accept people and situations. Acknowledges her or his biases and does not allow them to affect patient care.

Function under stress: Consistently maintains professional composure and exhibits good clinical judgment in stressful situations.

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Function under stress: Consistently maintains professional composure and exhibits good clinical judgment in stressful situations.
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Appearance: Always displays an appropriate professional appearance.

Educational Authority
Governance of the educational programs leading to medical degree resides in the Faculty of Medicine. Each class of students selects representatives who become voting members of the Faculty of Medicine. The faculty of the School of Medicine is responsible for the content, implementation and evaluation of the curriculum. The dean of the School of Medicine serves as its chief academic officer with overall responsibility to the university for the entire academic program. The vice dean for education and academic affairs carries the dean's academic and administrative authority and has direct supervisory responsibility over the units that lead and support the curriculum.

The faculty's Committee on Medical Education (CME) evaluates, reviews and makes recommendations concerning the major units of the medical education program. Acting for the faculty, the Committee on Medical Education evaluates the achievement and outcomes of curricular objectives and reviews the curriculum as a whole. The faculty elects the majority of the members of the Committee on Medical Education; student representatives also serve on this committee and its various subcommittees.

Three curriculum councils are responsible for the University Program and one curriculum council is responsible for the College Program; all four councils report to the CME. These councils are responsible for the strategic planning, content, design, selection of teaching leadership, and oversight of the curriculum, student assessment and program evaluation.

GRADUATION
A medical student who has satisfactorily completed all the required work in the School of Medicine program in which he or she is enrolled may be granted the degree of doctor of medicine (M.D.) by Case Western Reserve University, provided that:

1) He or she has been registered at Case Western Reserve University School of Medicine for at least four academic years, or has transferred to the University Program after two years at another accredited medical school.
2) The Committee on Students for the University Program or the Medical Student Promotions and Review Committee for the College Program approves his or her record of performance, and the faculty recommends him or her to the trustees for graduation.
3) He or she has discharged all financial obligations to the university and to the program in which he or she is enrolled.
4) He or she has taken the U.S. Medical Licensing Examination (USMLE) Steps 1 and 2 and the USMLE Step 2 Clinical Skills Examination, and has obtained a minimum passing score on the examinations as determined by the USMLE Composite Committee. The requirements for graduation of any class may be altered by action of the faculty of the School of Medicine.

LICENSE
Licensure to practice medicine in the United States and its territories is a privilege granted by the individual licensing boards of the states and territories. Each licensing board of the individual jurisdictions establishes its policies, eligibility and requirements for the practice of medicine within its boundaries pursuant to statutory and regulatory provisions. The degree of doctor of medicine awarded by Case Western Reserve University is an academic degree and does not provide a legal basis for the practice of medicine.

THE ELECTRONIC CURRICULUM
The School of Medicine has developed an integrated electronic curriculum for all four years of the medical curriculum that contains a list of learning objectives as well as the resources that allow the students to achieve the objectives. These resources include references to traditional textbooks and journal articles, original textual material, PowerPoint files, illustrations, animations, videos, audio files, and links to Internet-based learning resources (including original journal articles in electronic format). These resources are made available on the Internet by an NT/Internet server system.

Students have access to the Internet and the electronic curriculum from their assigned personal desks via fiber optic Ethernet connection to CWRU net and via wireless access when away from their desks. When off campus, access is through a modem connection.

Other Degree Programs
The degree programs listed in this section may require admission to another school at the university in addition to or instead of the School of Medicine. Each school may have different deadlines and requirements for admissions.

Please contact the other schools separately using information provided under that school's listing in this publication. Please see departmental listings in this section of the General Bulletin for information about additional degree programs offered through the medical school's departments.

CLINICAL RESEARCH SCHOLARS PROGRAM (CRSP)
Leading to a Master of Science degree in clinical research, the Clinical Research Scholars Program (CRSP) provides physicians, dentists, nurses, and Ph.D.-prepared health care professionals with a rigorous, high quality, didactic education in clinical research methods. The aim of CRSP is to develop a new generation of clinical investigators for leadership roles in academia and industry.

CRSP Scholars are individuals who have completed their clinical training and want to develop a professional career based in clinical investigation. A prerequisite for consideration for admission is a degree in medicine, dentistry, nursing, or an allied science. The program consists of formal didactic course work, a longitudinal seminar series, and an intensive mentored experience centered on a specific clinical research problem. The curriculum makes use of existing didactic material offered throughout Case Western Reserve’s medical, nursing, dental, management, and law schools as well as courses specifically designed for CRSP Scholars.

The program resides in the School of Medicine and the School of Graduate Studies and consists of a two-to-five year curriculum requiring 36 credit hours. Fifteen hours are accumulated in five required courses common to all fields of clinical investigation. At the end of the first year of study, Scholars differentiate into one of four specialty tracks that afford maximum flexibility and that are adapted to meet a wide array of clinical research career goals. Completion of a formal thesis is required for the awarding of the Master of Science degree.

For more information, see http://casemed.case.edu/CRSP or contact Carol Tolin, Program Coordinator, The Clinical Research Scholars Program at Case, c/o MetroHealth Medical Center - Bell Grove 3-45, 2500 MetroHealth Drive, Cleveland, Ohio 44109-1998; e-mail: carol.tolin@case.edu.

CLINICAL RESEARCH SCHOLARS PROGRAM (CRSP)
Course Descriptions

CRSP 401. Introduction to Clinical Research
Summer Series (1 - 3)
This course is designed to familiarize one with the language and concepts of clinical investigation and statistical computing, as well as provide opportunities for problem-solving, and practical application of the information derived from the lectures. The material is organized along the internal logic of the research process, beginning with mechanisms of choosing a research question and moving into the information needed to design the protocol, implement it, analyze the findings, and draw and disseminate the conclusion(s). Prereq: M.D., R.N., Ph.D., D.D.S., health professionals.

CRSP 402. Study Design and Epidemiologic Methods (3)
This course will cover the methods used in the conduct of epidemiologic and health services research and considers how epidemiologic studies may be designed to maximize etiologic inferences. Topics include: measures of disease frequency, measures of effect, cross-sectional studies, case-control studies, cohort studies, randomized controlled trials, confounding, bias, effect modification, and select topics. Recommended preparation: CRSP 401 or permission of instructor.

CRSP 403. Biostatistics for Clinical Research (3)
We introduce biostatistical methods for clinical investigators involved in patient-oriented, translational, epidemiologic, health services and public health research. We anticipate that students will be involved in designing and interpreting their own studies, but also in critically evaluating the work of others. The course thus emphasizes the statistical process: how to conduct studies, what the results mean, and what can be inferred about the whole from pieces of information. The focus is on understanding and describing relationships between phenomena and measuring how well these relationships fit data. A project involves problem specification, data collection, management, analysis, and presentation. Students will use statistical software extensively and will be exposed to multiple packages. Topics include descriptive statistics, exploratory data analysis, the fundamentals of probability, sampling, inferential statistics, power and sample size, experimental design, correlation, regression, and association. Recommended preparation: CRSP 401.

CRSP 406. Introduction to Statistical Programming using SAS (2)
This course will provide students with an introduction to SAS version 8.2 in the context of clinical research. Topics will include an overview of the SAS "data step" and procedures commonly used to explore, visualize, and summarize clinical data. Students will learn the basics of the SAS programming language, how to troubleshoot SAS code, as well as how to interpret selected SAS output. Clinical research datasets will be used in class examples, computer laboratory sessions, and homework. Each session will include a lecture immediately followed by a computer lab to reinforce the concepts introduced. Students will work in small groups or individually. Recommended preparation: CRSP 403 or consent of instructor.

CRSP 407. Logistic and Survival Analysis (3)
This course introduces two commonly used statistical modeling techniques found in the medical, epidemiologic, and public health research fields: logistic regression and survival analysis. The course emphasizes summarizing and analyzing binary and time-to-event outcomes. The focus is on establishing a foundation for when and how to use these modeling techniques as well as an understanding of interpreting results from analyses. Two course projects will involve problem specification, data collection, analysis, and presentation. Students will use statistical software extensively and will be exposed to output from SAS. Planned topics include contingency tables, logistic regression models and diagnostic measure, analyzing ordinal outcomes, estimating of the survival curve, Cox proportional hazard regression models and diagnostic measures, and sample size estimation. Prereq: CRSP 403 and CRSP 406.

CRSP 412. Communication in Clinical Research (Part 1) (1)
Parts 1 and 2 of this course build basic knowledge and develop core skills in scientific communication, grantsmanship, and the peer review process. Written and oral communication in clinical science, applying for grants, submitting abstracts and manuscripts, giving presentations, and the peer review process will be covered. Recommended preparation: CRSP 401 or equivalent and consent of instructor.

CRSP 413. Communication in Clinical Research (Part 2) (1)
Parts 1 and 2 of this course build basic knowledge and develop core skills in scientific communication, grantsmanship, and the peer review process. Written and oral communication in clinical science, applying for grants, submitting abstracts and manuscripts, giving presentations, and the peer review process will be covered. Recommended preparation: CRSP 401 or equivalent and consent of instructor.

CRSP 500. Observational Studies (3)
An observational study is an empirical investigation of treatments, policies or exposures and the effects that they cause, but it differs from an experiment because the investigator cannot control treatment assignment. We introduce design, data collection and analysis methods appropriate for clinical investigators, preparing students to design and interpret their own studies, and those of others in their field. Technical formalities will be minimized, and the presentations will focus on the practical application of methodologies and strategies. A course project involves the completion of an observational study, and substantial use of statistical software. Topics include randomized experiments and how they differ from observational studies, planning and design for observational studies, adjustments for overt bias, sensitivity analysis, methods for detecting hidden bias, and propensity methods for selection bias adjustment, including multivariate matching, stratification and regression adjustments. Prereq: EPBI 432, EPBI 441, or CRSP 407 or consent of instructor.

CRSP 501. Working in Interdisciplinary Research Teams (1)
This course will assist learners to understand why and how different professional disciplines, each representing a body of scientific knowledge, must work together to develop and disseminate knowledge. Learners will develop a set of skills specific to being an effective member and leader of an interdisciplinary research team, including working with different value and knowledge sets across disciplines, running effective meetings, managing conflict, giving and receiving feedback, and group decision-making techniques. Using the small group seminar approach and case studies, learners will practice individual and group communication, reflective and self-assessment techniques, and engage in experiential learning activities regarding effective teamwork in interdisciplinary research teams. Techniques to increase group creativity and frame new insights will be discussed. Recommended preparation: K grant Appointment or permission of instructor.

CRSP 502. Leadership Development (2)
Leadership Assessment and Development is for participants to learn a method for assessing their knowledge, abilities, and values relevant to management; and for developing and implementing plans for acquiring new management related knowledge and abilities. The major goals of this course include generating data through a variety of assessment methods designed to reveal your interests, abilities, values, and knowledge related to leadership effectiveness; learning how to interpret this assessment data and use it to design plan developmental activities; small group sharing of insights from the various assessments. Recommended preparation: K grant appointment or consent of instructor.

CRSP 503. Innovation and Entrepreneurship (2)
The purpose of this module is to acquaint and ultimately engage clinical researchers with the business of innovation and entrepreneurship. Goals include: (1) to provide researchers with many of the skills that they would need to translate academic research into commercial use; (2) to sensitize clinical researchers to the goals of the business community and facilitate their ability to work with the private sector on technology development and transfer. Sessions consist of lectures and case discussion facilitated by the instructor. Some sessions include members of the business community as guest lecturers. As an example, students will discuss the financing of new companies with local venture capitalists. Student products include the evaluation of the commercial potential of a university technology in which they apply their new knowledge about commercialization of scientific discoveries. Offered as CRSP 503, ECON 406, and HSMC 406.

CRSP 510. Health Disparities (3)
This course aims to provide theoretical and application tools for students from many disciplinary backgrounds to conduct research and develop interventions to reduce health disparities. The course will be situated contextually within the historical record of the United States, reviewing social, political, eco-
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nomic, cultural, legal, and ethical theories related to disparities in general, with a central focus on health disparities. Several frameworks regarding health disparities will be used for investigating and discussing the empirical evidence on disparities among other subgroups (e.g., the poor, women, uninsured, disabled, and non-English speaking populations) will also be included and discussed. Students will be expected to develop a research proposal (observational, clinical, and/or intervention) rooted in their disciplinary background that will incorporate materials from the various perspectives presented throughout the course, with the objective of developing and reinforcing a more comprehensive approach to current practices within their fields. Offered as CRSP 510, EPBI 510, MPHP 510, NURS 510, and SASS 510.

CRSP 603. Research Ethics and Regulation (2)
This course is designed to introduce students to the ethical, policy, and legal issues raised by research involving human subjects. It is intended for law students, post-doctoral trainees in health-related disciplines and other students in relevant fields. Topics include (among others): regulation and monitoring of research; research in third-world nations; research with special populations; stem cell and genetic research; research to combat bioterrorism; scientific misconduct; conflicts of interest; commercialization and intellectual property; and the use of deception and placebos. Course will meet in once per week for 2 hours throughout the semester. Grades will be based on class participation and a series of group projects and individual short writing assignments. Offered as CRSP 603 and LAWS 603.

CRSP 651. Clinical Research Scholars Thesis
CRSP Thesis M.S.

MASTER OF PUBLIC HEALTH (M.P.H.)
The master of public health program prepares students to enhance health in human populations through organized community effort. Graduates are qualified to work in local and state health departments, universities and colleges, hospitals, ambulatory medical centers, non-profit organizations, and the insurance and pharmaceutical industries.

The program seeks to attract a rich mix of students, including those pursuing degrees in medicine, nursing, dentistry, law, social work, bioethics, management and other fields, as well as students holding undergraduate degrees.

The program has tracks in adolescent health (the first in the country), public health research, urban health, health care policy and administration, health promotion/disease prevention, international health, and epidemiology. The 36-hour program can be completed in two years. Students earn 15 credit hours through five required courses representing the fundamentals of public health: biostatistics, epidemiology, environmental health, health policy/administration, and behavioral health. Also, students receive a total of nine credit hours for three courses in an area of concentration of their choice (see aforementioned list), three credit hours for an elective course, and nine credit hours from a one-semester public health field practicum. In the practicum, students develop and work on a project that brings their new public health skills to the community.

The M.P.H. program has developed several new dual degree programs. Each program combines the master of public health degree with one of the following degrees: master of science in nursing degree, medical degree, master of business administration degree, juris doctorate degree, master of arts in bioethics or master of arts/Ph.D. in anthropology. It is anticipated that additional dual degree programs will be developed.

Admission is through the Case Western Reserve University School of Graduate Studies. For more information, call 216-368-3725, e-mail acn3@case.edu, or visit www.casemph.org.

MASTER OF PUBLIC HEALTH (MPHP)

Course Descriptions

MPHP 306. History and Philosophy of Public Health (3)
The purpose of this course is to introduce students to the science and art of public health through an understanding of the history and philosophies that represent its foundation. Students will learn about the essentials of public health and applications of these precepts throughout history and in the present. The course will examine public health case histories and controversies from the past and present, in order to better understand solutions for the future. Offered as MPHP 306 and MPHP 406.

MPHP 313. Health Education, Communication, and Advocacy (3)
Using a biopsychosocial perspective, an overview of the measurement and modeling of behavioral, social, psychological, and environmental factors related to disease prevention, disease management, and health promotion is provided. Offered as EPBI 411 and MPHP 411.

MPHP 413. Health Education, Communication, and Advocacy (3)
Historical, sociological, and philosophical factors that have influenced definitions and the practice of health education and health promotion are studied. Advanced concepts in health communication theory will also be explored. This course is designed to education, motivate, and empower undergraduates and graduate students to become advocates for their own health, the health of their peers, and the health of the community. Offered as MPHP 313 and MPHP 413.

MPHP 419. Topics in Urban Health in the United States (3)
This course examines patterns of urban health and disease across the life course among marginalized populations and communities. We will examine the socio-environmental contexts that impact health status (i.e., racism, health disparities, neighborhood context, and environmental stressors). Readings from epidemiology, sociology, and public health literature will provide a foundation for the multiple factors and processes that impact health. Offered as EPBI 419 and MPHP 419.

MPHP 421. Health Economics and Strategy (3)
This course has evolved from a theory-oriented emphasis to a course that utilizes economic principles to explore such issues as health care pricing, anti-trust enforcement and hospital mergers, choices in adoption of managed care contracts by physician groups, and the like. Instruction style and in-class group project focus on making strategic decisions. The course is directed for a general audience, not just for students and concentration in health systems management. Offered as ECON 421, HSMC 421, and MPHP 421.

MPHP 429. Introduction to Environmental Health (3)
This is a survey course of environmental health topics including individual, community, population, and global issues. Introduction to risk management, important biological mechanisms, and age and developmental impacts are covered in an overview fashion. A practical inner city home environment experience is included. Offered as EVHS 429 and MPHP 429.

MPHP 431. Statistical Methods I (3)
Application of statistical techniques with particular emphasis on problems in the biomedical sciences. Basic probability theory, random variables, and distribution functions. Point and interval estimation, regression, and correlation. Problems whose solution involves using packaged statistical programs. First part of year-long sequence. Offered as ANAT 431, BIOL 431, EPBI 431, and MPHP 431.

MPHP 432. Statistical Methods II (3)
Methods of analysis of variance, regression and analysis of quantitative data. Emphasis on computer solution of problems drawn from the biomedical sciences. Design of experiments, power of tests, and adequacy of models. Offered as BIOL 432, EPBI 432, and MPHP 432. Prereq: EPBI 431 or equivalent.

MPHP 433. Community Interventions and Program Evaluation (3)
This course prepares students to design, conduct, and assess community-based health interventions and program evaluation. Topics include assessment of need, evaluator/stakeholder relationship, process vs. outcome-based objectives, data collection, assessment of program objective achievement based on process and impact, cost-benefit analyses, and preparing the evaluation report to stakeholders. Recommended preparation: EPBI 490, EPBI 431, or MPHP 405. Offered as EPBI 433 and MPHP 433.

MPHP 439. Public Health Management and Policy (3)
This course will include a description of the health care system, an understanding of population based health care, concept and methods of health management, current issues in health policy and the application of these concepts using case studies. Topics will include the role of the manager, organizational design and control, professionals in organizations, adaptation and accountability. This is a required course in the M.P.H. degree. Grades will be based on class participation and a paper.

MPHP 442. Biostatistics II (3)
This course deals with the basic concepts and applications of nonparametric statistics. Topics will include distribution-free statistics, one sample rank test, the Mann-Whitney and Kruskal Wallis tests, one sample and two sample U-statistics, asymptotic relative efficiency of tests, distribution-free confidence intervals, point estimation and linear rank statistics. Recommended preparation: EPBI 441. Offered as EPBI 442 and MPHP 442.

MPHP 444. Sexuality, Public Health and the Law (3)
This course provides an overview of numerous issues that arise at the intersection of public health, sexuality, and the law. In the context of public health, these issues include the prevention of infectious disease transmission, the prevention of violence, and the protection of the public health. Legal issues include those related to individuals' right to privacy, child custody, child abuse and neglect, and protection of the public.

MPHP 450. Clinical Trials and Intervention Studies (3)
Issues in the design, organization, and operation of randomized, controlled clinical trials and intervention studies. Emphasis on long-term multicenter trials. Topics include legal and ethical issues in the design; application of concepts of controls, masking, and randomization; steps required for quality data collection; monitoring for evidence of adverse or beneficial treatment effects; elements of organizational structure; sample size calculations and data analysis procedures; and common mistakes. Recommended preparation: EPBI 431 or consent of instructor. Offered as EPBI 450 and MPHP 450.

MPHP 451. Principles of Genetic Epidemiology (1 - 3)
A survey of the basic principles, concepts and methods of the discipline of genetic epidemiology, which focuses on the role of genetic factors in human disease and their interaction with environmental and cultural factors. Many important human disorders appear to exhibit a genetic component; hence the integrated approaches of genetic epidemiology bring together epidemiologic and human genetic perspectives in order to answer critical questions about human disease. Methods of inference based upon data from individuals, pairs of relatives, and pedigrees will be considered. The last third of the course (1 credit) is more statistical in nature. Offered as EPBI 451, GENE 451, and MPHP 451.

MPHP 456. Health Policy and Management Decisions (3)
This seminar course combines broad health care policy issue analysis with study of the implications for specific management decisions in organizations. This course is intended as an applied, practical course where the policy context is made relevant to the individual manager. Offered as HSMC 456 and MPHP 456.

MPHP 458. Statistical Methods for Clinical Trials (3)
This course will focus on special statistical methods and philosophical issues in the design and analysis of clinical trials. The emphasis will be on practically important issues that are typically not covered in standard biostatistics courses. Topics will include: randomization techniques, intent-to-treat analysis, analysis of compliance data, equivalency testing, surrogate endpoints, multiple comparisons, sequential testing, and Bayesian methods. Offered as EPBI 458 and MPHP 458.

MPHP 460. Health Research Methods I (3)
This is a course in research methods focusing on practical issues in the conduct of health services research studies. Topics include: an overview of health services research; ethics in health services research; proposal writing and funding; the relationship between theory and research; formulating research questions; specifying study design and study objectives; conceptualizing and defining variables; validity and reliability of measures; scale construction; operationalizing health research relevant variables using observation, self and other report, and secondary analysis; formatting questionnaires; developing analysis plans; choosing data collection methods; sampling techniques and sample size; carrying out studies; preparing data for analysis; and reporting of findings. Offered as EPBI 460 and MPHP 460.

MPHP 464. Obesity and Cancer: Views from Molecules to Health Policy (3)
This course will provide an overview of the components of energy balance (diet, physical activity, resting metabolic rate, dietary induced thermogenesis) and obesity, a consequence of long term positive energy balance, and various types of cancer. Following an overview of energy balance and epidemiological evidence for the obesity epidemic, the course will proceed with an introduction to the cellular and molecular biology of energy metabolism. Then, emerging research on biologically plausible connections and epidemiological associations between obesity and various types of cancer (e.g., colon, breast) will be presented. Finally, interventions targeted at decreasing obesity and improving quality of life in cancer patients will be discussed. The course will be cooperatively-taught by a transdisciplinary team of scientists engaged in research in energy balance and/or cancer. Didactic lectures will be combined with classroom discussion of readings. The paper assignment will involve application of course principles, lectures and readings. Offered as EPBI 464, MPHP 464.

MPHP 467. Cost-Effectiveness Analysis in Health Care (3)
Evaluation of alternative medical treatments and drug therapies. Topics include cost-benefit, cost-effectiveness and cost-utility analysis. Measuring cost, benefits and health outcomes. Quality of life and other measures of effectiveness will also be addressed. Emphasis on case studies, course project, and evaluation of publications. Some decision analysis and policy implications will also be included. Offered as EPBI 467 and MPHP 467.

MPHP 468. The Continual Improvement of Healthcare: An Interdisciplinary Course (3)
The focus of this course is on collaborative work for the benefit of patients and community. Seminar classwork is combined with a field project, in which interdisciplinary student teams apply what
they have learned to the improvement activities of a local health care organization. Successful completion of the course depends on participation in seminar sessions and completion of the interdisciplinary student team project. Offered as EPBI 468, NURS 468, and MPHP 468.

MPHP 474. Principles of Practice-Based Network Research (3)
Practice-based research networks (PBRNs) are organizations of community-based healthcare practices that engage in clinical research and practice improvement. In the U.S., there are more than 100 of these dynamic, collaborative organizations that enable the translation of research into practice and practice into research. They also frequently engage in developing and refining methods to improve healthcare quality. This course is designed to provide students with a foundation in PBRN methods and principles, including: introduction to PBRNs, methods for collaborating with community practices, PBRN funding strategies, PBRN data collections methods, statistical issues in network research, community-based participatory research, human subjects’ protection issues in PBRNs, quality improvement research in PBRNs, funding for PBRN research, and writing PBRN research findings for publication. Each 2.5 hour class session will feature a lecture followed by a discussion of readings from the literature. Students will develop a PBRN research or quality improvement proposal during the semester. Offered as EBPI 474, FAMD 474, MPHP474.

MPHP 475. Management of Disasters Due to Nature, War, or Terror (3)
The purpose of this course is to make participants aware of the special needs of children and families in disaster situations and understand public health approaches to address these needs. The learning objectives for this course are: 1) Identify the most important problems and priorities for children in disaster situations, 2) Identify the organizations most frequently involved in providing assistance in disaster situations and define their roles and strengths, 3) Describe the reasons why children are among the most vulnerable in disaster events, 4) Conduct emergency nutritional assessments for children, 5) Develop health profiles on displaced children and plan interventions based on results, 6) Define common psychosocial issues of children and the means to address them, 7) List basic points of international law including the Geneva Convention that relate to all persons involved in disaster situations, 8) List important security issues, 9) Appreciate ethical issues involved in disaster situations and employ skills of cross cultural communication, 10) Recognize and respond to special issues for children involved in biological and chemical terrorist attacks.

MPHP 477. Internship at Health-Related Government Agencies (3)
This independent study course will incorporate a one-semester-long internship at health-related government agencies (Ohio Department of Health, Ohio Department of Job and Family Services, or Cleveland City Health Department). The choice of the agency will depend on the student’s academic interests and research goals. The objective is to develop a level of familiarity with the organizational and operational aspects of such agencies, and to gain an understanding of agencies’ and bureaus’ interactions with the legislative body, as well as the processes of developing, implementing, managing, and monitoring health initiatives. The instructor and the liaison persons at the agencies will be responsible for planning structured encounters of interns with key administrators and policy makers, and to select a research project, based on the intern’s research interests and the agencies’ research priorities. Interns will be required to submit a draft of the report to the instructor at the end of the semester. The approved final report will be submitted to the agency. The project will be evaluated for its methodological soundness and rigor. Students will be required to be at the agency one day a week. Recommended preparation: EPBI 515. Offered as EPBI 477 and MPHP 477.

MPHP 484. Geographic Medicine and Epidemiology (1 - 3)
This course focuses on the epidemiology, prevention, treatment, and control of tropical and parasitic diseases. Emphasis will be placed on the triad of agent, host, and environment for infectious disease impacting global health. Three distinct modules will focus on specific examples such as malaria, helminths, bacteria, or viruses. Active class participation is required through discussions, case studies, and group projects. Recommended preparation: EPBI 490, EPBI 491 and a microbiology course or consent of instructor. Offered as EPBI 484, INTH 484, and MPHP 484.

MPHP 485. Adolescent Development (3)
Adolescent Development can be viewed as the overriding framework for approaching disease prevention and health promotion for this age group. This course will review the developmental tasks of adolescence and identify the impact of adolescent development on youth risk behaviors. It will build a conceptual and theoretical framework through which to address and change adolescent behavior to promote health. Offered as ADHT 485 and MPHP 485.

MPHP 488. Gender, Ethnicity, and Health Research (3)
This course is designed to acquaint students with the literature addressing the constructs of race, ethnicity, gender, and social class; to examine critically the contexts in which these constructs are often applied; and to assess the relationship between each of these constructs and access to health care, quality of care, and health outcome. Offered as EPBI 488 and MPHP 488.

MPHP 490. Epidemiology: Introduction to Theory and Methods (3)
Epidemiologic principles and methods needed to understand population-based statements of illness and health. Descriptive epidemiology, analytic epidemiology, and epidemiologic inference. Classification, morbidity and mortality rates, sampling, screening, epidemiologic models, field trials, controlled epidemiologic surveys, sources of bias, and causal models. Recommended preparation: STAT 201 or STAT 207 or STAT 312 or equivalent. Offered as EPBI 490 and MPHP 490.

MPHP 491. Epidemiology: Case-Control Study Design and Analysis (3)
This course builds upon EPBI 490 with a comprehensive study of the concepts, principles, and methods of epidemiologic research. The course content specifically focuses on the case-control study design and provides a framework for the design, analysis, and interpretation of case-control studies. Rigorous problem-centered training includes exposure measurement, subject selection, validity, reliability, sample size and power, effect modification, confounding, bias, risk assessment, matching, and logistic regression. Individual and group data projects will be analyzed using SAS statistical software. Offered as EPBI 491 and MPHP 491.

MPHP 492. Epidemiology: Cohort Study Design and Analysis (3)
This course provides a comprehensive introduction to the cohort study. Particular emphasis is placed on cohort study design and cohort data analysis. The course will cover the conceptual framework underlying cohort studies, planning and conducting a cohort study, basic concepts of time, exposure and outcome, and methods in the analysis of longitudinally collected data. Analytic methods covered in the class include, but are not limited to: analysis of age, period, and cohort effects, analysis of incidence rates, analysis of repeated measures, and analysis of time-to-event data. Students will have the opportunity to conduct analysis of data obtained from an actual cohort study using a statistical package of their choice. Offered as EPBI 492 and MPHP 492. Prereq: EPBI 431 and EPBI 490 or equivalent.

MPHP 493. Chronic Disease Epidemiology (3)
This course is intended for graduate students in epidemiology and M.P.H. students who are interested in chronic disease epidemiology and prevention. The course will cover: 1) overview of concepts in chronic disease epidemiology and etiology, study design in epidemiologic research, and causal inference; 2) major chronic diseases in the U.S. populations and prevention; and 3) cancer screening. For each specific disease of interest, the lecture is structured according to 4 major components: 1) basic epidemiology; 2) risk factors and etiology; 3) prevention (and screening); and 4) controversies and future research. Offered as EPBI 493 and MPHP 493. Prereq: EPBI 490 or equivalent.

MPHP 494. Infectious Disease Epidemiology (1 - 3)
The epidemiology, prevention and control of representative infectious disease models. Emphasis on the triad of agent, host, and environment and the molecular and genetic basis of agent and host interaction in the population. Recommended preparation: EPBI 490, EBPI 491, and a microbiology course or consent of instructor. Offered as EPBI 494, INTH 494, and MPHP 494.

MPHP 495. Mental Health Epidemiology (3)
This course explores the epidemiology of diseases affecting the brain, including various forms of mental illness and neuro logical disorders. The course utilizes a cross-disciplinary approach and draws on sci-
experience, sociology, history, and. Offered as EPBI 495 and MPHP 495.

MPHP 499. Independent Study (1 - 18)

MPHP 501. Graduate Seminar (0)

Students and faculty will meet twice a month to listen to local faculty and national researchers and discuss their current work. The students are encouraged to ask questions and challenge the speakers. Some of the talks will offer CME credits. Offered as EPBI 501 and MPHP 501.

MPHP 502. International Health Practice (3)

This course aims to provide practical knowledge to prepare students to serve and study for international health work particularly in complex humanitarian emergencies. The course is organized and discussed from the perspective of health care professional. This course is intended for graduate-level students in medicine, nursing, public health, social work, and medical anthropology. Historical development of the discipline, key methodological issues, and essential principles in key topics will be discussed in multidisciplinary approach. Offered as FAMD 502 and MPHP 502.

MPHP 506. The Future of Public Health (0 - 3)

This course provides a forum for students to examine topics critical to the future of public health in a structured and progressive format. Utilizing the expertise of public health practitioners, students will gain insight into core public health issues in an interdisciplinary, discussion-oriented seminar. The course begins with an introduction to Informatics, Technology, Leadership, and Communication in Public Health then moves to focused examinations of various methodologies, theories, and approaches used in the field. This foundation informs the final third of the semester, during which ethical issues, policy concerns, and specific topics are critically examined. The major class projects include the development of an electronic portfolio, relevant topic presentations and discussions.

MPHP 507. Building a Public Health Capstone (0 - 3)

This course is designed to walk students through the process of creating a Capstone Project, form “idea to field”. Specific topics to be covered include: identifying a project, creating a project plan, how to effectively work in the community, program design, evaluation, ethical issues in community research, creating an analytic plan, survey design, and writing results. Major class projects include completing an IRB application or completing a grant application for your own project. The last two weeks of class center around attending and discussing the Capstone Presentations of graduating students.

MPHP 508. Ethics, Law, and Epidemiology (3)

This course is designed to provide epidemiology students with basic knowledge about the ethical and legal principles underlying epidemiological research. This is not a public health law class. Issue papers are assigned on a weekly basis. Each issue paper requires that the student analyze the situation depicted and apply the principles learned. Some issue papers may require that the student draft a proposed rule, a portion of legislation, or a document such as an informed consent form. Other exercises may require that students critique an existing agency rule or legislation. Offered as EPBI 508 and MPHP 508. Prereq: EPBI 490 and EPBI 491 or equivalent.

MPHP 510. Health Disparities (3)

This course aims to provide theoretical and applicational tools for students from many disciplinary backgrounds to conduct research and develop interventions to reduce health disparities. The course will be situated contextually within the historical record of the United States, reviewing social, political, economic, cultural, legal, and ethical theories related to disparities in general, with a central focus on health disparities. Several frameworks regarding health disparities will be used for investigating and discussing the empirical evidence on disparities among other subgroups (e.g., the poor, women, uninsured, disabled, and non-English speaking populations) will also be included and discussed. Students will be expected to develop a research proposal (observational, clinical, and/or intervention) rooted in their disciplinary background that will incorporate materials from the various perspectives presented throughout the course, with the objective of developing and reinforcing a more comprehensive approach to current practices within their fields. Offered as CRS 510, EPBI 510, MPHP 510, NURS 510, and SASS 510.

MPHP 532. Health Care Information Systems (3)

This course covers concepts, techniques and technologies for providing information systems to enhance the effectiveness and efficiency of health care organizations. Offered as HSMC 432, MIDS 432, and MPHP 532.

MPHP 652. Public Health Capstone Experience (1 - 9)

The Public Health Capstone Experience consists of a public health field practicum, involving a placement at a community-based field site, and a Master’s essay. The field placement will provide students with the opportunity to apply the knowledge and skills acquired through their Master of Public Health academic program to a problem involving the health of the community. Students will learn to communicate with target groups in an effective manner; to order priorities for major projects according to definable criteria; to use computers for specific applications relevant to public health; to identify ethical, social, and cultural issues relating to public health policies, research, and interventions; to identify the process by which decisions are made within the agency or organization; and to identify and coordinate use of resources at the placement site. The Master’s essay represents the culminating experience required for the degree program and may take the form of a research thesis, an evaluation study, or an intervention study. Each student is required to formally present the experience and research findings. This course is available only to Master of Public Health students.

COURSE DESCRIPTIONS (MSTP)

MSTP 400. Research Rotation in Medical Scientist Training Program (0 - 9)

All students must complete research rotations in a minimum of three different MSTP-approved laboratories and submit rotation reports and rotation evaluations for each to the MSTP office. All three of the rotations must be completed before the beginning of each student’s third year of the program. The main purpose of research rotations is to aid the student in selecting a laboratory for their thesis work.

M.D./D.M.D. PROGRAM

The joint degree DMD/MD program of the Case Western Reserve University School of Dental Medicine and School of Medicine is poised as an innovative approach to satisfy the need for creation of a cadre of uniquely trained individuals who will integrate aspects of primary care into the practice of general dentistry. Students will obtain training in both the fields of medicine and dentistry in a five-year integrated training program that will lead to the DMD and MD degrees. This new joint degree program will address the emerging requirement for health professions students to be broadly trained with an extensive perspective of health and disease. As the associations between oral health and systemic health become clearer, the role of these new health care practitioners of tomorrow will emerge to provide health promotion and disease prevention care in a new framework.

Prospective students of this new innovative program are interested in the health professions using a more broadly defined context, are independent thinkers, and have excelled in baccalaureate programs in the sciences. A pioneering spirit will characterize their motivation. Students will be prepared to sit for the clinical licensure examination leading to the practice of dentistry and for post-graduate, year-one residencies in medicine which are required prior to medical licensure at the end of five years.

M.D./J.D.

This program, offered in conjunction with Case Western Reserve University School of Law, may be completed in six years. The J.D. portion requires the completion of 88 credit hours of study. Admission is through the School of Medicine and the School of Law. For more information about the J.D. portion of the program, visit http://law.case.edu/ academic, call the law school admissions office at 216-368-3600 or 800-756-0036, or e-mail lawadmissions@case.edu.

M.D./M.A. IN BIOETHICS

The 27-credit-hour Master of Arts in bioeth-
ics program, including a 12-hour foundations course taken during the first year of medical school, emphasizes the interdisciplinary and interprofessional nature of the field. It is designed to provide advance training in bioethics for those who anticipate encountering ethical issues in the course of their primary careers. Medical school students complete the bioethics program while pursuing their medical degrees; no additional time is required. Admission for the master's degree portion is through the Case Western Reserve University School of Graduate Studies. For more information, visit http://www.case.edu/med/bioethics/bioethics.html on the Web, e-mail bioethics@case.edu, or see http://www.case.edu/med/bioethics/bioethics.html on the Web.

PH.D. IN BIOETHICS
Case Western Reserve University is one of only two universities in the country to offer a pure bioethics doctorate program in addition to its master's and joint degree programs with medicine, nursing, law and genetics. Admission to the Ph.D. program is through the Case Western Reserve University School of Graduate Studies. For more information, please contact the Department of Bioethics at 216-368-6196, e-mail bioethics@case.edu, or see http://www.case.edu/med/bioethics/bioethics.html on the Web.

PH.D. IN GENETICS/M.A.
IN BIOETHICS
The rapid pace of human genetic research has led to an ever-increasing number of complex ethical issues, making the need for combined training in genetics and bioethics more critical. This is the first joint degree program in Ohio to address this need.

The master of arts in bioethics degree program is a 27-credit-hour program. Required courses include a 12-hour foundations course, a three-credit-hour clinical ethics rotation, and 12 hours of electives. Admission to the master's degree portion is through the Case Western Reserve University School of Graduate Studies Admission to the Ph.D. in genetics program is a separate process.

For more information, please contact the Department of Bioethics at 216-368-6196, e-mail bioethics@case.edu, or see http://www.case.edu/med/bioethics/bioethics.html on the Web.

M.D./M.B.A.
This program is offered in conjunction with Case Western Reserve University Weatherhead School of Management. For more information, visit http://weatherhead.case.edu/mba/jointDegree/joint_mbaMd.cfm on the Web, call the management school's admissions office at 216-368-2030 or 800-723-0203, or e-mail questions@exchange.som.case.edu.

M.D./M.S. IN APPLIED ANATOMY
The core curriculum of this 30-hour, non-thesis master of science master of science in applied anatomy degree program integrates aspects of modern molecular biochemistry, cell biology and physiology with the traditional aspects of anatomical structure and nomenclature of cells, tissues and organs. Electives allow students to pursue individual interests in special areas of research and health care. The program is excellent preparation for those preparing for biomedical careers or those planning to pursue a Ph.D. A thesis option is available.

For more information, visit http://case.edu/med/anatomy/msmd.html, call 216-368-2433, or e-mail mxs86@case.edu.

M.D./PH.D. IN HEALTH POLICY AND HEALTH SERVICES RESEARCH
This program prepares students for careers in academic medicine, health policy, public health, and/or health care management. An important area of focus within this training program is methods and issues in study design that pertain to research examining the health and health care problems of urban and vulnerable populations.

Application to and acceptance in the Ph.D. program in Health Policy/Health Services Research follows admission to the School of Medicine. Dual-degree students are fully integrated with graduate students in other tracks within the Department of Epidemiology and Biostatistics. Dual-degree students typically complete the Ph.D. coursework and the dissertation requirement by their end of their fifth year after matriculation, with the M.D. awarded at the end of the seventh year. Support for tuition and a stipend is available for a limited number of students each year.

For more information, see http://epbiwww.case.edu/hsr.html or contact the departmental coordinator for Graduate Studies, Ms. Alicia Boscarello at 216-368-5957 or by e-mail at alicia.boscarello@case.edu.

PHYSICIAN-ENGINEER TRAINING PROGRAM (PETP)

The Physician-Engineer Training Program (PETP) is a dual-degree program leading to an M.D. and a Ph.D. in biomedical engineering. The total program takes seven to eight years to complete. Students receive full financial support throughout the entire program. This includes all tuition costs, health service fees, computer fees and an annual stipend.

For more information, see http://bme.case.edu/petp/; write PETP Admissions, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio 44106-7207; phone 216-368-4094; or e-mail axb127@case.edu or ywc3@case.edu.

MEDICAL STUDENT ORGANIZATIONS
The list of organizations and activities available to medical students continually evolves to reflect the interests of current students. Here’s a sampling of the organizations and activities available at press time.

American Association of Anatomists
Contact: Tim Heacock (trh7),
Dave Jackowe (djl10)
Description: To promote science and research excellence, education and teaching excellence, and enhancement of resources for anatomy students.

American Medical Association- Medical Student Section
(Case AMA-MSS)
Contact: George Lominadze (gd61), Stephen Schuldt (ses44), Bishr Aldabagh (bxa33), CCLCM: Kevin Blaine (blainek@ccf.org)
Description: The AMA-MSS chapter at Case Western Reserve University serves to inform medical students about the events affecting medicine in general. It allows students to get involved locally, regionally and nationally in the other aspects of healthcare - policy and politics - with the backing of the most powerful medical association in the nation, the AMA. Want to know what else is out there, beyond the four walls of medical school? Want to be part of an association that will represent you for your entire career? Then come join the AMA-MSS!

American Medical Students Association (AMSA)
Contact: Laura Janneck - President (lmi17),
Dave Boverslus- Vice President (dbb11), Patrick Elliot - Treasurer (pf64), CCLCM Chair:
David Ly

Description: AMSA is the nation’s largest independent medical student organization. AMSA is committed to improving health care for all people; promoting improvement in medical education; being involved in the social, moral and ethical obligations of medicine; assisting in the improvement and understanding of world health problems; contributing to the welfare of medical students and residents; and advancing the profession of medicine. At Case, AMSA conducts events and projects that educate our students on these issues and empowers them to take action at our school, in our community, and nationally. AMSA offers a number of leadership opportunities, educational retreats, internships, and holds regional and national conferences that are the largest annual gatherings of medical students.

American Medical Women’s Association (AMWA)
Contact: Christine Gosen (clg10), Adriane Boyle (amb60), Jessica Bazick (jgb14)
Description: Welcome to the world of women in medicine! AMWA is the largest women’s medical organization in the country. Panel discussions for balancing life and medicine, lunch with women faculty, heart health presentations, and 3rd and 4th year mentoring.

Asian Pacific American Medical Students Association (APAMSA)
Contact: Case: Florence Lin (fls28@case.edu), Ravi Venkatesh (ravi.venkatesh@case.edu), Nolan Walther (nolan.walther@case.edu) Shelley Chang (sxc149@case.edu). Cleveland Clinic: Alan Siu (siua@ccf.org), Jun Xu (xuj@ccf.org)
Description: APAMSA: Not just for Asians. APAMSA is a medical student group dedicated to two specific aims: To educate medical students and health professionals in general about important health issues that affect Asian-Americans here and abroad. As a future physician, you will certainly encounter Asians in your practice, shouldn’t you know how to treat them effectively? If you are interested in learning about health issues that you won’t get in everydayclass and would like to make a positive impact on your community, then APAMSA is the group for you. Best yet, it is free to join!

Boys & Girls Club Tutoring
Joseph Fouche (jef20)

Case Against Tobacco (CAT)
Contact: Jonah Stulberg-Presdent (jjs42)
Description: Case Against Tobacco seeks to eliminate the morbidity and mortality associated with tobacco use through prevention, cessation, legislation and research. Case Against Tobacco coordinates tobacco related activities and provides a means of communication between Case and the greater community on tobacco related issues. In addition to connecting Case medical students to larger initiatives such as Smokefree Ohio, Case Against Tobacco is responsible for running large programs such as the Case Tar Wars Initiative and the Kick Start Program, prevention programs aimed at 4th -8th grade students in greater Cleveland.

Case For Life
Contact: Joe Sweigart (jrs61), Laura Campbell (lcd10)
Description: The mission of the Case For Life group of Case School of Medicine is to provide information necessary to understanding the complexities of life issues in medicine, raise awareness to pro-life perspectives, foster dialogue and personal reflections to reach informed decisions, and to encourage physician leadership in exploring and advocating for life issues. The group is dedicated to reducing the number of abortions performed in the medical profession. We envision a Case community in which all members appreciate the ethical and medical intricacies of life issues, as well as how those issues directly relate to the practice of medicine. We aim to promote an environment respectful of pro-life perspectives and in which all members are adequately informed about life issues to allow for meaningful discourse and informed decision making. This group is politically independent and not affiliated with any particular religion.

Cardiology Interest Group
Contact: Albert Luo (akl9)
Description: This is the first year of the Cardiology Interest Group. Our purpose is to introduce students to the exciting and diverse career options offered within the cardiology specialty, as well as to help students explore cardiology research opportunities. Throughout the course of the year, we hope to invite noted physicians from the Cleveland Clinic and University Hospitals to share their experiences as cardiologists working in leading heart care centers.

Christian Medical Association (CMA)

Contact: Christie Park (cep14), Florence Lin (fls28)
Description: CMA is a student led Christian fellowship for medical students that aims to foster relationships and spiritual growth. Our activities include bimonthly meetings, bible studies, fellowship events, outreach, mentoring, and prayer clusters.

Committee of Student Representatives (CSR)
Contact: John Mafi -President (jmni18), Jane Park-Vice-President (jhp16), Erin Broadus-Secretary (ecb16), James Choi-Treasurer (jic47), Eddie Jones-SCME Chair (edl14), Liz Alofs-Social Chair (ela10)
Description: CSR serves as the student government of the medical school, working to improve student life and serve as the main line of communication between students, faculty, and the administration. We coordinate events relating to diversity, community service, the alumni office, education resources, personal development, social outings, and send representatives to meetings of the Committee on Medical Education, Professional Council, Faculty in Medicine, as well as the national Organization of Student Representatives. We also compile the weekly feedback received by your faculty chairs from the students. Meetings are the 2nd Tuesday of every month and are open to the medical school community.

Complementary Medicine Interest Group (CMIG)
Contact: Dan Einstein (dpc)
Description: The Complimentary Medicine interest group supports those medical students who are interested in complementary, alternative and holistic medical modalities. We are dedicated to learning more about these modalities in order to provide our patients comprehensive medical care, to inform our peers, and finally to strengthen the relationship between all medical practitioners.

Dermatology Interest Group
Contact: Adriane Boyle (amb60), Jessica Rasntegar (jcr27)
Description: The Dermatology Interest Group exists to give information to students considering dermatology as a specialty. In the past, the group has hosted several events, such as a resident panel and a clinical workshop in dermatology. Through our organization, students will have an opportunity to get more exposure and experience in dermatology during their pre-clinical years.
Doc Opera
Contact: Bridget Combs-Director (bcc4), Julie Eppich-Director (jle10), Tyler Gifford-Director (txg46)
Description: Doc Opera is a show made up of videotaped skits and parodied songs targeting the medical school, medical community, life in Cleveland, and everything else that goes along with being a Case medical student. It is newly written, directed, and performed by medical students (and faculty) each year, and the proceeds are donated to a designated non-profit health-oriented organization.

Emergency Medicine Interest Group (EMIG)
Contact: Kristin Kuzma (ckk14)
Description: The EMIG strives to introduce students to the exciting specialty of Emergency Medicine through lectures, hands-on clinical skills labs, and networking opportunities with residents and attending physicians in the field.

Faith and Medicine
Contact: Paul Gunn (pfg4), Bishoy Gad (bgd24)
Description: We will explore the role that faith plays in the lives and care of our patients.

Family Medicine Interest Group (FMIG)
Contact: Nhu Hang-Communications Chair (nht2), Evelyn Morely-Education Chair (egm8), Doug Pepple-Community Service Chair (dpa6), Carrie Tuten-Administrative Chair (cct11)
Description: The Family Medicine Interest Group aims to develop the interest and knowledge in all students who have the “heart of a family doctor” to become active in leadership, education, and promotion of the ideals that are core family medicine values including relationship centered care, academic excellence, professionalism and humanism, integrity, and service through mentorship and community action. These ideals are promoted through educational workshops, lectures, special events, and for those committed to family medicine through their third and fourth year, an honors leadership program.

Healthy Boys and Girls Program
Contact: Joseph Fouche (jef20), Sara Heron (shh5)
Description: The Healthy Boys and Girls’ program established at Case provides youth in the surrounding underserved urban community with up-to-date health information, while at the same time providing medical students with experience of teaching in the community, and forging a relationship between the School of Medicine and the local urban community. Currently, the program visits the West Side Club and the King Kennedy Club, and instructs the children on a wide range of health topics, including physical fitness, mental health, and personal hygiene.

Holden Surgical Interest Society (Holden)
Contact: Tazo Inui-President (tsi2), Dave Matteson-Vice President (dtm6), Geoff Langham-Secretary (gel5)
Description: Holden was started by the surgical departments of UH and MetroHealth to help medical students gain exposure to the surgical specialties. Holden wants to establish and encourage contact between surgeons and students interested in their areas of expertise. There will be guest lecturers, workshops, opportunities for students to share their experiences, and many other activities.

Internal Medicine Interest Group (IMIG)
Contact: Jessica Bazick (jgb14), Vincent Chan (vbc), Nolan Walther (ndw7)
Description: IMIG serves to provide students with exposure and networking opportunities in the area of internal medicine and/or its subspecialties. Annual events include 1. An introductory talk by Dr. Armitage explaining what Internal Medicine is. 2. A panel of currently practicing internists and specialists explaining what they do on a day to day basis. 3. A department dinner at the end of the year attended by physicians and students. This year, we will be introducing some new clinical intro workshops, where students may experience the clinical procedures within the specialties of internal medicine as they progress through the corresponding academic committees.

International Health Interest Group
Silvia Chiang (ssc15), Patrick Elliot (pfe4), Dave Beverslius (ddb11), Laura Janneck (lmj17)
LGBTM – Dante Roulette (gdr4), Dan Wei (ddw8)
Medical Students for Choice (MSFC)
Contact: Millie Gentry-Student Coordinator (mcg19), Kathryn Feldman-Student Coordinator (krf11), Christine Gosen – Secretary (cgl10), Christina Shenko-Treasurer (cas32), Karen Gibbins-Education Chair (kkg7), Stephanie Tarkowsky-Community Liaison (smt15)
Description: Focusing on reproductive health through educating medical students and working with faculty to improve curriculum coverage of reproductive health topics. Panel discussions, counseling techniques, lunch seminars, movies, annual conferences, and more. Welcoming anyone curious for knowledge or with an interest to get involved! Keep an eye out for an interactive lunch session. Men, don’t be shy! Email christine.gosen@case.edu to get on the list-serve in advance.

Military Medicine Interest Group (MMIG)
Contact: Jessie Cassada-President (jlc20), Emily Link-Vice-President (elc4)
Description: MMIG is a recent addition to the student organizational body. The goal of the group is to raise military awareness at Case SOM. It is open to both civilian and HPSP students. It is non-political and not an attempt at recruitment. Activities include guest speakers, volunteering in support of our country and troops and military informational discussions. It also aims to build a local support network for HPSP students.

Neuro Interest Group
Contact: Jenn Lin (jlj23)
Description: The Neuro IG is a diverse group representing neurology, neurosurgery, and basic neuroscience. Our goal is to connect students with prominent faculty members in their field of interest, upper-classmen who are in the process of applying to residency programs, as well as other fellow students who are currently conducting research in various neuro fields. We will have periodic meetings throughout the year focusing on issues related to residency matching, research, and a general meet-and-greet with the faculty.

Obstetrics/Gynecology Interest Group (OB/GYN Interest Group)
Contact: Kathryn Feldman (krf11), Karen Gibbins (kkg7)
Description: The objectives of the OB/GYN Interest Group are 1) to help students understand the dynamics of a career in OB/GYN, 2) to promote clinical skills relevant to women's
health, 3) to match students with OB/GYN mentors based on their interests, 4) to understand the residency application process for OB/GYN. Members are encouraged to join the American College of Obstetricians and Gynecologists. This is a new organization at Case School of Medicine and all students with an interest in women’s health are encouraged to participate.

Oncology Interest Group
Contact: Rashedah Eke-Oduru - President (rae8)
Description: The goal of the Oncology Interest Group is to increase student awareness and interest in the various fields of oncology which encompass the disciplines of internal medicine, pediatrics, and surgery. The organization will highlight the breadth of career options and encourage advancement in cancer research. In addition, support will be given to local and national anti-cancer efforts through volunteer work, fundraising, and supplemental educational opportunities.

Orthopaedics Interest Group
Contact: Mark Sando (mjs73), Chad Fortun (cmf15)
Description: The mission of the orthopaedics interest group is to provide students with an open forum to learn about and discuss opportunities in the field. Through faculty lectures, discussion panels, and shadowing experiences, the group aims to expose students to the general practice of orthopaedics as well as inform students of recent innovations. By educating members about orthopaedic residency programs, the group hopes to provide students with information to better prepare them for application to this competitive field.

Otolaryngology (E.N.T.) Interest Group (ENTIG)
Contact: Adriane Boyle (amb60), John Heaphy (jch36)
Description: Our goal is to help students, especially those in their preclinical years, to explore the field of Otolaryngology. This means providing opportunities to learn about the field, about the research taking place at affiliated institutions, as well as to learn about what it really takes to become and be an otolaryngologist.

Pediatric Interest Group (Peds IG)
Contact: Jane Park (jhp16), Maya Kido (mmk35), Jessica Bazick (jgb14), Iris Kuo (ixk37), Lacey Benson (ljb23)
Reach Out and Read: Christie Park (cep14), Florence Lin (flx128)
Description: The Pediatric Interest Group is geared towards providing students with opportunities for education, mentorship and community service in the field of pediatric medicine. We accomplish this through a variety of projects and events that allow students to interact with both patients and physicians in the Cleveland area.

Phi Delta Epsilon (PDE)
Eddie Jones (elj4), Iris Kuo (ixk37), Jane Park (jhp16), Christine Gosen (clg10), Hadele Banna (hbh53)
A national service medical student organization with flexible and fun involvement in various activities in the community. PhiDE also gives you the opportunity to join a network of physicians nationwide who share a devotion to education and philanthropy. Events include Medwish, food/clothing drives, Ronald McDonald House, Cleveland Food Bank, Habitat for Humanity and volunteer work at Rainbow Hospital (a Carnival for the kids). We’re open to all suggestions!

Physicians for Human Rights (PHR)
Silvia Chiang (ssc15), Patrick Elliot (pfe4), Dave Beversluis (dwb11), Laura Janneck (ljm1j7)
Description: Physicians for Human Rights (PHR) is a national public health organization dedicated to helping the millions of children in the world who suffer from cleft lip and palate through free surgery for children, free training for doctors and research to find a cure. Smile Train provides free surgery and related treatment, which is performed by local medical teams in local hospitals in developing countries. This student organization exists to support the national organization in its goals and to allow students interested in craniofacial reconstruction to get involved in the reconstructive plastic surgery community.

Student Committee on Admissions (SCA)
Contact: Lei Lei (lxl94), Christine Gosen (clg10), Brandon Maughan (bmc16), Christina Shenko (cas32), Ryan Chamberlain (rjc28)
Description: The SCA functions to manage all aspect of student involvement in Office of Admissions activities. This includes: (1) Recruiting activities, (2) the new Student Interviewing program, and (3) student involvement on the Admissions Committee. The SCA works under the direct oversight of the deans of admissions.

Student National Medical Association (SNMA)
also are required. Elective course work and, for the thesis M.S. and Ph.D. students, laboratory rotations and research, complete the graduate students’ program of study. Research areas of particular strength among faculty in the Department of Anatomy include biological anthropology, cell injury, control of respiration, and non-molecular developmental neurobiology. The department has existing collaborative research efforts with basic scientists in several clinical departments, including medicine, orthopaedics, pediatrics, neurology, and neurosurgery. Please see the Department of Anatomy Web site for additional information.

**SCHOOL OF MEDICINE**

Contact: Ostranda Williams (ow2), Teresa Edwards (tme8)

Description of Organization: The Student National Medical Association is committed to supporting current and future underrepresented minority medical students, addressing the needs of underserved communities, and increasing the number of clinically excellent, culturally competent and socially conscious physicians.

**Unite for Sight/Prevent Blindness Ohio**

Contact: Christopher Gee (cjg15), Shamill Patel (ssp4), Jeffery Goshe (jmg20), Fahhad Farukhi (ff), Mazen Aways (mxa38)

Description: Unite for Sight serves to develop vision health education programs for the underserved population and raise funds and eyeglasses for international aide efforts. Numerous national and international opportunities exist. Prevent Blindness Ohio provides free vision screening at local clinics, vision education programs, insurance assistance, eyeglasses donation program, and school programs for the underserved population.

**DEPARTMENT OF ANATOMY**

Room WG-46, School of Medicine
Phone 216-368-2433
http://www.case.edu/med/anatomy/

The development of independence in research and experience in teaching are essential factors for scholars. The goal of the Department of Anatomy is to provide individuals with the skills and experiences that will allow them to develop and maintain successful careers as researchers and teachers. The strengths of both the faculty and students of the department help lead to the achievement of this goal. The graduate program in anatomy fulfills all requirements of the university’s School of Graduate Studies. Graduate studies in the Department of Anatomy can lead to the master of science degree in applied anatomy and to the doctor of philosophy degree. The master’s degree may be obtained as part of a joint degree program for qualified individuals participating in other programs at the university, such as the joint M.D./M.S. degree. Every graduate student in the Department of Anatomy must successfully complete 19 credits in the core curriculum of anatomical sciences, human gross anatomy, histology, neuroanatomy and embryology. An additional two credits offered by the department in seminar and research presentations

**COURSE DESCRIPTIONS (ANAT)**

ANAT 312. Basic Histology (3)
Fundamental histology course covering microscopic structure, nomenclature, and function of normal cells, tissues, and organs (human emphasis) to provide a sound foundation for bioengineering, premedical and pre-dental students.

ANAT 353. Anatomy for the Artist (3)
Reflecting the interdisciplinary nature of medical illustration, the course will have two complementary components. Morning sessions will involve instruction in human anatomy followed by direct observation and drawing of that anatomy from the cadaver. The entire body will be covered, including both the internal structures as well as those that directly impact the surface anatomy, to provide the student with a comprehensive understanding of the human form in its totality. Afternoon sessions will have students study the perceptual problems of drawing from the live model, focusing mainly on the developing human. A detailed description of development will be presented, focusing mainly on the developing human.

ANAT 375. Human Evolution: The Fossil Evidence (3)
This course will survey the biological and behavioral changes that occurred in the hominid lineage during the past five million years. In addition to a thorough review of the fossil evidence for human evolution, students will develop the theoretical framework in evolutionary biology. Recommended preparation: ANTH 377, BIOL 225. Offered as ANAT 375, ANTH 375, ANAT 475 and ANTH 475. Prereq: ANTH 103.

ANAT 377. Human Osteology (4)
This course for upper division undergraduates and graduate students will review the following topics: human skeletal development and identification; and forensic identification (skeletal aging, sex identification and population affiliation). Offered as ANAT 377, ANTH 377, ANAT 477 and ANTH 477.

ANAT 391. Embryology (3)
A detailed description of development will be presented, focusing mainly on the developing human. Discussions and presentations will also include several developing systems that have served as useful models in experimental embryology for deciphering mechanisms responsible for producing adult metazoan organisms. Offered as ANAT 391 and ANAT 491.

ANAT 398. Anatomy Departmental Seminar (1)
During the first half of the course, the organization, preparation, and delivery of oral scientific presentations are discussed. During the second half of the course, students, faculty, and invited speakers give presentations. These presentations include literature reviews and/or summaries of individual research projects. Reports on current research opportunities and ethical issues will also be presented.

ANAT 399. Independent Study (1 - 4)
Laboratory research project. Student must obtain approval of a supervising Anatomy department professor before registration and list the professor’s name on the schedule card.

ANAT 400. Research Rotation (0 - 6)
One semester-long laboratory rotation in a selected faculty research laboratory designed to introduce the student to all aspects of modern laboratory research including the design, execution, and analysis of original experimental work.

ANAT 411. Gross Anatomy (6)
This in-depth, cadaver dissection-based, course covers all aspects of human gross anatomy. The course is modeled after a traditional medical school gross anatomy curriculum and taught by the School of Medicine, Department of Anatomy faculty. It is divided into three sections: thorax and abdomen; pelvis/perineum and limbs/back; and head and neck. One hour of lecture will precede 3 hours of dissection laboratory Monday, Wednesday, and Friday. Lectures and dissection labs will cover all human anatomy, and students should be prepared to devote more time that the scheduled hours of 1:00 to 5:00pm. Dissection labs are open 24 hours 7 days a week. Recommended preparation: B.A./B.S., or fourth year undergraduate science major.

ANAT 412. Histology and Ultrastructure (4)
Comprehensive functional histology course integrating microscopic identification (‘structure plus nomenclature’) of normal cells, tissues, and organs with aspects of their cell biology, biochemistry, and physiology (‘function’). Topical coverage includes complete (‘head-to-toe’) tissue and organ survey with human emphasis.

ANAT 413. General Histology Laboratory (2)
Microscopic structure of tissues and organs. Laboratory course associated with ANAT 412 (see ANAT 412 description). Recommended preparation: ANAT 312 or ANAT 412 or concurrent enrollment.

ANAT 414. Neurological Anatomy (3)
This course provides a current and comprehensive survey of the structure of the human nervous system. It covers concepts which will be of practical value to students needing an understanding of the working mechanisms of the nervous system. The viewpoints of three closely dependent fields, neuroanatomy, neuropathology and neurology, are presented, not
with a view to covering them exhaustively but in the belief that a truly useful understanding of the morphology of the nervous system can only be attained by bringing together these three disciplines.

ANAT 415. Neurological Anatomy Laboratory (1)
This laboratory course provides an adjunct to ANAT 414, Neurological Anatomy. It affords the student the opportunity to learn the complex three-dimensional anatomy of the human central nervous system from photographs of brain slices and sections, from glass slides of human brain sections, from actual brain slices, and from dissection of the brain. The material will be approached not only through traditional methods of studying regional morphology but also by "following" the components of functional systems through the spinal cord, brain stem, and/or forebrain. Animated, three-dimensional, and color imagery will also be employed. Recommended preparation: ANAT 414 or concurrent enrollment.

ANAT 420. Forensic Pathology (3)
Forensic Pathology is a discipline where medicine and the law meet. Forensic pathologists strive to determine the cause, manner, and mechanism of death, and how to prevent unnatural death from occurring. This course reviews the field of forensic pathology, from sudden natural death, to homicide, to child abuse. Students will be exposed to an autopsy, and tour a crime laboratory. These tours are mandatory. Grading is based on performance on an examination and review and presentation of a forensic paper. Actual case material will be used. Students are therefore expected to maintain the highest professional and ethical standards.

ANAT 424. Neural Integrative and Regulatory Mechanisms (3)
This course is designed as a sequence to ANAT 414, Neurological Anatomy, or any other "introductory" course in neuroanatomy. Topics to be addressed include central regulation of pain, the regulation of somatic and visceral motor activity, neurotransmitter substances, the basal forebrain, the blood-brain barrier, levels of consciousness, sleep-wake mechanisms, cognitive behaviors and memory. Appreciation of the three-dimensional anatomical anatomy and vasculature of the spinal cord and brain will be gained through brain dissection and study of stained and unstained sections. Recommended preparation: ANAT 414 or permission.

ANAT 425. Techniques in Microscopy (3)
The microscopic technique course is designed for students to learn the basic knowledge and skills on light microscopy. Students will learn, through demonstration and hands-on experience, how to prepare complete microscopic slides. Routine histological stains, histochemical and immunohistochemical stains will be covered. Some knowledge about electron microscopy and confocal laser scanning microscopy will also be introduced.

ANAT 429. Medical Microscopic Anatomy (3)
This course covers condensed material in a microscopic anatomy course in most U.S. medical school curricula. It is intended for students who are interested in professional schools of medicine, dentistry, nursing or allied health sciences or who simply want to learn the structure and functions of cells, tissues and organs of the human or mammalian body. It is for students who want to learn the subject matter in a shorter summer session. It also serves as a review course for health professional students. The course will cover basic biology of cells and tissue types of the body. It will further cover how cells and tissues are organized to perform specific functions in organs and organ systems. The format includes lectures followed by laboratory sessions on the same topic using microscope slides and PowerPoint presentations. Optional weekly or biweekly review sessions will be scheduled for students who need these extra sessions.

ANAT 431. Statistical Methods I (3)
Application of statistical techniques with particular emphasis on problems in the biomedical sciences. Basic probability theory, random variables, and distribution functions. Point and interval estimation, regression, and correlation. Problems whose solution involves using packaged statistical programs. First part of year-long sequence. Offered as ANAT 431, BIOL 431, EPBI 431, and MPH 431.

ANAT 435. Morphometrics of Biological Shape (3)
Morphometrics is the measurement of biological shape. This course will focus on the collection of data, especially landmarks, from biological forms directly and especially via imaging. We will use best fit and interpolant algorithms (Geometric Morphometrics) to compare two and three dimensional landmark configurations of an individual over time, different individuals to each other, and individuals to average forms. The results are interpreted with standard multivariate statistical techniques. These tools are especially relevant to applications in medical imaging and other areas of biometrics. Background in linear algebra and basic statistics is desirable. This course is offered every other year, in odd numbered years. Recommended preparation: multivariate statistics course, familiarity with linear algebra, and permission of instructor.

ANAT 451. Writing and Reviewing Scientific Papers and Grants (2)
This is a graduate level course in writing scientific reports, i.e., theses, articles, and grants. The course includes weekly writing assignments and practice in analyzing and reviewing scientific papers. Students will also write a brief but complete paper. Recommended preparation: Undergraduate degree.

ANAT 452. Writing a Scientific Paper (2)
For graduate and post-doctoral students. Participants must have experimental data (not necessarily complete) with which they will write a full scientific paper. Course is limited to two participants.

ANAT 462. Advanced Principles of Developmental Biology (3)
Same as BIOL 362 except the required term paper is an NIH-format research proposal. Recommended preparation: BIOL 216. Offered as ANAT 462 and BIOL 462.

ANAT 467. Topics in Evolutionary Biology (3)
The focus for this course on a special topic of interest in evolutionary biology will vary from one offering to the next. Examples of possible topics include theories of speciation, the evolution of language, the evolution of sex, evolution and biodiversity, molecular evolution. ANAT/ANTH/GEOL/PHIL 467/BIOL 468 will require a longer, more sophisticated term paper, and additional class presentation. Offered as ANTH 367, BIOL 368, GEOL 367, PHIL 367, ANAT 467, ANTH 467, BIOL 468, GEOL 467, and PHIL 467.

ANAT 475. Human Evolution: The Fossil Evidence (3)
This course will survey the biological and behavioral changes that occurred in the hominid lineage during the past five million years. In addition to a thorough review of the fossil evidence for human evolution, students will develop the theoretical framework in evolutionary biology. Recommended preparation: ANTH 377, BIOL 225. Offered as ANAT 375, ANTH 375, ANAT 475 and ANTH 475. Prereq: ANTH 103.

ANAT 477. Human Osteology (4)
This course for upper division undergraduates and graduate students will review the following topics: human skeletal development and identification; and forensic identification (skeletal aging, sex identification and population affiliation). Offered as ANAT 377, ANTH 377, ANAT 477 and ANTH 477.

ANAT 491. Embryology (3)
A detailed description of development will be presented, focusing mainly on the developing human. Discussions and presentations will also include several developing systems that have served as useful models in experimental embryology for deciphering mechanisms responsible for producing adult metazoan organisms. Offered as ANAT 391 and ANAT 491.

ANAT 497. Scientific Presentations (1)
These courses provide a foundation and experience for making scientific presentations. Scheduled simultaneously with ANAT 498 and students from both courses are present, but the requirements for passing differ. Students in ANAT 497 prepare PowerPoint and poster presentations. Oral presentations by students taking ANAT 498 will occur during the class periods for the remainder of the semester. Students taking 497 and 498 must participate in these discussions. Students must take ANAT 497: Scientific Presentations before ANAT 498: Departmental Seminar.

ANAT 498. Anatomy Departmental Seminar (1)
These courses provide a foundation and experience for making scientific presentations. Scheduled simultaneously with ANAT 497 and students from both courses are present, but the requirements for passing differ. Students in ANAT 497 prepare PowerPoint and poster presentations. Oral presentations by students taking ANAT 498 will occur during the class periods for the remainder of the semester. Students taking 497 and 498 must participate in these discussions. Students must take ANAT 497: Scientific Presentations before ANAT 498: Departmental Seminar.

ANAT 499. Special Topics (1-12)
This course is designed to provide students with the opportunity to study an advanced topic in an area of specialization to which the student does not have access in formal courses. Recommended preparation: Undergraduate degree.
Seminar.

ANAT 499. Independent Study (1 - 4)
Laboratory research project. Student must obtain approval of a supervising Anatomy department professor before registration and list the professor’s name on the schedule card.

ANAT 503. Readings and Discussions (1 - 3)
In-depth consideration of special selected topics through critical evaluation of the literature. Student must obtain approval of supervising Anatomy department professor before registration.

ANAT 513. Surgical Anatomy of the Thorax and Abdomen (4)
This course is intended for graduate and fourth-year medical students interested in surgery and surgical subspecialties. This integrated course will review basic gross anatomy, provide advanced training in gross and surgical anatomy, introduce common clinical problems and their anatomical consequences, and basic surgical approaches. Recommended preparation: ANAT 411 and permission of instructor.

ANAT 515. Surgical Anatomy: Orthopaedic Musculoskeletal (4)
This orthopaedic musculoskeletal anatomy course is offered to M.S. in Applied Anatomy students and Musculoskeletal (4) basic surgical approaches. Recommended preparation: ANAT 411 and permission of instructor.

ANAT 516. Surgical Anatomy: Head and Neck (4)
Students will build on their understanding of basic gross, histological, pathologic, and embryonic anatomy of the head and neck. Human cadaveric dissection, radiographic aids, and clinical case reports of head and neck pathologies will be studied as to how they can inform the surgical approach to lesion removal and other therapeutic surgical interventions. Students participate in approximately one or two surgical intervention labs per week. Each is then followed by a student-led presentation and discussion in a "grand rounds" atmosphere. Surgical approaches covered include: cranial cavity, skull base, orbit, mandibulofacial, oral, otic, pharyngeal, and airway. Students are required to prepare for, attend and participate in all presentations, dissection sessions, and surgical intervention laboratories. There are two essay examinations, one at the start of class and another at the end of the course. Recommended preparation: ANAT 411, ANAT 412, ANAT 413, ANAT 414, ANAT 415, and ANAT 491 and permission of instructor.

ANAT 523. Histopathology of Organ Systems (3)
Comprehensive course covering the underlying basic mechanisms of injury and cell death, inflammation, immunity, infection, and neoplasia followed by pathology of specific organ systems. Material will include histological ‘structure’ and physiological ‘function’ aspects related to pathology (human emphasis). Recommended preparation: ANAT 412 or permission of instructor. Offered as ANAT 523 and PATH 523.

ANAT 530. Medical Sculpture: Basic Facial Reconstruction (2)
This introductory course takes a step-by-step approach to forensic facial reconstruction. Students will study the placement and function of head and neck muscles and learn about average tissue depths. An oil-based clay will be used to add muscles and contours to a human skull cast at the depth indicated by tissue markers to successfully recreate facial features.

ANAT 531. Medical Sculpture: Advanced Facial Reconstruction (2)
Students must be able to interpret soft tissue data with a minimal amount of help. Students will be provided a cast human skull on which to complete a facial reconstruction using an oil-based clay using tissue depth data information from that skull. Once completed, a photograph of that individual is available to compare the achieved likeness. A final exercise will have students advance the age of the individual using age rendering techniques (adaptable to work with fugitives and missing persons). Recommended preparation: ANAT 530.

ANAT 601. Research (1 - 18)
Predoctoral laboratory research.

ANAT 610. Oxygen and Physiological Function (3)
Lecture/discussion course which explores the significance and consequences of oxygen and oxygen metabolism in living organisms. Topics to be covered include oxygen transport by blood tissues, oxygen toxicity, and mitochondrial metabolism. Emphasis will be placed on mammalian physiology with special reference to brain oxidative metabolism and blood flow as well as whole body energy expenditure and oxidative stress related to disease. Offered as ANAT 610 and PHOL 610.

ANAT 611. Practicum in Human Gross Anatomy (1 - 3)
A course of study designed especially for the preparation of teachers that involves the supervised practical application of previously studied theory. Students accepted into ANAT 611 must participate in one of three sections of the course (as described below). Participation is defined as preparing a prosecution prior to each dissection laboratory and being present to teach in each dissection laboratory. The opportunity exists, at the discretion of the course director, to present classroom lectures. Presentation of classroom lectures is not required. The teaching experience obtained will be obtained in ANAT 611- Human Gross Anatomy. Teaching will be guided, supervised, and evaluated by the appropriate faculty from the department of anatomy. The three sections of ANAT 611 and the subjects covered are: Trunk Gross Anatomy (6 weeks), Musculoskeletal Gross Anatomy (3 weeks), Head & Neck Gross Anatomy (4 weeks). Recommended preparation: ANAT 411 and permission of instructor.

ANAT 614. Practicum in Neurological Anatomy (1)
A course of study designed especially for the preparation of teachers that involves the supervised practical application of previously studied theory. The graduate student will administer all laboratory sessions, assisting students with identification of structures and with understanding the functional aspects of neuroanatomical pathways. The graduate student will meet with the course director once per week to discuss the student’s performance and progress and to plan for upcoming class sessions. The course director will assist the student in developing the organizational skills necessary to be a course director as the student learns to anticipate questions, define problematic areas, and recognize varying learning styles. The graduate student will be evaluated by the course director with reference to the graduate student’s overall progress and performance as a teacher. Recommended preparation: ANAT 414.

ANAT 651. Thesis M.S. (1 - 9)
Master’s Thesis Plan A.

ANAT 691. Practicum in Embryology (1)
A course of study designed especially for the preparation of teachers that involves the supervised practical application of previously studied theory. In the first half of the course, the graduate student will meet with small groups of three to four students on a twice-weekly basis to guide them in preparing their weekly classroom presentations. Each week, the graduate student will meet with the course director to evaluate the organization and quality of the classroom presentations and to discuss an organizational plan for the presentations scheduled for the next week. In the second half of the course, the graduate student will deliver at least two but no more than four lectures covering basic and advanced topics in human embryology. At least one week prior to each lecture, the graduate student will meet with the course director to review the material to be presented and to plan the lecture. The graduate student will be evaluated by both the students and the course director with respect to the lectures the graduate student presents in the second half of the course. Recommended preparation: ANAT 491.

ANAT 701. Dissertation Ph.D. (1 - 18)
(Credit as arranged.) Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF ANESTHESIOLOGY AND PERIOPERATIVE MEDICINE
Lakeside Hospital Room 2532
Phone 216-844-8077/Fax 216-844-7349
www.anesthesiaprogram.com

Master of Science in Anesthesiology (MSA)
The Master of Science in Anesthesiology (MSA) Program mission is to graduate skilled and compassionate anesthesiologist assistants. The admission policy reflects this goal. Applicants are considered on a variety of parameters.
which measure academic ability, communication skills, clinical aptitude, and personality traits.

Admission to the MSA program requires that the following criteria are met:

A. Bachelor’s degree from an accredited college or university

Documentation of each of the prerequisites listed below having been completed with a grade of B or higher within five (5) years prior to the application deadline at an accredited American or Canadian institution of higher learning. For those courses that have been repeated, the highest grade will be used in the calculation.

- one semester of biochemistry
- one year of biology with laboratory
- one year of anatomy with laboratory (human preferred)
- one year of physiology
- one year of chemistry with laboratory
- one year of organic chemistry with laboratory
- one year of physics with laboratory
- one year of calculus for premedical/life sciences OR one semester of calculus I & one semester of statistics (with a calculus I prerequisite)*
- one year of English with expository writing*

*If any of the above courses marked with an asterisk were completed (with a grade of B or higher) in excess of five (5) years prior to the application deadline, they will meet the prerequisite criteria if the composite score of the MCAT is 25 or higher.

A. Medical College Admission Test
- minimum composite score of 20
- test must have been completed within 3 years of application deadline
- when the MCAT has been taken more than once, component scores from different exams may not be combined

Applicants with international undergraduate, graduate or advanced degrees must meet the standard admission requirements listed above. International application requirements also include the TOEFL (Test of English as a Foreign Language) OR the IELTS (International English Language Testing System) and Educational Credential Evaluation Reports for foreign transcripts.

All information must be received by the deadline, October 1st. Candidates participate in interviews with members of the Admission Committee, which is comprised of faculty and staff members of the MSA program. All academic requirements must be completed satisfactorily before matriculation. Prospective candidates are permitted and encouraged to shadow an anesthetist in the OR. Prior approval for this visitation is required.

The 24-month program includes 63 credit hours (six semesters) of classroom and clinical instruction. The first three semesters integrate basic science and clinical instruction. During the remaining 3 semesters, students complete month-long rotations in all subspecialties of anesthesiology: ambulatory surgery, burns and trauma, cardiovascular surgery, general surgery, neurosurgery, obstetrics, pediatrics, surgical intensive care unit. Clinical training focuses on all types of anesthesia including general, epidural, spinal and peripheral nerve blockade.

Instruction is also provided in advanced patient care monitoring techniques and pretesting, calibration and operation of anesthesia delivery systems and monitors. At Case our personal approach and rigorous educational standards produce compassionate and highly skilled anesthesiologist assistants.

The MSA Program is accredited by the Commission on Accreditation of Allied Health Education Programs (CAAHEP) and is based on the Standards for Anesthesiologist Assistant Programs. Graduates sit for the Certification Examination administered by the National Commission for Certification of Anesthesiologist Assistants (NCCAA) and co-sponsored by the National Board of Medical Examiners (NBME).

Additional information may be found on the Master of Science in Anesthesia Program Web site at www.anesthesiaprogram.com.

**COURSE DESCRIPTIONS (ANES)**

**ANES 403. Physical Methods for Anesthesiologist Assistants (2)**
Basic concepts in electricity, gas/liquid interfaces, acid/base balance, immunology, hematology, statistics, and computer systems needed for subsequent work.

**ANES 440. Patient Monitoring and Instrumentation I (2)**
Students are taught the proper balance between circuits and engineering concepts and the clinical application of anesthesia instrumentation. Monitors and devices used in the operating room are studied with respect to principles of operation, calibration, and interpretation of data. A hands-on laboratory is utilized to maximize direct contact to the instrumentation of the profession.

**ANES 441. Patient Monitoring and Instrumentation II (3)**
Continuation of ANES 440. Recommended preparation: ANES 440.

**ANES 456. Applied Physiology for Anesthesiologist Assistants I (3)**
Basic and applied human systems physiology with emphasis on topics and areas of special concern to the anesthetist.

**ANES 458. Applied Physiology for Anesthesiologist Assistants II (3)**
Continuation of ANES 456. Recommended preparation: ANES 403 and ANES 456.

**ANES 460. Introduction to Anesthesia (2)**
Introduction to basic concepts dealing with clinical anesthesia. Medical terminology, human anatomy, medical chart interpretation and drug dosage calculations.

**ANES 461. Orientation to Clinical Experience (3)**
Introduction to experience in the operating room with emphasis on the fundamental procedures and techniques used in administering an anesthetic. Preoperative assessment, IV placement techniques, airway management, intraoperative patient care and postoperative management are all emphasized in this course. BLS (basic life support) certification is required for course completion. Recommended preparation: Acceptance in the M.S.A. program.

**ANES 462. Anesthesia Clinical Correlation I (1)**
A series of conferences presented by students that applies to anesthetic theory as it relates to the clinical experience. Specific anesthetic situations are emphasized. Recommended preparation: ANES 460.

**ANES 463. Anesthesia Clinical Experience I (3)**
A continuation of the preparation, observation, and hands-on learning format initiated in ANES 461. Patient management and technical skills are refined with close attention to the didactic course work. A comprehensive clinical examination is administered at the end of the semester. ACLS (Advanced Cardiac Life Support) certification is required for course completion. Recommended preparation: ANES 461.

**ANES 464. Anesthesia Clinical Correlation II (1)**
A spectrum of case presentation conferences presented by the students dealing with basic and major problems in anesthesia management. Medical and surgical history of individual patients and the outcomes of anesthesia and surgery are emphasized. Journal Club and Morbidity and Mortality conferences are included. Recommended preparation: ANES 462.

**ANES 465. Anesthesia Clinical Experience II (4)**
A continuation of ANES 463. A comprehensive clinical examination is administered at the end of the semester. PALS (Pediatric Advanced Life Sup-
Introduction to physiological model-based simulation using on-screen computer simulation and mannequins. Emphasis is placed on improving appropriate anesthesia-related basic science knowledge, manual skills in anesthesiology machine checkout, drug and equipment setup, safety inspections, and performing anesthesia for uncomplicated surgical cases.

ANES 486. Physiological Model-Based Simulation I (1)
An extension of ANES 485 with emphasis on improving or exercising knowledge of anesthesia-appropriate basic science, the use of more advanced equipment and techniques for uncomplicated surgical cases with an introduction to crisis management. Recommended preparation: ANES 485.

ANES 487. Physiological Model-Based Simulation II (1)
An extension of ANES 486 emphasizing the physical techniques aspects of crisis management, team work and rescue in anesthesia, including support for and review of training in Basic Life Support and Advanced Cardiac Life Support. Recommended preparation: ANES 486.

ANES 490. Ethics, Law and Diversity for Anesthesiologist Assistants (2)
This course will focus on three topics. First, a discussion of legal practice as it applies to health care including basics of medical jurisprudence, negligence, and how to avoid a lawsuit. Second, a discussion of ethical theory including the principles of medical ethics, do not resuscitate, truth telling, and assessment of competence. Last, a discussion on diversity that will focus on the differences and similarities among people and how these factors influence patient care. The final grade will be based on an essay and a multiple choice exam.

ANES 499. Clinical Remediation (1 - 10)
(Credit as arranged.) Course offered to the student one time during the program of study which remediates "C" or below work in a clinical course.

ANES 580. Fundamentals of Anesthetic Sciences II (1)
The second-year equivalent of ANES 480. An examination is administered at the end of each semester. Recommended preparation: ANES 480.

ANES 585. Physiological Model-Based Simulation III (1)
A review of critical crisis management and rescue techniques which are not often seen in practice. (Course will be scheduled either Fall or Spring Semester based on external rotation schedule.) Recommended preparation: ANES 487.

ANES 599. Clinical Remediation (1 - 10)
(Credit as arranged.) Course offered to the student one time during the program of study which remediates "C" or below work in a clinical course.
three-year program receive a stipend, and tuition costs are covered by the department. The students pursue flexible and individually designed schedules, which prepare them for independent research projects in the second and third years of the program. The program simultaneously develops background knowledge and technical skills in modern biochemistry, which can be applied to several career paths. A more complete description of the program, admission policies, and financial aid is available from the departmental office.

Master of Science in Biochemistry Degree

The program leading to the M.S. degree in biochemistry is designed to provide students with knowledge of the latest advancements in biochemistry and related fields. It is intended for students who desire to pursue a career not directly involved with research, such as teaching, or various administrative positions in the pharmaceutical industry. Students typically enroll in three courses for each of four semesters.

REQUIRED COURSES ARE:

- BIOC 407 (General Biochemistry) and BIOC 408 (Molecular Biology). Other lecture courses are selected by the students in consultation with academic advisors who are assigned to the students upon matriculation into the program. A more complete description of the program and admission policies is available from the departmental office.

Ph.D. in Biochemistry

The aim of the Ph.D. in biochemistry program is to prepare students for careers in teaching and research in biochemistry. The emphasis of the doctoral program is on research culminating in the completion of an original independent research project under the guidance of a faculty member in the biochemistry program. The research areas in the department are described later in this section. In addition to the research activities, graduate students participate in formal courses both within and outside the department, formal and informal seminars, and discussions of current literature. Schedules are flexible and are individually tailored to each student’s needs. Although students choose from the various tracks within the department, they are broadly trained in modern aspects of biochemistry and become familiar with techniques and literature in a variety of areas. Many collaborative projects with other departments also are available to broaden the spectrum of training offered. Most students select a multidepartmental, integrated curriculum in cellular and molecular biology in addition to specialized courses in biochemistry.

Most Ph.D. students in biochemistry are admitted through the Biomedical Sciences Training Program (BSTP). This program, which combines thirteen graduate programs in the School of Medicine, is described under a separate listing in this General Bulletin. A complete description of the program, including research activities, admission policies, and financial aid, may be obtained from the departmental office or the BSTP coordinator.

Medical Scientist Training Program

Students may pursue a Ph.D. in biochemistry as part of the combined M.D./Ph.D. program. Information on this program may be obtained from the departmental office or the Medical Scientist Training Program coordinator. Please see the separate listing in this publication for information on the MSTP program.

MD/MS in Biomedical Investigation Students may pursue a Master of Science Degree in biochemistry by completing some additional course work in biochemistry and by completing a years worth of research. This program requires five years of study with tuition and stipend provided for the year of research. Please see the separate listing in this General Bulletin for information on the MD/MS program.

J.D./M.S. in Biochemistry

This program allows students admitted to the School of Law an opportunity to pursue a master of science degree in Biochemistry as part of an additional year of study. Such training adds expertise to students who anticipate careers in patent law or in areas related to biotechnology or pharmaceutical research. Please see the separate listing in the publication materials provided by the School of Law on this program.

RESEARCH AREAS

Research of Department of Biochemistry faculty members covers a broad spectrum of topics from events at the level of electron movement in biochemical reactions to the intracellular trafficking of proteins. Research in the department is broadened by collaborations with faculty in other university departments and with scientists at other Cleveland research institutions. The specific areas of active research within the department are outlined below.

Proteins and Enzymes

Proteins are components of all living tissue, and their function is critical for life processes. Understanding the chemical mechanisms of enzymatic catalysis is essential for determining the role of individual proteins in human disease. Biochemistry faculty study a variety of proteins and enzymes ranging from growth factors to oncoproteins.

Structural Biology

The function of a protein is determined by its three-dimensional structure and interactions. Faculty apply many modern techniques to the determination of macromolecular structures, including X-ray crystallography, and multidimensional heteronuclear NMR, fluorescence, Raman, and circular dichroism spectroscopy. Macromolecules under investigation include transcarboxylase, ribosomes, DNA-protein complexes, and neurochemical enzymes.

Regulation of Gene Expression

The elucidation of mechanisms regulating gene expression is a major goal of modern biology. Biochemistry faculty study the control of transcription by hormones and other regulatory molecules, the interaction between proteins and DNA, the function of oncogenes, the basal and hormone mediated transcriptional machinery, and the processing and translation of RNA.

Cell Biology

The control of the metabolism, differentiation and cell signaling within and between cells is an area of active investigation.

Metabolic Regulation

Biochemistry faculty investigate the control of metabolism in animals, such as dietary and hormonal regulation of gene expression. Transgenic murine technology allows the study of the impact of gene ablation on metabolic processes.

COURSE DESCRIPTIONS (BIOC)

BIOC 307. General Biochemistry (4)
Overview of the macromolecules and small molecules key to all living systems. Topics include: protein structure and function; enzyme mechanisms, kinetics and regulation; membrane structure and function; bioenergetics; hormone action; intermediary metabolism, including pathways and regulation of carbohydrate, lipid, amino acid, and nucleotide biosynthesis and breakdown. One semester of biology is recommended. Offered as BIOC 307, BIOC 407, and BIOL 407. Prereq: CHEM 223 and CHEM 224.
BIOC 308. Molecular Biology: Genes and Genetic Engineering (4)

An examination of the flow of genetic information from DNA to RNA to protein. Topics include: nucleic acid structure; mechanisms and control of DNA, RNA, and protein biosynthesis; recombinant DNA; and mRNA processing and modification. Where possible, eukaryotic and prokaryotic systems are compared. Special topics include yeast as a model organism, molecular biology of cancer, and molecular biology of the cell cycle. Current literature is discussed briefly as an introduction to techniques of genetic engineering. Recommended preparation for BIOC 408 and BIOC 408: BIOC 307 or BIOL 214. Offered as BIOC 308, BIOL 308, BIOC 408, and BIOL 408. Prereq: BIOC 307 or BIOL 215.

BIOC 312. Proteins and Enzymes (3)

Aspects of protein and nucleic acid function and interactions are discussed, including binding properties, protein-nucleic acid interactions, kinetics and mechanism of proteins and enzymes, and macromolecular machines. Recommended Preparation: CHEM 301. Offered as BIOC 312 and BIOC 412. Prereq: BIOC 307.

BIOC 334. Structural Biology (3)

Introduces basic chemical properties of proteins and discusses the physical forces that determine protein structure. Topics include: the elucidation of protein structure by NMR and by X-ray crystallographic methods; the acquisition of protein structures from data bases; and simple modeling experiments based on protein structures. Offered as BIOC 334, BIOL 334, BIOC 434, and BIOL 434. Prereq: BIOC 307.

BIOC 373. Biochemistry Sages Seminar (3)

Discussion of current topics in biochemical research using readings from the scientific literature. The goals are for the student: 1) to discuss and critically analyze selections from the biochemical literature; 2) to gain a broader understanding of important topics not formally covered in the didactic courses; and 3) to learn to write in the style of journals in the field of biochemistry. Prereq: BIOC 307 and BIOC 308. Restricted to majors in Biochemistry. SAGES Dept Seminar.

BIOC 391. Research Project (1–9)

(Credit as arranged.) Offered on a pass/fail basis only. Maximum 9 hours total credit.

BIOC 393. Senior Capstone Experience (3)

Students will complete their Capstone Projects, begun in BIOC 391. Pertinent research activities will depend on the nature of the student's project. The student will meet regularly with their Capstone advisor, at least twice monthly, to provide progress reports, discuss the project, and for critique and guidance. By the end of this course, the student will have completed their SAGES Senior Capstone research project, written a project report in the form of a manuscript, and presented their project reports orally in the department and at the Senior Capstone Fair, or its equivalent. Prereq: BIOC 307 and BIOC 308. SAGES Senior Cap.

BIOC 401. Impacts of Intellectual Property on Biomedical Research (1)

This course will expose students to the challenges and opportunities related to intellectual property when developing biomedical technologies within the context of nonprofit research institutions. The course will examine the effects that patent law has on research strategy, funding availability and follow-on funding availability. Special attention will be paid to the dynamics between the potential for profit, the need for translational research and institutional and individual conflicts of interest.

BIOC 407. General Biochemistry (4)

Overview of the macromolecules and small molecules key to all living systems. Topics include: protein structure and function; enzyme mechanisms, kinetics and regulation; membrane structure and function; bioenergetics; hormone action; intermediary metabolism, including pathways and regulation of carbohydrate, lipid, amino acid, and nucleotide biosynthesis and breakdown. One semester of biology is recommended. Offered as BIOC 307, BIOC 407, and BIOL 407. Prereq: CHEM 223 or CHEM 224.

BIOC 408. Molecular Biology: Genes and Genetic Engineering (4)

An examination of the flow of genetic information from DNA to RNA to protein. Topics include: nucleic acid structure; mechanisms and control of DNA, RNA, and protein biosynthesis; recombinant DNA; and mRNA processing and modification. Where possible, eukaryotic and prokaryotic systems are compared. Special topics include yeast as a model organism, molecular biology of cancer, and molecular biology of the cell cycle. Current literature is discussed briefly as an introduction to techniques of genetic engineering. Recommended preparation for BIOC 408 and BIOL 408: BIOC 307 or BIOL 214. Offered as BIOC 308, BIOL 308, BIOC 408, and BIOL 408.

BIOC 412. Proteins and Enzymes (3)

Aspects of protein and nucleic acid function and interactions are discussed, including binding properties, protein-nucleic acid interactions, kinetics and mechanism of proteins and enzymes, and macromolecular machines. Recommended Preparation: CHEM 301. Offered as BIOC 312 and BIOC 412.

BIOC 420. Molecular Genetics of Cancer (3)

Cancer is a genetic disease, not only in the Mendelian sense of inheritance, but also in the sense that it is caused by somatic mutation. The targets of mutation are a set of proto-oncogenes and tumor suppressor genes whose products govern cellular proliferation, death and differentiation. The objectives of this course are to examine the types of genes that are the targets of mutational activation or inactivation and the mechanistic outcome of mutational changes that lead to oncogenesis. The course will also probe viral mechanisms of oncogenesis related to the products of cellular proto-oncogenes or tumor suppressor genes. In the course of these examinations we will explore the genetic and molecular genetic approaches used to identify and study oncogenes and tumor suppressor genes. Students should be prepared to present and discuss experimental design, data and conclusions from assigned publications. There will be no exams or papers but the course will end with a full-day, student-run symposium on topics to be decided jointly by students and instructors. Grades will be based on class participation and symposium presentation. Offered as BIOC 420, MBIO 420, MVIR 420, PATH 422, and PHRM 420. Prereq: CBIO 453 and CBIO 455.

BIOC 430. Advanced Methods in Structural Biology (3)

Provides students with an in-depth introduction to biophysical techniques used to quantify macromolecular structures. A major part of the course will deal with the use of nuclear magnetic resonance to derive a 3-D structures of macromolecules in solution. Other topics include electron spin resonance, absorption, fluorescence and circular dichroism spectroscopies, Raman and infrared spectroscopies and methods used in modeling. Offered with BIOC 431, “Advanced Methods Biology II” in alternate years. BIOC 430 deals with protein hydrodynamics and thermodynamics, crystallography, and mass spectrometry. The course will be mostly lecture based. This course will provide an extensive overview for graduate students specializing in structural biology. Offered as BIOC 430, CHEM 430, PHOL 430 and PHRM 430.

BIOC 431. Advanced Methods in Structural Biology II (3)

This course provides an introduction to biophysical techniques for graduate students who are interested in structural biology and biophysical chemistry. Offered with BIOC 430, “Advanced Structural Biology I” in alternate years. Advanced Methods I (430) focuses on NMR and optical spectroscopies. Advanced Methods II deals with protein hydrodynamics and thermodynamics, crystallography, and mass spectrometry.

BIOC 434. Structural Biology (3)

Introduces basic chemical properties of proteins and discusses the physical forces that determine protein structure. Topics include: the elucidation of protein structure by NMR and by X-ray crystallographic methods; the acquisition of protein structures from data bases; and simple modeling experiments based on protein structures. Offered as BIOC 334, BIOL 334, BIOC 434, and BIOL 434.

BIOC 452. Nutritional Biochemistry and Metabolism (3)

Mechanisms of regulation of pathways of intermediary metabolism; amplification of biochemical signals; substrate cycling and use of radioactive and stable isotopes to measure metabolic rates. Recommended preparation: BIOC 307 or equivalent. Offered as BIOC 452 and NTRM 452.

BIOC 460. Introduction to Microarrays (3)

Microarray technology is an exciting new technique that is used to analyze gene expression in a wide variety of organisms. The goal of this course is to give participants a hands-on introduction to this technology. The course is intended for individuals who are preparing to use this technique, including students, fellows, and other investigators. This is a
hands-on computer-based course, which will enable participants to conduct meaningful analyses of microarray data. Participants will gain an understanding of the principles underlying microarray technology, including: theory of sample preparation, sample processing on microarrays, familiarity with the use of Affymetrix Microarray Suite software and generation of data sets. Transferring data among software packages to manipulate data will also be discussed. Importation of data into other software (GeneSpring and DecisionSite) will enable participants to mine the data for higher-order patterns. Participants will learn about the rationale behind the choice of normalization and data filtering strategies, distance metrics, use of appropriate clustering choices such as K-means, Hierarchical, Self Organizing Maps. Prereq: CBIO 455.

BIOC 475. Protein Biophysics (3)
This course focuses on in-depth understanding of the molecular biophysics of proteins. Structural, thermodynamic and kinetic aspects of protein function and structure-function relationships will be considered at the advanced conceptual level. The application of these theoretical frameworks will be illustrated with examples from the literature and integration of biophysical knowledge with description at the cellular and systems level. The format consists of lectures, problem sets, student presentations. A special emphasis will be placed on discussion of original publications. Offered as BIOC 475, CHEM 475, PHOL 475, PHRM 475, and NEUR 475.

BIOC 476. Cellular Biophysics (4)
This course focuses on a qualitative understanding of cellular processes. It is designed for students who feel comfortable with and are interested in analytical and quantitative approaches to cell biology and cell physiology. Selected topics in cellular biophysics will be covered in depth. Topics include theory of electrical and optical signal processing used in cell physiology, thermodynamics and kinetics of enzyme and transport reactions, single ion channel kinetics and excitability, mechanotransduction, and transport across polarized cell layers. The format consists of lectures, problem sets, computer simulations, and discussion of original publications. The relevant biological background of topics will be provided appropriate for non-biology science majors. Offered as BIOC 476, NEUR 477, PHOL 476, PHRM 476.

BIOC 515. Endocrine Pharmacology (3)
Seminar lecture course on regulation at the molecular level of selected interrelated endocrine systems. Offered as BIOC 515 and PHRM 515.

BIOC 519. Molecular Biology of RNA (3)
Selected topics regarding editing, enzymatic function, splicing, and structure of RNA. Offered as BIOC 519, CLBY 519, and MBIO 519.

BIOC 521. Chromatin Structure and Transcription (3)
A critical review of selected topics and current literature on the role of chromatin structure in the regulation of gene expression. Offered as BIOC 521 and GENE 521.

BIOC 555. Emerging Concepts in Cell Regulation (3)
This course will cover the general principles of cell regulation with an emphasis on the emerging novel mechanisms of signal transduction. The traditional areas of receptor tyrosine kinases, G-protein coupled receptors will be examined but the focus will be on the roles novel mechanisms such as regulated proteolysis, ubiquitin proteasomal degradation, protein acetylation etc. in signal transduction and gene expression. This will be a literature-based course which will depend on critical evaluation of research papers, reviews and accompanied with in-depth discussion. Recommended preparation: CBIO 453. Offered as BIOC 555, CLBY 555, and PATH 555.

BIOC 599. RNA Structure and Function (3)
This course will cover fundamental aspects of modern RNA biology with emphasis on the interplay of three dimensional structure of nucleic acids and their function. The main focus of the course is on the recent discoveries that indicate a prominent role of RNA as a major regulator of cellular function. Topics discussed will include an introduction to RNA structure, folding and dynamics, RNA/RNA and RNA-protein interactions, and role of RNA in catalysis of biological reactions in ribosome and the role of other catalytic RNAs in tRNA biogenesis, pre-mRNA splicing, and viral replication. The course also covers the recently discovered RNA regulatory switches, large noncoding regulatory RNAs, and the role of RNA in human diseases and novel, RNA-based therapeutics. Offered as BIOC 599, CLBY 599, and MBIO 599.

BIOC 601. Biochemical Research (1-18)
Credit as arranged.

BIOC 605. Independent Project in Biochemical Research (1-18)
Credit as arranged. Limited to students in the M.S. program in biochemical research. Prereq: BIOC 407 and BIOC 601.

BIOC 611. Biochemistry Seminar I (1)
Student presentations of topics from the current scientific literature unrelated to the student's research project. Participants are required to present a seminar.

BIOC 612. Biochemistry Seminar II (1)
Discussion of current research.

BIOC 617. Special Topics in Biochemistry (3)
Special topics courses on areas of current interest in biochemistry.

BIOC 618. Special Topics in Biochemistry (3)
Special topics courses on areas of current interest in biochemistry.

BIOC 620. Transcription and Gene Regulation (3)
This course covers mechanisms of transcription that play critical roles in biological processes. It is designed to develop scientific thinking in designing experiments and evaluating the merits of research papers. Students will be able to present two to three 30-minute talks. Topics include: 1) structure and function of RNA polymerases; 2) accessory factors involved in initiation, elongation, and termination; 3) regulation transcription; 4) transcriptional co-activators and corepressors; 5) regulation of transcription factor activity. A take-home exam will be conducted at the final week. Grades will be based on presentations and take-home exam. Offered as BIOC 620 and MBIO 620.

BIOC 641. Proposition I (2)
Design of research proposal.

BIOC 643. Proposition II (2)
Design of research proposal.

BIOC 651. Thesis M.S. (1 - 6)
(Credit as arranged.)

BIOC 701. Dissertation Ph.D. (1 - 18)
(Credit as arranged.) Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF BIOETHICS
Room TA-200, School of Medicine
Stuart J. Youngner, M.D., Susan E. Watson
Professor of Biomedical Ethics and Chair
Phone: 216-368-6196
http://www.case.edu/med/bioethics/bioethics.html

The Department of Bioethics provides a forum for the study and discussion of ethical issues in medicine. Its mission is to improve public and professional understanding of the ethical issues involved in health sciences research, health care delivery, and health policy development through teaching, research and community dialogue.

The department has offices at the Case's School of Medicine and at MetroHealth Medical Center and has faculty from multiple disciplines, including philosophy, religion, law, political science, anthropology, history, sociology, nursing and medicine.

Department faculty teach in both core and elective components of the medical school curriculum, undergraduate courses in ethics, and an intensive course in ethics of scientific work for Ph.D. students in the Biomedical Sciences Training Program. The department also has a highly successful master's degree program in bioethics.

Department faculty have gained international prominence for research in many areas of biomedical ethics that collectively address the concerns of the School of Medicine's spectrum of biomedical disciplines.

The Department of Bioethics publishes a newsletter, Bioethics Update. Bioethics Update contains information and articles on a variety of ethical issues of interest to both professional and lay communities. It is published three times a year and features faculty research
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and activities, department events, and master's degree alumni information.

The department has a website where visitors can read Bioethics Update online, obtain information about the master's degree and Ph.D. programs, and learn about department and faculty activities: http://www.case.edu/med/bioethics/bioethics.html/.

Master of Arts in Bioethics Degree
The Department of Bioethics offers a program leading to the Master of Arts degree in bioethics, emphasizing the interdisciplinary and inter-professional nature of the field. This graduate program is designed to provide advance training in bioethics for students and professionals who anticipate encountering ethical issues in the course of their primary careers.

The 27 credit-hour degree can be earned full-time in one year or part-time in up to three years. Core courses are taught by department faculty and are scheduled so that part-time students can continue their professional responsibilities while completing the degree.

The Master of Arts program provides students with a firm understanding of the intellectual content of the study of bioethics, of bioethical literature, and of the underlying philosophical arguments and empirical assumptions that inform it. Students are taught to understand the institutions and structures of health care and the ethical issues that arise in medical practice. They are trained to identify and analyze a range of clinical ethics issues.

All students pursuing a Master of Arts degree in bioethics are required to complete the interdisciplinary core of 12 credit hours (the equivalent of four courses) in the first two semesters of their first year of study.

The courses, BETH 401: Foundations in Bioethics I, and BETH 402: Foundations in Bioethics II, each six credits, examine 10 basic topic areas in bioethics: death and dying, the therapeutic relationship, method and theory in bioethics, organ transplantation, health care justice, defining health care needs, reproduction and fertility, families, babies and children, research ethics and genetics. Classes meet two evenings per week for seminar sessions (two hours per session).

Another required course is BETH 405: Clinical Ethics Rotation (three credits). This course requires a minimum of 8 hours of clinical experience per week during the 10-week rotation. Students spend most of their time observing rounds in relevant services (intensive care units, pediatrics, geriatrics, etc.) with leading clinicians at several area hospital sites. Students must complete rotations at two sites. At the conclusion of each rotation, students are familiar with the clinical, psychological, social, professional, and institutional contexts in which ethical problems arise. Also, they are able to identify, analyze and understand ethical issues as they develop.

In addition, all students must complete 12 credit hours of electives. Electives are selected in consultation with a faculty advisor. Electives must enhance the student's understanding of bioethical issues and must be relevant to the student's academic goals.

The department currently offers dual-degree programs with the School of Medicine (M.D./M.A.), the School of Medicine's Department of Genetics (Ph.D./M.A.), the School of Law (J.D./M.A.), the Frances Payne Bolton School of Nursing (M.S.N./M.A.), the School of Medicine’s Public Health program (MPH/MA) and Mandel School of Applied Social Sciences (MSSA/MA) at Case. Students must apply and be accepted to each program to qualify.

Commencing in the fall semester of 2007, the department will offer a new research ethics track within the MA program, designed to prepare specialists who will pursue research ethics-related work as a primary career (IRB coordinators, research administration, etc.) or who will use this specialized training to enhance their primary careers (investigators, regulators, etc.). In addition to the core seminars BETH 401 and 402, discussed above, the research ethics track will feature a modified clinical ethics rotation, focused on IRB work and research ethics activities, and four research ethics electives.

Admission policies conform to those of Case Western Reserve University School of Graduate Studies. In general, an applicant for admission and concurrent financial consideration must have completed application forms on file by March 1 for the fall semester.

PH.D. in Bioethics
The increasing complexity of the healthcare system has resulted in a growing need for investigators who can conduct research to address pressing social problems in bioethics. The objective of the bioethics doctoral program is to train scholars who will have specific expertise in the conceptualization, design and conduct of empirical research concerning bioethics questions. Graduates will:

• obtain grounding in the philosophical basis of bioethics to conceptualize and analyze moral problems;
• develop a theoretical perspective to guide their research;
• be proficient in empirical methodologies (both qualitative and quantitative) so that they can conduct research in bioethics problems; and
• become researchers who can develop and conceptualize timely and meaningful research questions in bioethics.

Graduates of the program have a wide range of opportunities, including careers as independent investigators, serving as a bridge between colleagues in the traditional medical humanities and those in clinical and basic-science departments, and employment in academic bioethics centers, clinical and basic science departments in medical schools and schools of public health, government agencies, and public policy institutes.

Each student will receive a full scholarship and a $20,000-per-year graduate assistantship.

Course of Study
• Minimum of 51 credit hours of course work for candidates with bachelor's degrees; minimum of 42 credit hours for candidates with master's degrees
• 18 credit hours of dissertation coursework
• 125 research hours (supervised research experiences with Department faculty)
• Training in research ethics
• Comprehensive examination preceding advancement to candidacy
• Defense of dissertation proposal
• Completion of dissertation
• Defense of dissertation

CORE COURSEWORK
(see course descriptions for more information)

• Foundations in Bioethics I & II
• Clinical Ethics Rotation
• Advanced Seminar on Methods in Normative Bioethics I & II
• Empirical Research Methods and Design in Bioethics I & II
• Statistical Methods and Data Management in Bioethics I & II
• Grant Writing
• Critical Readings in Bioethics
• Research hours

Additional course work: three credit hours each in advanced statistics, methods and study
design, and theory from the social sciences, and six credit hours of elective courses

**Enrollment in the Doctoral Program**

The doctoral program is highly selective. Candidates should have a strong theoretical background in the social sciences or philosophy, preferably in the form of a master's degree in a relevant discipline or a clinical degree. Candidates also must demonstrate the ability to work with quantitative data and demonstrate promise of integrating theory and empirical application.

- Applicants must complete an interview and submit:
  - Transcripts (undergraduate and graduate if applicable)
  - GRE scores — verbal, analytic and quantitative sections. Scores will be considered in relation to the applicant's other credentials. Applicants may submit scores of other standardized tests in addition to the GRE.
  - Three letters of recommendation
  - A letter to the admission committee detailing the applicant's general interests in bioethics and the candidate's past training and current research interests
  - Completed Case Western Reserve University graduate school application form

For more information about the Department of Bioethics and its programs, contact:

DEPARTMENT OF BIOETHICS
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Cleveland, Ohio 44106-4976
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**COURSE DESCRIPTIONS (BETH)**

**BETH 271. Bioethics: Dilemmas (3)**

We have the genetic technology to change nature and human nature, but should we? We have the medical technology to extend almost any human life, but is this always good? Should we clone humans? Should we allow doctor-assisted suicide for the terminally ill? This course invites students from all academic disciplines and fields to examine current and future issues in bioethics—e.g., theory and methods in bioethics; death and dying; organ transplantation; genetics; aging and dementia; fertility and reproduction; distributive justice in health care access. The course will include guest lecturers from nationally-known Bioethics faculty. Offered as BETH 271, PHIL 271.

**BETH 315. International Bioethics: Policy and Practice (3)**

Taught by Case and international faculty, this course will include 7-10 days of intensive didactic and experiential learning in one of several "host" countries. Examples of sites include: Free University of Amsterdam and University of Utrecht in the Netherlands; University of Paris in France; and Ben Gurion University in Israel. It will afford a unique opportunity to gain perspective on important bioethics issues in different societies, i.e., euthanasia, public health policies, access to healthcare, and stem cell research. At the international site, students will spend 6 hours per day (5 days) in seminar (including didactics, discussion, and guided-observation clinical experience). There will be two 3-hour preparatory sessions, required reading, and two 3-hour post trip sessions. Requirements: preparation, attendance, and class participation, a 12-15 page paper (graduate credit). Graduate credit will also require students to prepare a presentation for a post-intensive session. Enrollment will be capped at 25. This course has an additional fee to cover costs of travel and lodging. Limited scholarships are available. Offered as BETH 315 and BETH 415.

**BETH 401. Foundations in Bioethics I (6)**

The first of the two required seminar courses, this course covers five basic topic areas in bioethics: death and dying; health professional-patient relationship; method and theory in bioethics; organ transplantation; and ethics and children. The course meets twice weekly and is taught in seminar format by Center faculty members who are experts on specific topics. Preentry.

**BETH 402. Foundations in Bioethics II (6)**

This course completes the required seminar core and covers the basic bioethics topic areas: health care justice; defining 'health care needs'; reproduction and fertility ethics; research ethics; and ethics in genetics. The course meets twice weekly and is taught in seminar format by Center faculty members who are experts on specific topics. Recommended preparation: BETH 401.

**BETH 405. Clinical Ethics Rotation (1.5 - 3)**

In this course, students will become familiar with the clinical, psychological, social, professional, and institutional context in which ethical problems arise. This course exposes students to clinical cases, to hospital ethics committees and ethics consultation programs, to institutional review boards (IRB), and to hospital policies covering the "do not resuscitate" orders (DNR), advance directives, withdrawal of artificial feeding, organ procurement and transplantation, and medical futility. Requires minimum of 8 total hours of rotation experience per week during two semester 10-week rotations. Locations for this course include: MetroHealth Medical Center, University Hospitals of Cleveland, and the Hospice of the Western Reserve. Recommended preparation: BETH 401 or concurrent enrollment.

**BETH 414. International Health Research Ethics (3)**

This course will introduce students to the health and social sciences to key ethical issues that arise in international health research. The course will include intensive reading and case-based discussion of current ethical and moral quandaries posed by research conducted in the international arena. Five full-day sessions are planned. Each day will be divided into a series of formal presentations and active, group-based discussions around topics that include: the theoretical and practical aspects of ethics and public health research; current international ethics principles, standards, and declarations; key tools and concepts for unpacking ethical issues in international health research; issues in informed consent and conflict of interest; "reasonable availability" and the conduct of clinical trials; cutting-edge international genetics research; and, the responsibility of researchers to the international health community. Course evaluation is based on class participation, a written exercise, and a case analysis.

**BETH 415. International Bioethics: Policy and Practice (3)**

Taught by Case and international faculty, this course will include 7-10 days of intensive didactic and experiential learning in one of several "host" countries. Examples of sites include: Free University of Amsterdam and University of Utrecht in the Netherlands; University of Paris in France; and Ben Gurion University in Israel. It will afford a unique opportunity to gain perspective on important bioethics issues in different societies, i.e., euthanasia, public health policies, access to healthcare, and stem cell research. At the international site, students will spend 6 hours per day (5 days) in seminar (including didactics, discussion, and guided-observation clinical experience). There will be two 3-hour preparatory sessions, required reading, and two 3-hour post trip sessions. Requirements: preparation, attendance, and class participation, a 12-15 page paper (graduate credit). Graduate credit will also require students to prepare a presentation for a post-intensive session. Enrollment will be capped at 25. This course has an additional fee to cover costs of travel and lodging. Limited scholarships are available. Offered as BETH 315 and BETH 415.

**BETH 417. Introduction to Public Health Ethics (3)**

The course will introduce students to theoretical and practical aspects of ethics and public health. This course will help students develop the analytical skills necessary for evaluating of ethical issues in public health policy and public health prevention, treatment, and research. Requirements: preparation, attendance, and class participation, a 12-15 page paper (graduate credit). Graduate credit will also require students to prepare a presentation for a post-intensive session. Enrollment will be capped at 25. This course has an additional fee to cover costs of travel and lodging. Limited scholarships are available. Offered as BETH 315 and BETH 415.

**BETH 418. Ethical Issues in Genetics/Genomics (3)**

This course is designed to familiarize graduate students with the major controversies over the generation and use of new human genetic information. Topics will include the spread of predictive genetic testing, prenatal diagnosis, genetic discrimination, human genetic variation research, eugenics, genetic counseling, and the limits of human gene therapy.

**SCHOOL OF MEDICINE**

The course will be conducted as a seminar, involving discussions of readings, guest speakers, and student presentations.

**BETH 414. International Health Research Ethics (3)**

This course will introduce students in the health and social sciences to key ethical issues that arise in international health research. The course will include intensive reading and case-based discussion of current ethical and moral quandaries posed by research conducted in the international arena. Five full-day sessions are planned. Each day will be divided into a series of formal presentations and active, group-based discussions around topics that include: the theoretical and practical aspects of ethics and public health research; current international ethics principles, standards, and declarations; key tools and concepts for unpacking ethical issues in international health research; issues in informed consent and conflict of interest; "reasonable availability" and the conduct of clinical trials; cutting-edge international genetics research; and, the responsibility of researchers to the international health community. Course evaluation is based on class participation, a written exercise, and a case analysis.

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SCHOOL OF MEDICINE

This course is open to graduate students with an interest in health-related bioethics. Enrollment preference will be given to Masters-level bioethics students in the Research Ethics Track (RET). The course provides students with a comprehensive study of critical issues in research ethics, including the modern history of research ethics in science and medicine, the ethics of clinical trial design and conduct, advanced issues in informed consent, the ethics of animal experimentation, and key issues in genetics research. Coursework will include case studies and in-depth readings to highlight topic areas. Discussions of ethical and regulatory frameworks that influence decision-making, policy development, and the conduct of biomedical and social-behavioral science research will allow students to explore the nuances, gaps, challenges, and concerns present in research, particularly research involving human subjects. Topics will be addressed within the framework of integrating research ethics into the scientific process. Students are expected to lead class discussions and write a course-relevant paper. Enrollment will be limited to 15 students. Class will meet weekly for 3 hours.

BETH 421. Research Ethics Practicum (1.5)
The Research Ethics Practicum (80 hours, 1.5 CREDITS) is designed to complement the theoretical and conceptual training received in the course, Critical Issues in Research Ethics. By way of a series of campus-wide rotations, students learn about the practical, everyday side of research administration, compliance, and scientific review. Students will work with key staff in research ethics centers, and observe their day-to-day operations, as well as attend institutional review board (IRB) and Institutional Animal Care and Use Committee (IACUC) meetings. They will become familiar with human subjects, animal, and tissue research regulations and policies as these are applied in an institutional/academic research context. Students will also spend time in a clinical trials unit and tour animal care facilities. The practicum has the following overall objectives: (1) students will be able to identify, analyze, and understand research ethics issues as they develop in the context of actual institutional research governance (2) students will gain an understanding of methods of ethical research design and implementation.

BETH 422. Clinical Ethics: Theory & Practice (3)
This course will focus on both theoretical and practical issues in clinical ethics. Clinical ethics will be distinguished from other areas of bioethics by highlighting distinctive features of the clinical context which must be taken into account in account in clinical ethics policy and practice. Fundamental moral and political foundations of clinical ethics will be examined, as well as the role of bioethical theory and method in the clinical context. Topical issues to be considered may include informed consent; decision capacity; end of life decision making; confidentiality and privacy; the role and function of ethics committees; ethics consultation; the role of the clinical ethicist; decision making in various pediatriac settings (from neonatal through adolescent); the role of personal values in professional life (e.g., rights of conscience issues, self disclosure and boundary issues); dealing with the chronically non-adherent patient; ethical issues in organ donation and transplant; health professional-patient communication; medical mistakes; and other ethical issues that emerge in clinical settings.

BETH 423. Stem Cells: Ethics and Policy (3)
This graduate-level course addresses major issues in the science, ethics, and politics of stem cell research. Over the past decade, embryonic stem cell research has emerged as one of the world’s most controversial areas of biomedical research. While new forms of stem cell research have emerged recently which appear to sidestep the debate over the use of human embryos, these new forms of stem cell research raise a host of problems in their own right. Furthermore, as stem cell research marches toward clinical applications for patients, the scientific and ethical issues will continue to evolve in evermore complex directions. In order to fully appreciate the ethical and policy issues at the cutting edge of stem cell science, one needs a sound grasp of the science of stem cell research. Thus this course is designed to take a science-based approach to the ethics of stem cell research. (No prior knowledge of stem cell biology is presupposed.)

BETH 440. Science and Society Through Literature (3)
This course will examine the interaction of scientific investigation and discovery with the society it occurs in. What is the impact of science on society and, as importantly, what is the effect of society on science? An introduction will consider the heliocentric controversy with focus on Galileo. Two broad areas, tuberculosiasis and the Frankenstein myth, will then be discussed covering the period 1800-present. With tuberculosis, fiction, art and music will be examined to understand the changing views of society towards the disease, how society’s perception of tuberculosis victims changed, and how this influenced their treatments and research. With Frankenstein, the original novel in its historical context will be examined. Using fiction and film, the transformation of the original story into myth with different connotations and implications will be discussed. Most classes will be extensive discussions coupled with student presentations of assigned materials. Offered as PHRM 340, BETH 440, PHRM 440, and HSTY 440.

BETH 496. Public Policy and Aging (3)
Overview of aging and the aged. Concepts in the study of public policy. Policies on aging and conditions that they address. The politics of policies on aging. Emergent trends and issues. Offered as ANTH 498, BETH 496, EPBI 408, GERO 496, HSTY 480, MPH 408, NURS 479, NURS 579, POSC 480, and SOCI 496.

BETH 501. Advanced Seminar in Bioethics (3)
Special topics of interest, such as advanced studies in theory and method in bioethics, ethics and reproduction, the ethics of research with human subjects, religion and medicine, historical perspectives on medical ethics, cross-cultural issues in bioethics, or ethics in applied settings such as hospitals and long term care facilities. Seminar typically taught by visiting professor in intensive format. Consult the term roster of courses for the specific topic. Recommended preparation: BETH 401 or concurrent enrollment.

BETH 504. Critical Readings in Bioethics (3)
This course will focus on both normative (traditional) and descriptive (empirical) approaches to bioethics. It will be co-directed by two faculty members, one with a specialization in normative bioethics and one with a specialization in descriptive bioethics.

BETH 505. Methods in Normative Bioethics I (3)
The first of the two required Methods seminars is designed to give graduate students an intensive introduction to the modes of moral reasoning that have been adopted and adapted by contemporary Bioethics, and the major critical perspectives that have been brought to bear upon them.

BETH 506. Methods in Normative Bioethics II (3)
The second of the two required Methods seminars is designed to give graduate students an intensive introduction to the modes of moral reasoning that have been adopted and adapted by contemporary Bioethics, and the major critical perspectives that have been brought to bear upon them.

BETH 507. Research Design in Bioethics I (3)
The first of two empirical research courses will introduce students to theoretical and methodological approaches in the design and implementation of empirical research on topics in biomedical ethics. Students will be provided with a comprehensive and robust exploration of empirical models for the development of bioethics research and the skills for critically assessing the optimal methods for designing studies relevant to ethical issues in biomedicine.

BETH 508. Research Design in Bioethics II (3)
The second of two empirical research courses will introduce students to theoretical and methodological approaches in the design and implementation of empirical research on topics in biomedical ethics. Students will be provided with a comprehensive and robust exploration of empirical models for the development of bioethics research and the skills for critically assessing the optimal methods for designing studies relevant to ethical issues in biomedicine.

BETH 509. Statistical Methods in Bioethics I (3)
The first of two required Statistical Methods will focus on basic concepts of distributions of random variables, point and interval estimation, statistical hypotheses, correlation and regression; and survey of statistical methods in analysis of variance, categorical data analysis, survival data analysis, non-parametric methods, generalized linear model and multivariate techniques. Students will also be introduced to data management strategies and computer applications in database management. Topics in the use of statistical packages will be introduced and used to solve data-intensive problems and projects.
BETH 510. Statistical Methods in Bioethics II (3)
The second of two required Statistical Methods will focus on basic concepts of distributions of random variables, point and interval estimation, statistical hypothesis, correlation and regression; and survey of statistical methods in analysis of variance, categorical data analysis, survival data analysis, non-parametric methods, generalized linear model and multivariate techniques. Students will also be introduced to data management strategies and computer applications in database management. Topics in the use of statistical packages will be introduced and used to solve data-intensive problems and projects. Prereq: BETH 509.

BETH 511. Grant Writing (3)
This course will teach students the fundamentals of writing a grant proposal. We will concentrate on NIH-style applications, although the principals of grant writing can be applied to any venue. In the process of working through devising a research question and study design, students will be encouraged to use this as an opportunity to think about their dissertation topic. In addition to applying theoretical and research design knowledge gained through their core course work, the course will also teach students about how to complete application forms and to create a budget. We will also familiarize students with the peer review process. Each student will produce a draft grant application. The students will form a mock peer review section and will critique the grants.

BETH 512. Clinical Ethics Rotation - Ph.D. (1.5)
In this course students will become familiar with the clinical, psychological, social, professional, and institutional context in which ethical problems arise. This course exposes students to clinical cases, to hospital ethics committees and ethics consultation programs, to institutional review boards (IRB), and to hospital policies covering the “do not resuscitate” orders (DNR), advance directives, withdrawal of artificial feeding, organ procurement and transplantation, and medical futility. Requires minimum of 10 total hours of rotation experience per week during two semester 10-week rotations. Locations for this course include: MetroHealth Medical Center, University Hospitals of Cleveland, and the Hospice of the Western Reserve. Recommended preparation: BETH 520/521 or concurrent enrollment.

BETH 520. Foundations in Bioethics I - Ph.D. (3)
The first of the two required seminar courses, this course covers five basic topic areas in bioethics: death and dying; health professional-patient relationship; method and theory in bioethics; organ transplantation; and ethics and children. The course meets twice weekly and is taught in seminar format by Center faculty members who are experts on specific topics.

BETH 521. Foundations in Bioethics II - Ph.D. (3)
The second of the two required seminar courses, this course covers five basic topic areas in bioethics: death and dying; health professional-patient relationship; method and theory in bioethics; organ transplantation; and ethics and children. The course meets twice weekly and is taught in seminar format by Center faculty members who are experts on specific topics.

BETH 602. Special Topics in Bioethics (1 - 3)
Students will explore particular issues and themes in biomedical ethics in depth through independent study and research under the direction of a faculty member.

BETH 701. Dissertation Ph.D. (1 – 18)
(Credit as arranged.) Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

BIOMETRICS

THE FIRST YEAR

Coursework
Students take an integrated series of courses in cell and molecular biology (CBIO 453 and 455). This one-semester course emphasizes the molecular approach that forms the basis of modern biology. Qualified students also may take more specialized elective courses.

Research Rotations
The research rotations allow the student to sample areas of research and become familiar with faculty members and their laboratories. The main purpose of these rotations is to aid the student in selecting a laboratory for the thesis work. Students are encouraged to begin their rotations in July. Doing so gives them the opportunity to complete one rotation during the summer before classes begin at the end of August. A minimum of three rotations must be completed during the year.

Choosing a Thesis Advisor
During the first year, students select an advisor for the dissertation research. Each student also joins the training program with which the advisor is affiliated. Once a student has chosen a program, the specific requirements of that program are followed to obtain the Ph.D. The emphasis of the Ph.D. work is on research, culminating in the completion of an original, independent research thesis. Participating Training Programs

- Anatomy
- Biochemistry
- Biology
- Cell Biology
- Molecular Biology and Microbiology
- Molecular Virology
- Molecular and Cellular Basis of Disease and Immunology
- Molecular, Developmental, and Human Genetics
The Cell Biology Program provides educational and research opportunities through its journal clubs and colloquia and through graduate training toward the Ph.D. degree. The research environment includes all the basic science departments of the School of Medicine, the Department of Biology, and several laboratories at University Hospitals of Cleveland and the Cleveland Clinic Foundation. These departments collectively cover a diverse set of areas of contemporary interest in the cell biology of higher animals, plants, yeast and other microorganisms. These include the extra cellular matrix, secretion and endocytosis, cell adhesion, the cytoskeleton, the nuclear envelope, and others. Many of these areas interface with local research in biochemistry, genetics, immunology, molecular biology, neuroscience, pharmacological sciences, and physiology and biophysics.

First-year graduate students follow the Correlated Curriculum in Cell and Molecular Biology (CBIO 453 and 455, 8 credit hours) along with students from all graduate departments. They also complete three laboratory rotations (starting July 1) among the laboratories of training faculty, which span the entire campus. The goal of the rotations is to guarantee that the student has sufficient breadth of familiarity with cell biology faculty to allow him or her to make the best choice of a permanent research laboratory. In all cases, this selection must be made, with the consent of the sponsor and his or her department, before nine months have elapsed. First-year students also actively participate in the weekly Cell Biology Journal Club and attend the cell biology colloquia.

During the subsequent years, students devote most of their time to laboratory research, while also attending courses, seminars and journal clubs and participating in occasional national/international Cleveland cell biology symposia organized by the program. Past or planned topics include Membrane Traffic in Health and Disease (1996), Cell Biology of Huntington's Disease and Related Disorders (2000), Perspectives on the Fragile X Syndrome (2001), and Regulation of Functions of the Nucleus (2004).

The elective courses may be given by any department or program on campus. Students must take a total of 36 credit hours of courses and maintain a B average.

Preparation for the qualifying exam and the writing of research proposals and the dissertation match the norm of the department in which the student elects to do his or her thesis work; however, the content of the exams and proposal(s) must have a clear emphasis on cell biology itself.

All efforts should be made to complete the Ph.D. within four years. It is expected that the student will be the first author of at least two articles accepted for publication in highly regarded scientific journals.

CELL BIOLOGY PROGRAM (CBIO)

REQUIRED (FIRST YEAR)

- **CBIO 453-456. Correlated Curriculum in Cell and Molecular Biology (12 credits)**
- **CLBY 422. Topics in Cell Biology (3 credits).**
- Electives are listed on the Cell Biology Program Web site.
- **CLBY 701. Dissertation (credit as arranged)**

PARTICIPATING FACULTY

Josephine Adams  
Erik Andrulis  
Susann Brady-Kalnay  
Carleen Carlin  
Martha Catcchart  
Piet de Boer  
Guy Chisolm  
Paul DiCorletto  
Donna Driscoll  
Thomas Egelhoff  
Maria Febbraio  
Paul Fox  
Edward Greenfield  
Clifford Harding  
Stanley Hazen  
Phil Howe  
Donald Jacobsen  
Michael Kinter  
Andrea Ladd  
Gary Landreth  
Veronique Lefebvre  
Alan Levine  
Gregory Matera  
David McDonald  
Thomas McIntyre  
Richard Morton  
Virgil Muresan  
Cathy Patterson  
Marc Penn  
Sanjay Pimplikar  
Arne Rietsch  
Ofer Reizes  
Iain Robinson  
Kurt W. Runge  
Steven Sanders  
Ruth E. Siegel  
Roy Silverstein  
Neena Singh  
Jonathan Smith  
Martin Snider  
Alan M. Tartakoff  
Patrick Viollier  
Amy Wilson-Delfosse  
Jo Ann Wise  
Alan Wolfman  
Alan Zhu  
Richard Zigmond

COURSE DESCRIPTIONS (CBIO AND CLBY)

**CBIO 453. Cell Biology I (4)**

Part of the first semester curriculum for first year graduate students along with CBIO 455. This course is designed to give students an intensive introduction to prokaryotic and eukaryotic cell structure and function. Topics include membrane structure.
and function, mechanisms of protein localization in cells, secretion and endocytosis, the cytoskeleton, cell adhesion, cell signaling and the regulation of cell growth. Important methods in cell biology are also presented. This course is suitable for graduate students entering most areas of basic biomedical research. Undergraduate courses in biochemistry, cell and molecular biology are excellent preparation for this course. Recommended preparation: Undergraduate biochemistry or molecular biology.

CBIO 455. Molecular Biology I (4)
Part of the first semester curriculum for first year graduate students along with CBIO 453. This course is designed to give students an intensive introduction to prokaryotic and eukaryotic molecular biology. Topics include protein structure and function, DNA and chromosome structure, DNA replication, RNA transcription and its regulation, RNA processing, and protein synthesis. Important methods in molecular biology are also presented. This course is suitable for graduate students entering most areas of basic biomedical research. Undergraduate courses in biochemistry, cell and molecular biology are excellent preparation for this course. Recommended preparation: Undergraduate biochemistry or molecular biology.

CBIO 518. Signaling via Cell Adhesion (3)
Molecular mechanisms by which cells interact with and are regulated by extracellular matrices and other cells. Offered as CBIO 518, CLBY 518, MBIO 518, and NEUR 518.

CELL BIOLOGY PROGRAM (CLBY)
Master's Degree Programs
Thesis (Plan A) and non-thesis (Plan B) master of science degree programs are offered to students who have completed an undergraduate degree program from an accredited university or college. Course schedules are arranged to accommodate individuals who wish to enroll on a part-time basis. Both programs require a total of 27 semester hours at the 400 level or higher. A minimum of 27 semester hours of formal course work is required for the non-thesis degree, and a minimum of 18 semester hours is required for the thesis degree. The remaining nine hours required for completion of Plan A must be fulfilled with research credits (EVHS 651). Students enrolled in Plan B must pass a comprehensive examination before being awarded the degree. The requirements for the master's program must be completed within five consecutive calendar years after matriculation.

Ph.D. Program
Admission to the doctoral degree program may follow successful completion of the undergraduate degree or master's degree program. A minimum of 36 semester hours of graduate study is required for students entering with an undergraduate degree, and 18 semester hours typically are required for students who have completed an M.S. degree program. A proposal-type examination is required before admission to candidacy. Award of the Ph.D. degree is dependent on completion of the course work requirements, 18 hours of dissertation research credit (EVHS 701 or 702) and an original, independent research project under the guidance of a faculty advisor, as well as the submission and defense of a written dissertation. There is no foreign language requirement.

FINANCIAL SUPPORT
Financial support is available for Ph.D. candidates and for a limited number of full-time master's degree candidates.

For more information
Those interested in obtaining applications should contact Karen E. Hendershot, department administrator, at 10900 Euclid Ave., Cleveland, Ohio 44106-4940, telephone (216) 368-5959, or e-mail keh2@case.edu, or contact Carole S. Jackson, department assistant, at (216) 368-5961 or csj3@case.edu. For further information, contact Karen E. Hendershot by the aforementioned means or Martina L. Veigl, Ph.D., at 11001 Cedar Ave., Cleveland, Ohio 44106-7047, telephone (216) 844-7525, or e-mail mlv2@case.edu.
CLBY 488. Yeast Genetics and Cell Biology (3)
This seminar course provides an introduction to the genetics and molecular biology of the yeasts S. cerevisiae and S. pombe by a discussion of current literature focusing primarily on topics in yeast cell biology. Students are first introduced to the tools of molecular genetics and special features of yeasts that make them important model eukaryotic organisms. Some selected topics include cell polarity, cell cycle, secretory pathways, vesicular and nuclear/cytosplasmic transport, mitochondrial import and biogenesis, chromosome segregation, cytoskeleton, mating response and signal transduction. Offered as CLBY 488, GENE 488, MBIO 488, and PATH 488.

CLBY 511. Cell Biology Seminar (1)
The Cell Biology Seminar provides a forum for presentation and discussion of contemporary issues in Cell Biology. Students, fellows, local faculty and guest speakers present both research talks and journal clubs.

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CLBY 518. Signaling via Cell Adhesion (3)
Molecular mechanisms by which cells interact with and are regulated by extracellular matrices and other cells. Offered as CBIO 518, CLBY 518, MBIO 518, and NEUR 518.

CLBY 519. Molecular Biology of RNA (3)
Selected topics regarding editing, enzymatic functions, splicing, and structure of RNA. Offered as CBIO 519, CLBY 519, and MBIO 519.

CLBY 525. Transport and Targeting of Macromolecules in Health and Disease (3)
Each class includes introductory lecture, followed by student participation in interactive discussion of 3 to 5 research publications. At the end of the course, the students are expected to submit a paper or a short research proposal on any of the topics discussed during the course. Recommended preparation: CBIO 453, CBIO 454, CBIO 455, and CBIO 456. Offered as CLBY 525 and PATH 525.

CLBY 555. Emerging Concepts in Cell Regulation (3)
This course will cover the general principles of cell regulation with an emphasis on the emerging novel mechanisms of signal transduction. The traditional areas of receptor tyrosine kinases, G-protein coupled receptors will be examined but the focus will be on the roles novel mechanisms such as regulated proteolysis, ubiquitin proteasomal degradation, protein acetylation etc. in signal transduction and gene expression. This will be a literature-based course which will depend on critical evaluation of research papers, reviews and accompanied with in-depth discussion. Recommended preparation: CBIO 453. Offered as CBIO 555, CLBY 555, and PATH 555.

CLBY 599. RNA Structure and Function (3)
This course will cover fundamental aspects of modern RNA biology with emphasis on the interplay of three dimensional structure of nucleic acids and their function. The main focus of the course is on the recent discoveries that indicate a prominent role of RNA as a major regulator of cellular function. Topics discussed will include an introduction to RNA structure, folding and dynamics, RNA/RNA and RNA-protein interactions, and role of RNA in catalysis of biological reactions in ribosome and the role of other catalytic RNAs in tRNA biogenesis, pre-mRNA splicing, and viral replication. The course also covers the recently discovered RNA regulatory switches, large noncoding regulatory RNAs, and the role of RNA in human diseases and novel, RNA-based therapeutics. Offered as BIOC 599, CLBY 599, and MBIO 599.

CLBY 601. Special Problems (1 - 18)
This is the listing for independent research. Students should enroll in this course once they have selected their laboratory for Ph.D. research. The number of credit hours depends on how many didactic courses they are following at the same time. Once they have passed their qualifying examination they should register for CLBY 701.

CLBY 701. Dissertation Ph.D. (1 - 18)
This is the listing for independent research toward the Ph.D. The number of credit hours depends on how many didactic courses students are following at the same time. Students may register for this course only once they have passed their qualifying examination. Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCES

Room W-G19, School of Medicine
Phone (216) 368-5962
http://casemed.case.edu/dept/evhs/evhs.htm

The Department of Environmental Health Sciences is devoted to the study of the mechanisms of action, epidemiology studies and controlled clinical trials. Recommended preparation: EVHS 429.

EVHS 401. Fundamentals of Environmental Health Sciences: Biochemical Toxicology (3)
This course details the fundamentals of biochemical toxicology. Specific topics include oxidation-reduction reactions, Phase I and II xenobiotic metabolism and mechanisms of cellular toxicity. Also, this course focuses on pharmacology. General principles of pharmacology, drug transport and absorption, drug metabolism, neuropharmacology, immunopharmacology and pharmacokinetics are discussed.

EVHS 402. Fundamentals of Environmental Health Sciences: Risk Assessment (3)
This course presents an overview of the scientific approaches used to determine whether environmental agents are potentially dangerous to people. In this course, criteria utilized for establishing exposure limits is presented. A variety of assays which can be employed to assess the impact of environmental exposure on normal and genetically susceptible individuals are studied. These include: numerous animal tests, short term toxicity and mutagenicity tests, functional assays, molecular techniques to delineate mechanisms of action, epidemiology studies and controlled clinical trials. Recommended preparation: EVHS 429.

EVHS 405. Effects of Exposure to Env Toxins (3)
This course provides an introduction to toxic agents found in the environment and presents an overview of chemical and physical agents which have acute toxic and/or genotoxic effects on cells. Toxicity, mutagenicity, carcinogenicity, teratogenicity and the potential for exposure to these agents through environmental, occupational and medicinal routes are discussed. This topic will be covered at both the molecular and the clinical level. Discussion of clinical cases will be included. Prereq: EVHS 401 and EVHS 402.

EVHS 429. Introduction to Environmental Health Sciences
Health (3)
This is a survey course of environmental health topics including individual, community, population, and global issues. Introduction to risk management, important biological mechanisms, and age and developmental impacts are covered in an overview fashion. A practical inner city home environment experience is included. Offered as EVHS 429 and MPHP 429.

EVHS 502. Genetic Toxicology II: DNA Damage and Repair (3)
This course provides an in-depth consideration of agents which alter DNA directly or indirectly through effects on its synthesis and examines the mechanisms and repair processes through which cells respond to this damage. The class consists of formal lectures which introduce each topic, and analysis of up-to-date literature on topics representative of major current areas of interest in this field. Topics covered include fidelity of DNA replication, excision repair, mismatch repair, transcription-linked repair, SOS repair and recombinational repair. Other DNA damage responses controlling decision points between DNA repair and apoptosis are also considered. Agent-specific DNA damage, such as that caused by agents leading to bulky adducts, AP sites, base-base mismatches and damage to DNA bases, are considered in the context of specific repair processes responding to these DNA insults in procaryotes and eukaryotes. Recommended preparation: EVHS 401 and 402.

EVHS 506. Independent Study in Environmental Health Sciences (1 - 6)
EVHS 510. Molecular Oncology (3)
This course explores the role of environmental factors in causing alterations in cellular mechanisms which lead to cancer. Emphasis is placed on genetic and other regulatory alterations leading to cell transformation. The possible role of oncogenes and suppressor genes in these processes and the mechanisms through which chemotherapy and immunotherapy manifest toxicity for cancer cells are considered.

EVHS 651. Master’s Thesis Research (1 - 9)
EVHS 701. Dissertation Ph.D. (1 - 9)
(Credit as arranged.) Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF EPIDEMIOLOGY AND BIOSTATISTICS
Room W-G57, School of Medicine
Phone 216-368-3197
http://epbiwww.case.edu/

The Department of Epidemiology and Biostatistics offers graduate programs leading to the master of science, doctor of philosophy, M.D./Ph.D., and master of public health degrees. Students may select a division in one of the following programs: biostatistics, epidemiology, genetic and molecular epidemiology, health services research, and public health.

Epidemiology is the study of the distribution and determinants of disease in human populations. Epidemiologic studies are concerned with the determination of risk factors for a particular disease, such as cigarette smoking and bladder cancer. After risks are determined, epidemiologists concern themselves with interventions to prevent, treat or change the behavior to reduce the probability of disease.

The study of biostatistics includes design and analysis of experimental studies such as clinical trials and non-experimental studies, theory of probability and statistics, mathematical and statistical modeling, and knowledge of methodology used to evaluate the properties of statistical procedures. It also includes a competency in computers, which encompasses programming, statistical software use, and database management. Biostatistical methods are utilized in almost all medical research.

Genetic and molecular epidemiology encompasses the study of genetic and environmental factors that determine the distributions and dynamics of health outcomes in populations. Investigating such outcomes entails using tools from both the field of human genetics and the field of epidemiology. Numerous human disorders appear to result from the joint action of genes and environment, providing the genetic epidemiologist with ample opportunity for making important contributions to the study of human disease.

According to the Institute of Medicine, health services research is a “multidisciplinary field of inquiry, both basic and applied, that examines the use, costs, quality, accessibility, delivery, organization, financing and outcomes of health care services to increase knowledge and understanding of the structures, processes, and effects of health services for individuals and populations.” The health services research division prepares professionals to design and implement sophisticated studies of complex health services issues and problems using a wide range of quantitative and qualitative analytic techniques. Graduates are prepared for careers in academe, industry, and an array of health-oriented organizations and agencies.

A master of public health degree is designed to prepare students to address the broad mission of public health, defined as “enhancing health in human populations, through organized community effort,” utilizing education, research and community service. Public health practitioners are prepared to identify and assess the health needs of different populations, and then to plan, implement and evaluate programs to meet those needs. It is the task of the public health practitioner to protect and promote the wellness of humankind. For more information about the master of public health degree program, please see “Other Degree Programs” in the medical school section of this General Bulletin or contact the department.

Department faculty are nationally recognized and have more than $9.5 million in grants that support projects including HIV/VTB research in Uganda, the search for genes that cause disease, cancer prevention and control, studies of interventions to change human behaviors that promote good health, design of clinical trials, studies to change high-risk behaviors related to AIDS, studies of public policies concerning the health of the elderly, and cost/benefit studies of medical interventions. The department has offices at the university, the Memory and Aging Center, the Louis Stokes Cleveland Department of Veteran's Affair Medical Center, and MetroHealth Medical Center, the latter nationally recognized as a premier public hospital. The department also maintains a scientific computer center comprised of 15 servers. Several very large national health care and demographic databases (including Medicare, Medicaid, and Vital Statistics databases) are stored on the servers and are used for faculty and student research and educational projects.

COURSE DESCRIPTIONS (EPBI)

EPBI 408. Public Policy and Aging (3)
Overview of aging and the aged. Concepts in the study of public policy. Policies on aging and conditions that they address. The politics of policies on aging. Emergent trends and issues. Offered as ANTH 498, BETH 496, EPBI 408, GERO 496, HSTY 480, MPHP 408, NURS 479, NURS 579, POSC 480, and SOCI 496.

EPBI 411. Introduction to Behavioral Health (3)
Using a biopsychosocial perspective, an overview of the measurement and modeling of behavioral, social, psychological, and environmental factors related to disease prevention, disease management, and health promotion is provided. Offered as EPBI 411 and MPHP 411.

EPBI 414. Introduction to Statistical Computing (3)
This course introduces the use of computers in epidemiologic investigations and biostatistical applications. Topics covered include the computer operating system UNIX, the use of the Internet to access and obtain databases, and database and spreadsheet concepts, along with instruction in the use of SAS software for database management, spreadsheet construction, statistical analysis, and graphics, with a cursory review of SPSS. Primary emphasis in on
developing the knowledge and familiarity required for running these particular programs in connection with data collection, analysis, and presentation of results in clinical studies. Studies will be required to complete assignments using personal computers and UNIX systems maintained by the department. Knowledge of basic statistics in beneficial, as this course does not teach statistical analysis, but it is not vital to learning the material in this course.

EPBI 419. Topics in Urban Health in the United States (3)
This course examines patterns of urban health and disease across the life course among marginalized populations and communities. We will examine the socio-environmental contexts that impact health status (i.e., racism, health disparities, neighborhood context, and environmental stressors). Readings from epidemiology, sociology, and public health literature will provide a foundation for the multiple factors and processes that impact health. Offered as EPBI 419 and MPHP 419.

EPBI 431. Statistical Methods I (3)
Application of statistical techniques with particular emphasis on problems in the biomedical sciences. Basic probability theory, random variables, and distribution functions. Point and interval estimation, regression, and correlation. Problems whose solution involves using packaged statistical programs. First part of year-long sequence. Offered as ANAT 431, BIOL 431, EPBI 431, and MPHP 431.

EPBI 432. Statistical Methods II (3)
Methods of analysis of variance, regression and analysis of quantitative data. Emphasis on computer solution of problems drawn from the biomedical sciences. Design of experiments, power of tests, and adequacy of models. Offered as BIOL 432, EPBI 432, and MPHP 432. Prereq: EPBI 431 or equivalent.

EPBI 433. Community Interventions and Program Evaluation (3)
This course prepares students to design, conduct, and assess community-based health interventions and program evaluation. Topics include assessment of need, evaluator/stakeholder relationship, process vs. outcome-based objectives, data collection, assessment of program objective achievement based on process and impact, cost-benefit analyses, and preparing the evaluation report to stakeholders. Recommended preparation: EPBI 490, EPBI 431, or MPHP 405. Offered as EPBI 433 and MPHP 433.

EPBI 435. Survival Data Analysis (3)
Basic concepts of survival analysis including hazard function, survival function, types of censoring: non-parametric models; extended Cox models; time dependent variables, piece-wise Cox model, etc; sample size requirements for survival studies. Prereq: EPBI 432.

EPBI 441. Biostatistics I (3)
Sampling techniques and statistical methods applicable to data derived from sampling surveys. Principles of random sampling, stratification, systematic sampling, and cluster sampling. Emphasis on sampling problems encountered in surveying human populations. Recommended preparation: EPBI 432.

EPBI 442. Biostatistics II (3)
This course deals with the basic concepts and applications of nonparametric statistics. Topics will include distribution-free statistics, one sample rank test, the Mann-Whitney and Kruskal Wallis tests, one sample and two sample U-statistics, asymptotic relative efficiency of tests, distribution-free confidence intervals, point estimation and linear rank statistics. Recommended preparation: EPBI 441. Offered as EPBI 442 and MPHP 442.

EPBI 443. Applied Multivariate Analysis (3)

EPBI 448. Genetic Analysis Programs (3)
Theory underlying software developed specifically for the genetic analysis of family data. The course will focus mainly on the programs in the S.A.G.E. (Statistical Analysis for Genetic Epidemiology) program package, but will also cover other programs that are available. Use of these programs to determine genetic components of complex traits and writing up reports summarizing the results. Recommended preparation: EPBI 452 and EPBI 457.

EPBI 450. Clinical Trials and Intervention Studies (3)
Issues in the design, organization, and operation of randomized, controlled clinical trials and intervention studies. Emphasis on long-term multicenter trials. Topics include legal and ethical issues in the design; application of concepts of controls, masking, and randomization; steps required for quality data collection; monitoring for evidence of adverse or beneficial treatment effects; elements of organizational structure; sample size calculations and data analysis procedures; and common mistakes. Recommended preparation: EPBI 431 or consent of instructor. Offered as EPBI 450 and MPHP 450.

EPBI 451. Principles of Genetic Epidemiology (1 - 3)
A survey of the basic principles, concepts and methods of the discipline of genetic epidemiology, which focuses on the role of genetic factors in human disease and their interaction with environmental and cultural factors. Many important human disorders appear to exhibit a genetic component; hence the integrated approaches of genetic epidemiology bring together epidemiologic and human genetic perspectives in order to answer critical questions about human disease. Methods of inference based upon data from individuals, pairs of relatives, and pedigrees will be considered. The last third of the course (1 credit) is more statistical in nature. Offered as EPBI 451, GENE 451, and MPHP 451. Prereq: EPBI / MPHP 431 and EPBI/MPHP 490 or MPHP 405.

EPBI 452. Statistical Methods for Genetic Epidemiology (1 - 3)
Analytic methods for evaluating the role of genetic factors in human disease, and their interactions with environmental factors. Statistical methods for the estimation of genetic parameters and tests of genetic hypotheses, emphasizing maximum likelihood methods. Models to be considered will include such components as genetic loci of major effect, polygenic inheritance, and environmental, cultural and developmental effects. Topics will include familial aggregation, segregation and linkage analysis, ascertainment, linkage disequilibrium, and disease marker association studies. Recommended preparation: EPBI 431 and EPBI 451.

EPBI 453. Categorical Data Analysis (3)
Descriptive and inferential methods for categorical data with applications: bivariate data; models for binary and multinomial response variables, with emphasis on logit models; loglinear models for multivariate data; model fitting using the maximum likelihood approach; model selection and diagnostics; and sample size and power considerations. Topics in repeated response data as time allows. Recommended preparation: EPBI 441.

EPBI 454. Population Genetics for Genetic Epidemiology (3)
This course will cover basics of population genetics (mutation, migration, natural selection) as well as topics such as random mating populations and inbred populations. Emphasis will be placed on migration studies and on linkage disequilibrium mapping. Measures on linkage disequilibrium, methods for linkage disequilibrium mapping of disease genes and the use of isolated versus outbred population in linkage of disequilibrium mapping will be discussed. Recommended preparation: EPBI 431.

EPBI 457. Genetic Linkage Analysis (3)
Methods of analyzing human data to detect genetic linkage between disease traits, discreet and continuous, and polymorphic markers. Both model-based maximum likelihood (lod score) and model-free robust methods will be discussed. Additional topics covered will include measures of informativeness, multipoint analysis, numerical methods and mod score analysis. Prereq: EPBI 432. Coreq: EPBI 451.

EPBI 458. Statistical Methods for Clinical Trials (3)
This course will focus on special statistical methods and philosophic issues in the design and analysis of clinical trials. The emphasis will be on practically important issues that are typically not covered in standard biostatistics courses. Topics will include: randomization techniques, intent-to-treat analysis, analysis of compliance data, equivalency testing, surrogate endpoints, multiple comparisons, sequential testing, and Bayesian methods. Offered as EPBI 458 and MPHP 458. Prereq: EPBI 432 or MPHP 432.

EPBI 459. Longitudinal Data Analysis (3)
This course will cover statistical methods for the analysis of longitudinal data with an emphasis on application in biological and health research. Topics include exploratory data analysis, response feature analysis, growth curve models, mixed-effects mod-
ells, generalized estimating equations, and missing data. Prereq: EPBI 432.

EPBI 460. Health Research Methods I (3)
This is a course in research methods focusing on practical issues in the conduct of health services research studies. Topics include: an overview of health services research; ethics in health services research; proposal writing and funding; the relationship between theory and research; formulating research questions; specifying study design and study objectives; conceptualizing and defining variables; validity and reliability of measures; scale construction; operationalizing health research relevant variables using observation, self and other report; and secondary analysis; formatting questionnaire; developing analysis plans; choosing data collection methods; sampling techniques and sample size; carrying out studies; preparing data for analysis; and reporting of findings. Offered as EPBI 460 and MPH 460.

EPBI 461. Health Research Methods II (3)
Focus on measurement strategies for key health services research concepts including case mix, severity of illness, functional status, and patient outcomes. Examine the interplay between physician practice patterns, geography, standards of care, and practice guidelines and patient management and outcomes. Statistical methods especially useful in health services research (e.g., cost/effectiveness and cost/benefit analysis, conjoint analysis, utility assessment, and meta-analysis) will be introduced as well as examining approaches to the assessment of care quality. Recommended preparation: EPBI 460 or consent of instructor.

EPBI 462. Computation Methods in Genetic Epidemiology (3)
Methods for computing genetic likelihoods and estimating genetic parameters; Elston-Stewart algorithm, IBD computation; Markov chain Monte Carlo methods; Gibbs sampling; Newton-Raphson; E-M algorithm. Prereq: EPBI 457 and EPBI 482.

EPBI 464. Obesity and Cancer: Views from Molecules to Health Policy (3)
This course will provide an overview of the components of energy balance (diet, physical activity, resting metabolic rate, dietary induced thermogenesis) and obesity, a consequence of long term positive energy balance, and various types of cancer. Following an overview of energy balance and epidemiological evidence for the obesity epidemic, the course will proceed with an introduction to the cellular and molecular biology of energy metabolism. Then, emerging research on biologically plausible connections and epidemiological associations between obesity and various types of cancer (e.g., colon, breast) will be presented. Finally, interventions targeted at decreasing obesity and improving quality of life in cancer patients will be discussed. The course will be cooperatively-taught by a transdisciplinary team of scientists engaged in research in energy balance and/or cancer. Didactic lectures will be combined with classroom discussion of readings. The paper assignment will involve application of course principles, lectures and readings. Offered as EPBI 464, MPH 464.

EPBI 467. Cost-Effectiveness Analysis in Health Care (3)
Evaluation of alternative medical treatments and drug therapies. Topics include cost-benefit, cost-effectiveness and cost-utility analysis. Measuring costs, benefits and health outcomes. Quality of life and other measures of effectiveness will also be addressed. Emphasis on case studies, course project, and evaluation of publications. Some decision analysis and policy implications will also be included. Offered as EPBI 467 and MPH 467.

EPBI 468. The Continual Improvement of Healthcare: An Interdisciplinary Course (3)
The focus of this course is on collaborative work for the benefit of patients and community. Seminar classwork is combined with a field project, in which interdisciplinary student teams apply what they have learned to the improvement activities of a local health care organization. Successful completion of the course depends on participation in seminar sessions and completion of the interdisciplinary student team project. Offered as EPBI 468, NURS 468, and MPH 468.

EPBI 471. Statistical Aspects of Data Mining (3)

EPBI 472. Special Topics in Statistical Genetics (1 - 4)
Various topics in statistical genetics will be discussed, depending on student interest and needs. Examples of topics are paternity and zygosity testing, path analysis for genetic epidemiology, the analysis of racial admixture and modeling such phenomena as imprinting and anticipation. The course will consist of four modules. A student may, in consultation with the instructor, elect to take 1 - 4 modules for the corresponding amount of credit. Recommended preparation: EPBI 452.

EPBI 473. Integrative Cancer Biology (3)
This is a project-focused research level course in integrative cancer biology, an emergent field in which mathematical models and computer simulations are used to synthesize various forms of cancer data to yield experimentally testable scientific hypotheses. The course is designed for oncologists and cancer biologists who are interested in learning how to apply mathematics and a high level programming language (the freeware R) to analyzes of cancer research data. Data on all levels will be considered, ranging from epidemiological datasets to DNA microarray datasets. Recommended preparation: BIO 407, EPBI 432.

EPBI 474. Principles of Practice-Based Network Research (3)
Practice-based research networks (PBRNs) are organizations of community-based healthcare practices that engage in clinical research and practice improvement. In the U.S., there are more than 100 of these dynamic, collaborative organizations that enable the translation of research into practice and practice into research. They also frequently engage in developing and refining methods to improve healthcare quality. This course is designed to provide students with a foundation in PBRN methods and principles, including: introduction to PBRNs, methods for collaborating with community practices, PBRN-building strategies, PBRN data collection methods, statistical issues in network research, community-based participatory research, human subjects’ protection issues in PBRNs, quality improvement research in PBRNs, funding for PBRN research, and writing PBRN research findings for publication. Each 2.5 hour class session will feature a lecture followed by a discussion of readings from the literature. Students will develop a PBRN research or quality improvement proposal during the semester. Offered as EPBI 474, FAMD 474, MPH 474.

EPBI 477. Internship at Health-Related Government Agencies (3)
This independent study course will incorporate a one-semester-long internship at health-related government agencies (Ohio Department of Health, Ohio Department of Job and Family Services, or Cleveland City Health Department). The choice of the agency will depend on the student’s academic interests and research goals. The objective is to develop a level of familiarity with the organizational and operational aspects of such agencies, and to gain an understanding of agencies’ and bureaus’ interactions with the legislative body, as well as the processes of developing, implementing, managing, and monitoring health initiative. The instructor and the liaison persons at the agencies will be responsible for planning structured encounters of interns with key administrators and policy makers, and to select a research project, based on the intern’s research interests and the agency’s research priorities. Interns will be required to submit a draft of the report to the instructor at the end of the semester. The approved, final report will be submitted to the agency. The project will be evaluated for its methodological soundness and rigor. Students will be required to be at the agency one day a week. Recommended preparation: EPBI 515. Offered as EPBI 477 and MPH 477.

EPBI 480. Introduction to Mathematical Statistics (3)
An introduction to statistical inference at an intermediate mathematical level. The concepts of random variables and distributions, discrete and continuous, are reviewed. Topics covered include: expectations, variance, moments, the moment generating function; Bernoulli, binomial, hypergeometric, Poisson, negative binomial, normal, gamma and beta distribution; the central limit theorem; Bayes estimation, maximum likelihood estimators, unbiased estimators, sufficient statistics; sampling distributions (chi-square, t) confidence intervals, Fisher information; hypothesis testing, uniformly most powerful tests and multi-decision problems. Prereq: EPBI 431.

EPBI 481. Theoretical Statistics I (3)
Topics provide the background for statistical infer-

EPBI 482. Theoretical Statistics II (3)
Point estimation; maximum likelihood, moment estimators. Methods of evaluating estimators including mean squared error, consistency, “best” unbiased and sufficiency. Hypothesis testing; likelihood ratio and union-intersection tests. Properties of tests including power function, bias. Interval estimation by inversion of test statistics, use of pivotal quantities. Application to regression. Graduate students are responsible for mathematical derivations, and full proofs of principal theorems. Recommended preparation: MATH 223 or STAT 445. Offered as EPBI 482 and STAT 445.

EPBI 484. Geographic Medicine and Epidemiology (1 - 3)
This course focuses on the epidemiology, prevention, treatment, and control of tropical and parasitic diseases. Emphasis will be placed on the triad of agent, host, and environment for infectious disease impacting global health. Three distinct modules will focus on specific examples such as malaria, helminths, bacteria, or viruses. Active class participation is required through discussions, case studies, and group projects. Recommended preparation: EPBI 490, EPBI 491 and a microbiology course or consent of instructor. Offered as EPBI 484, INTH 484, and MPHP 484.

EPBI 488. Gender, Ethnicity, and Health Research (3)
This course is designed to acquaint students with the literature addressing the constructs of race, ethnicity, gender and social class; to examine critically the contexts in which these constructs are often applied; and to assess the relationship between each of these constructs and access to health care, quality of care, and health outcome. Offered as EPBI 488 and MPHP 488.

EPBI 490. Epidemiology: Introduction to Theory and Methods (3)
Epidemiologic principles and methods needed to understand population-based statements of illness and health. Descriptive epidemiology: analytic, community-based, and biostatistics. Analytic epidemiology and epidemiologic inference. Classification, morbidity and mortality rates, sampling, screening, epidemiologic models, field trials, controlled epidemiologic surveys, sources of bias, and causal models. Recommended preparation: STAT 201 or STAT 207 or STAT 312 or equivalent. Offered as EPBI 490 and MPHP 490.

EPBI 491. Epidemiology: Case-Control Study Design and Analysis (3)
This course builds upon EPBI 490 with a comprehensive study of the concepts, principles, and methods of epidemiologic research. The course content specifically focuses on the case-control study design and provides a framework for the design, analysis, and interpretation of case-control studies. Rigorous, problem-centered training includes exposure measurement, subject selection, validity, reliability, sample size and power, effect modification, confounding, bias, risk assessment, matching, and logistic regression. Individual and group data projects will be analyzed using SAS statistical software. Offered as EPBI 491 and MPHP 491. Prereq: EPBI/MPHP 431 and EPBI/MPHP 490.

EPBI 492. Epidemiology: Cohort Study Design and Analysis (3)
This course provides a comprehensive introduction to the cohort study. Particular emphasis is placed on cohort study design and cohort data analysis. The course will cover the conceptual framework underlying cohort studies, planning and conducting a cohort study, basic concepts of time, exposure and outcome, and methods in the analysis of longitudinally collected data. Analytic methods covered in the class include, but are not limited to: analysis of age, period, and cohort effects, analysis of incidence rates, analysis of repeated measures, and analysis of time-to-event data. Students will have the opportunity to conduct analysis of data obtained from an actual cohort study using a statistical package of their choice. Offered as EPBI 492 and MPHP 492. Prereq: EPBI 431 and EPBI 490 or equivalents.

EPBI 493. Chronic Disease Epidemiology (3)
This course is intended for graduate students in epidemiology and M.P.H. students who are interested in chronic disease epidemiology and prevention. The course will cover: 1) overview of concepts in chronic disease epidemiology and etiology, study design in epidemiologic research, and causal inference; 2) major chronic diseases in the U.S. populations and prevention; and 3) cancer screening. For each specific disease of interest, the lecture is structured according to 4 major components: 1) basic epidemiology; 2) risk factors and etiology; 3) prevention (and screening); and 4) controversies and future research. Offered as EPBI 493 and MPHP 493. Prereq: EPBI 490 or equivalent.

EPBI 494. Infectious Disease Epidemiology (1 - 3)
The epidemiology, prevention and control of representative infectious disease models. Emphasis on the triad of agent, host, and environment and the molecular and genetic basis of agent and host interaction in the population. Recommended preparation: EPBI 490, EPBI 491, and a microbiology course or consent of instructor. Offered as EPBI 494, INTH 494, and MPHP 494.

EPBI 495. Mental Health Epidemiology (3)
This course explores the epidemiology of diseases affecting the brain, including various forms of mental illness and neuro logical disorders. The course utilizes a cross-disciplinary approach and draws on science, sociology, history, and. Offered as EPBI 495 and MPHP 495.
and invited guests. These activities give students the opportunity to improve their ability to: 1) critically evaluate research literature in epidemiology; 2) lead effectively a discussion of a research article; and 3) organize and deliver oral presentations based on published literature and their own research endeavors. Some sessions are devoted to didactic training and hands-on experience with career-related tasks and skills such as grant writing, proposal evaluation, and manuscript review. The specific content of the seminar for any given semester will be determined jointly by the students and faculty in the Division of Epidemiology. Enrollment is limited to students in the Division of Epidemiology of the Department of Epidemiology and Biostatistics.

**EPBI 508. Ethics, Law, and Epidemiology (3)**

This course is designed to provide epidemiology students with basic knowledge about the ethical and legal principles underlying epidemiological research. This is not a public health law class. Issue papers are assigned on a weekly basis. Each issue paper requires that the student analyze the situation depicted and apply the principles learned. Some issue papers may require that the student draft a proposed rule, a portion of legislation, or a document such as an informed consent form. Other exercises may require that students critique an existing agency rule or legislation. Offered as EPBI 508 and MPH 508. Prereq: EPBI 490 and EPBI 491 or equivalents.

**EPBI 510. Health Disparities (3)**

This course aims to provide theoretical and application tools for students from many disciplinary backgrounds to conduct research and develop interventions to reduce health disparities. The course will be situated contextually within the historical record of the United States, reviewing social, political, economic, cultural, legal, and ethical theories related to disparities in general, with a central focus on health disparities. Several frameworks regarding health disparities will be used for investigating and discussing the empirical evidence on disparities among other subgroups (e.g., the poor, women, uninsured, disabled, and non-English speaking populations) will also be included and discussed. Students will be expected to develop a research proposal (observational, clinical, and/or intervention) rooted in their disciplinary background that will incorporate materials from the various perspectives presented throughout the course, with the objective of developing and re-inforcing a more comprehensive approach to current practices within their fields. Offered as CRSP 510, EPBI 510, MPH 510, NURS 510, and SASS 510.

**EPBI 515. Secondary Analysis of Large Health Care Data Bases (3)**

Development of skills in working with the large-scale secondary data bases generated for research, health care administration/billing, or other purposes. Students will become familiar with the content, strength, and limitations of several data bases; with the logistics of obtaining access to data bases; the strengths and limitations of routinely collected variables; basic techniques for preparing and analyzing secondary data bases and how to apply the techniques to initiate and complete empirical analysis. Recommended preparation: EPBI 414 or equivalent; EPBI 431 or EPBI 460 and EPBI 461 (for HSR students).

**EPBI 592. Special Topics in Epidemiology (1 - 10)**

Short, intensive courses on current research topics, statistical analyses, methodological issues or intervention approaches related to epidemiology, particularly infectious disease, chronic disease, behavioral and social epidemiology. Course hours and requirements vary by topic each semester.

**EPBI 601. Master's Project Research (1 - 18)**

**EPBI 602. Practicum (1 - 3)**

**EPBI 651. Thesis M.S. (1 - 18)**

**FAMD 502. International Health Practice (3)**

This course aims to provide practical knowledge to prepare students to serve and study for international health work particularly in complex humanitarian emergencies. The course is organized and discussed from the perspective of health care professional. This course is intended for graduate-level students in medicine, nursing, public health, social work, and medical anthropology. Historical development of the discipline, key methodological issues, and essential principles in key topics will be discussed in multidisciplinary approach. Offered as FAMD 502 and MPH 502.

**FAMD 601. Independent Study (1 - 18)**

**FAMD 651. Thesis M.S. (1 - 18)**

**DEPARTMENT OF FAMILY MEDICINE**

The Department of Family Medicine offers a master's degree in family medicine. The program includes basic training in biostatistics, epidemiology and research methods, with a specific emphasis on the family. The department is a national leader in primary care research and is one of three national research centers funded by the American Academy of Family Physicians.

**COURSE DESCRIPTIONS (FAMD)**

**FAMD 431. Applied Statistics in Medical Education (3)**

**FAMD 474. Principles of Practice-Based Network Research (3)**

Practice-based research networks (PBRNs) are organizations of community-based healthcare practices that engage in clinical research and practice improvement. In the U.S., there are more than 100 of these dynamic, collaborative organizations that enable the translation of research into practice and practice into research. They also frequently engage in developing and refining methods to improve healthcare quality. This course is designed to provide students with a foundation in PBRN methods and principles, including: introduction to PBRNs, methods for collaborating with community practices, PBRN-building strategies, PBRN data collection methods, statistical issues in network research, community-based participatory research, human subjects’ protection issues in PBRNs, quality improvement research in PBRNs, funding for PBRN research, and writing PBRN research findings for publication. Each 2.5 hour class session will feature a lecture followed by a discussion of readings from the literature. Students will develop a PBRN research or quality improvement proposal during the semester. Offered as EPBI 474, FAMD 474, MPH 474.

**FAMD 502. International Health Practice (3)**

This course aims to provide practical knowledge to prepare students to serve and study for international health work particularly in complex humanitarian emergencies. The course is organized and discussed from the perspective of health care professional. This course is intended for graduate-level students in medicine, nursing, public health, social work, and medical anthropology. Historical development of the discipline, key methodological issues, and essential principles in key topics will be discussed in multidisciplinary approach. Offered as FAMD 502 and MPH 502.

**FAMD 601. Independent Study (1 - 18)**

**FAMD 651. Thesis M.S. (1 - 18)**

**DIVISION FOR ADOLESCENT HEALTH**

2027 Cornell Road
Barbara A. Cromer, M.D., Director
Frederick C. Robbins, M.D., Professor of Child and Adolescent Health
Phone 216-368-3770
http://www.case.edu/med/adolescent-health/blah.html

The School of Medicine established the Center for Adolescent Health in 1990 in recognition of the multidimensional biopsychosocial problems of contemporary youth. It was formed by educators and researchers from a variety of disciplines seeking to bring their expertise to bear on the serious problems facing youth. The center became a Division of Adolescent Health in Family Medicine in 2005. The mission has remained the same. It seeks to address these issues through an integrated, transdisciplinary approach that incorporates research, professional education, programmatic intervention and collaboration between Case and community agencies and programs.

This unique program has four objectives:

1) To promote and coordinate collaborative research activities relevant to adolescents;
2) To provide interdisciplinary educational training at undergraduate, post-baccalaureate, and post-graduate levels for profes-
sionals interested in adolescent health, including an adolescent track in the Master in Public Health Program at the Medical School;
3) To serve as a resource for Greater Cleveland community agencies that provide services for adolescents; and
4) To help promote the development of rational public policies addressing health and social issues that concern youth.

For information about the adolescent health track of the master of public health degree, please see "Other Degree Programs" in the medical school section of this General Bulletin or contact the center. A certificate in adolescent health also is offered; please contact the center for more information.

Although based at the School of Medicine, the division has developed relationships with other schools and departments at Case and the community at large. In addition, the division is the umbrella organization for Cuyahoga County’s Adolescent Consortium, a networking organization for more than 100 local youth-serving agencies. The center also provides program evaluation services and consultation to community-based youth-serving projects, as well as establishing and maintaining a countywide Adolescent Health Risk Behavior database.

Current research interests of the faculty include adolescent health promotion and resilience, sexuality, mental health, substance abuse prevention and violence.

COURSE DESCRIPTIONS (ADHT)

ADHT 485. Adolescent Development (3)
Adolescent Development can be viewed as the overarching framework for approaching disease prevention and health promotion for this age group. This course will review the developmental tasks of adolescence and identify the impact of adolescent development on youth risk behaviors. It will build a conceptual and theoretical framework through which to address and change adolescent behavior to provide new and better options in cancer prevention, diagnosis and treatment to the people of Northeast Ohio. The center is one of the 39 National Cancer Institute-designated comprehensive cancer centers.

The Case Comprehensive Cancer Center supports and coordinates all of the cancer research conducted by researchers and clinicians at the School of Medicine, the University, University Hospitals of Cleveland, and Cleveland Clinic. By providing a platform for multidisciplinary and transdisciplinary research across these campuses, the Cancer Center promotes the translation of basic science advances as rapidly as possible into research involving humans and human cancers and then into clinical research activities. The goal of the more than 310 members is to discover basic processes in cancer, to develop innovative population based research efforts, and to evaluate patients with cancer to provide new and better options in cancer prevention, diagnosis and treatment to the people of Northeast Ohio. The center is one of the 39 National Cancer Institute-designated comprehensive cancer centers.

Researchers and clinicians associated with the Case Comprehensive Cancer Center participate in one or more of nine organized interdisciplinary programs, each focused on a different area of cancer research: Cancer Genetics; Cell Proliferation and Cell Death; Radiation and the Cellular Stress Response; Molecular Basis of Oncogenesis, Stem Cells and Hematologic Malignancies, Genitourinary Malignancies; Developmental Therapeutics; Behavioral Prevention and Population based research; and Aging and Cancer. These research efforts are facilitated by seventeen shared resource facilities supported by the center that provide essential services for cancer center members. The cross-disciplinary interactions catalyzed by these research programs create a rich training environment, and members participate in five National Cancer Institute-sponsored interdisciplinary training programs.

CENTER FOR ADVANCEMENT OF MEDICAL LEARNING
Director, to be announced
For more information, contact Daniel Anker
dxa2@case.edu

CENTER FOR BIO-ARCHITECTONICS
Room BRB 8-17, School of Medicine
Raymond J. Lasek, Ph.D. (Anatomy),
Professor and Director
Phone 216-368-2390

Bio-architectonics is the study of complex biological architectures. The center was established in 1986 to explore biological architectures in medicine, and it has focused specifically on the teaching of medical anatomy.

CENTER FOR CLINICAL INVESTIGATION
For more information, contact Daniel Anker
dxa2@case.edu

CENTER FOR GLOBAL HEALTH AND DISEASE
Fourth Floor, Iris S. and Bert L. Wolstein Research Building
James W. Kazura, M.D., Professor of International Health, Medicine, and Pathology and Director
Phone 216-368-6321

The Center for Global Health and Diseases in the School of Medicine was established in 2002 by the integration of the Division of Geographic Medicine and the Center for International Health. The Center for Global Health and Diseases links the numerous international health resources of the university, its affiliated institutions, and the northern Ohio community in multidisciplinary programs of research and education related to global health. The challenges presented by world health problems are enormous, and the opportunities presented to the university community are great. In meeting these challenges and in responding to these opportunities, those affiliated with the center have the opportunity to promote health in the world and to enrich the community. The Center and its faculty engage in basic and applied biomedical research on diseases of developing countries as well as interdisciplinary studies of microbial threats to the American public, including agents of bioterrorism. Thus, the scope
of the center includes education and service as well as basic and clinical investigations of human health and disease.

Faculty members have primary appointments in the center, which is an administratively independent unit within the Division of General Medical Sciences of the School of Medicine. Secondary appointments are held in various departments in the School of Medicine, including medicine, genetics, epidemiology and biostatistics, and pathology and other units within the university. The center endeavors to foster programs that encourage creative people from many disciplines and cultures to work toward solutions of global health and disease issues (e.g., Departments of Anthropology, Biology and Mathematics in the College of Arts and Sciences). Its efforts are thus built on a strong base of specialized strengths from many academic disciplines. The center is currently a national leader in National Institutes of Health-supported studies of the major infectious diseases of developing countries. Faculty use cutting-edge approaches to examine the molecular, genetic and immunologic basis of susceptibility to infectious diseases such as malaria, river blindness, lymphatic filariasis, schistosomiasis and leishmaniasis. Center faculty have been successful in expanding the scope of their work to major viral diseases that threaten not only populations of developing countries but also American civilian and military populations. Examples include smallpox, Rift Valley fever, dengue, HIV and Epstein-Barr virus, the agent that underlies Burkitt’s lymphoma, the major childhood cancer of the tropics. Faculty with primary appointments in the center have major overseas research collaborations in Kenya, Papua New Guinea and Brazil. Faculty with secondary appointments in the center, from the division of infectious diseases in the Department of Medicine, division of pediatric infectious diseases in the Department of Pediatrics, and the Department of Epidemiology and Biostatistics, have long-standing research and educational activities in Uganda and Brazil focused on tuberculosis and HIV infection.

Educational programs sponsored by the center include electives in international health and population biology and genetics of infectious diseases, overseas rotations for medical students, and training programs at the university for visiting students and scholars from developing countries. In the Greater Cleveland community, substantial international expertise and experience exists in corporate, private, institutional and voluntary agency sectors. Citizen interest and commitment is high. The center seeks to provide a focal point for this interest, encouraging cooperative activities among these groups and academic units of the university. Specific objectives of the center:

1) Linkages. To foster interdisciplinary and intercultural linkages related to international health in the university and the community.
2) Training. To promote training programs throughout the university that will equip a cadre of scientists from diverse backgrounds to address global health issues.
3) Research. To conduct and facilitate collaborative, multidisciplinary research programs focused on major diseases of public health significance in developing countries as well as the United States.
4) Application. To work with institutions and agencies in developing countries to help design and establish research and education programs that meet their needs and function as models of sustainable health systems.

CENTER FOR PROTEOMICS AND MASS SPECTROMETRY

Biomedical Research Building, Ninth Floor
Phone 216-368-1490
Mark R. Chance, Ph.D., Professor of Physiology, and Biophysics, and Director

The Center for Proteomics and Mass Spectrometry in the School of Medicine was established in 2005. The Case Proteomics Center (CPC) was created, in part, to strengthen Cleveland’s presence in modern proteomics and mass spectrometry research to make the region a leader in the field. The vision for the Center has been shaped over the past several years by the senior leadership of the School of Medicine, and more recently, has been further developed in conjunction with the Center’s director, Mark Chance, Ph.D., with the Center’s grand opening in February 2006. One of the primary goals of the CPC is to develop an infrastructure of sophisticated equipment that facilitates and maximizes shared equipment usage, as well as to offer a wide array of proteomics services including 2D gel and mass spectrometry analyses.

Proteomics entails the in depth structural analysis of individual proteins in human and animal cells. In studying proteins and their changes, researchers are able to identify the causes of, and therefore the treatments of, human disease. The School of Medicine has established the Center for Proteomics and Mass Spectrometry to perform research to better understand the genetic and environmental bases of disease as well as provide new technologies to diagnose diseases such as cancer, heart disease, and diabetes. New technologies in mass spectrometry are also allowing protein expression, localization, structure, post-translational modifications, and interactions to be studied in increasing detail and on a genome wide scale. The center is also developing and applying state of the art structural proteomics technologies to understand the function and interactions of macromolecular complexes.

The CPC has a wide range of facilities and equipment available for the use of the Case community. These include biochemistry and computation facilities and equipment such as a Thermo-Finnegan Fourier Transform LTQ mass spectrometer, GE/Amersham 2-D gel DIGE system, Applied Biosystems Q-star mass spectrometers, Thermo-Finnegan DECA XP-Plus and LTQ instruments, Beckman Biomec FX robotic liquid handling systems, a Pro-TOF 2000 MALDI mass spectrometer, as well as additional ion trap instruments with LC-systems.

The center also offers a wide range of seminars, workshops, and possibilities for individual training. These activities are posted on the CPC Web site. For a list of services and to explore opportunities to collaborate, please visit the Web site: http://casemed.case.edu/proteomics/ or e-mail: proteomics@case.edu.

CENTER FOR PSYCHOANALYTIC CHILD DEVELOPMENT

Hanna Perkins Center
19910 Malvern Road
Shaker Heights OH 44122-2823
Phone 216-929-0216
Thomas F. Barrett, Ph.D., Director

The Center for Psychoanalytic Child Development was created in the Case School of Medicine after Thomas F. Barrett, Ph.D., director of the Hanna Perkins Center for Child Development, was named the John A. Hadden Jr., M.D., Professor in Psychoanalytic Child Development in late 2001. The purpose of the center is to promote the understanding of the emotional development of children, how they experience and deal with feelings and conflicts, how their inner lives interact with the outer world in the process of growing up, and the interaction between emotional development, physical development and the external environment. Activities organized in the center’s initial stages have included an elective course in the medical school curriculum, about the
emotional development of children; consulta-
tion with the school’s Center for Adolescent Health; and participation in the formative stages of a research project focused on children in whom attention deficit hyperactivity disorder has been diagnosed. In 2003, a child analyst joined a pediatric preceptor to discuss the observations of students conducting well-baby exams in the Family Clinic of University Hospitals of Cleveland. In the future, the center hopes to collaborate in many more joint endeavors to study the emotional and physical interactions of the growing child. For more information, contact Dr. Barrett using the information appearing at the beginning of this write-up or write Elizabeth Fleming at the same address, or call her at 216-929-0220.

CENTER FOR RNA MOLECULAR BIOLOGY
Room W-TT3, School of Medicine
Timothy W. Nilsen, Ph.D., Professor and Director of Center
Phone 216-368-1606
http://www.rnaresearch.org

Formally established in 2001, the goal of the Center for RNA Molecular Biology is to create a focus of excellence in the study of all aspects of RNA metabolism, including molecular biology and cell biology, and to investigate the potential clinical and commercial applications of these studies. The center strives for a national reputation for excellence in research and training of both graduate students and medical students, while maintaining interactions with other departments, centers and programs at Case Western Reserve, University Hospitals of Cleveland, and the Cleveland Clinic.

The primary faculty in the center and secondary faculty housed in other university departments and the Cleveland Clinic Foundation form a highly cohesive group. Current research areas include the roles of protein factors in cis- and trans-splicing of mRNA, mechanisms of cis- and trans-splicing in nematodes, protein-dependent RNA catalysis, RNA-RNA and RNA-protein interactions studied by nuclear magnetic resonance, apolipoprotein B RNA editing, RNA editing in Physarum, the structure and catalytic function of RNA, RNA helicases, alternative pre-mRNA processing, the subcellular organization of RNPs in mammals, mRNA splicing in S. cerevisiae, mRNA transport in S. cerevisiae, pre-mRNA splicing by the major and minor spliceosomes, alternative splicing in Drosophila, and the control of gene expression and protein folding.

Center faculty participate in teaching first-year graduate and medical student courses, as well as special-topics graduate courses. Graduate students are encouraged to apply directly to the Biomedical Sciences Training Program or to the Department of Biochemistry or to the Department of Molecular Biology and Microbiology; see the listings for these areas elsewhere in the School of Medicine section of this publication.

CENTER FOR SCIENCE, HEALTH AND SOCIETY
Case Western Reserve University
School of Medicine
Health Center Library, Robbins Building
Suite R106
216-368-2059
http://www.case.edu/med/cshs/index.htm
Nathan A. Berger, M.D.
Hanna-Payne Professor of Experimental Medicine; Professor of Medicine, Oncology and Biochemistry; Director, Center for Science, Health and Society

Recognizing that the successful futures of Case Western Reserve University, the City of Cleveland, and the County of Cuyahoga are integrally related, the Center for Science, Health and Society (CShS) was created in 2002 to focus the efforts of the University and the city in a significant new collaboration to impact the areas of health and healthcare delivery systems through community outreach, education, and health policy. The Center, based in the School of Medicine, with university wide associations is engaging the many strengths of the University and the community to:
1. Improve the health of the community
2. Educate and empower the community to become better consumers of healthcare and more informed and stronger advocates for healthcare policy and legislation in their own interests
3. Encourage members of the community to enter careers in the biomedical workforce and healthcare professions

The Center has engaged the community at the level of the individual and the neighborhood, in public and private schools, at civic and faith-based organizations, and at the level of governmental agencies and community leadership to identify community problems, perceptions, assets and resources; advise the community of faculty skills, assets and expertise; and, catalyze community service based scholarship that benefits community interests and promotes mutual enhancement.

CENTER FOR HEALTH CARE RESEARCH AND POLICY
Rammelkamp Research and Education Building, second floor,
MetroHealth Medical Center
Phone: 216-778-3902
Fax: 216-778-3945
Web site: www.chrp.org
Randall D. Cebul, M.D., Director of Center
Professor of Medicine and Epidemiology and Biostatistics

The two-fold mission of the Center for Health Care Research & Policy is to: 1) improve the health of the public by conducting research that improves access to health care, increases the quality and value of health care services, and informs health policy and practice; and 2) lead education and training programs that promote these goals. Formally established in 1994, the Center’s mission is carried out by a cross-disciplinary faculty who both lead and collaborate with other scholars in Northeast Ohio and beyond. A core faculty of 17 is extended by affiliated Senior Scholars throughout the university, assisted by an able staff and over 30 grant-supported research associates. The Center’s home at MetroHealth’s Rammelkamp Research and Education Building is an outstanding venue for collaborative research, mentoring of students and junior faculty, and cross-disciplinary seminars.

The Center’s research and training focuses in programmatic areas that reflect national health care priorities as well as high impact problems in adults. Center Programs pertain to chronic conditions, especially stroke, obesity and diabetes, and kidney disease, and to problems in aging. Programs are complemented by methods-focused Units, including biostatistics and evaluation, health care decision making, health economics, and quality measurement and improvement. A recent initiative in clinical research informatics will capitalize on growing institutional capacities in electronic medical records and clinical decision support. Center faculty view Northeast Ohio as a laboratory for research, recognizing the national relevance of regional challenges and opportunities.

Center faculty assume leadership roles in federally-supported degree-granting training programs in Health Services Research and Clinical Investigation and teach in the core curriculum of the School of Medicine. See the listings for related training programs elsewhere in this bulletin or contact the Center.

INTERNATIONAL HEALTH

CASE WESTERN RESERVE UNIVERSITY
INTH 301. Fundamentals of Global Health (3)
This course seeks to integrate the multiple perspectives and objectives in global health by investigating how the disciplines of Biology, Medicine, Anthropology, Nursing, Mathematics, Engineering analyze and approach the same set of international health problems. Students will develop a shared vocabulary with which to understand these various perspectives from within their own discipline. The focus sites will emphasize issues related to the health consequences of development projects, emergency response to a health care crisis and diseases of development in presence of underdevelopment. Offered as INTH 301 and INTH 401. Prereq: Junior or senior.

INTH 401. Fundamentals of Global Health (3)
This course seeks to integrate the multiple perspectives and objectives in global health by investigating how the disciplines of Biology, Medicine, Anthropology, Nursing, Mathematics, Engineering analyze and approach the same set of international health problems. Students will develop a shared vocabulary with which to understand these various perspectives from within their own discipline. The focus sites will emphasize issues related to the health consequences of development projects, emergency response to a health care crisis and diseases of development in presence of underdevelopment. Offered as INTH 301 and INTH 401. Prereq: Graduate student.

INTH 484. Geographic Medicine and Epidemiology (1 - 3)
This course focuses on the epidemiology, prevention, treatment, and control of tropical and parasitic diseases. Emphasis will be placed on the triad of agent, host, and environment for infectious disease impacting global health. Three distinct modules will focus on specific examples such as malaria, helminths, bacteria, or viruses. Active class participation is required through discussions, case studies, and group projects. Recommended preparation: EPBI 490, EPBI 491 and a microbiology course or consent of instructor. Offered as EPBI 484, INTH 484, and MHPH 484.

INTH 494. Infectious Disease Epidemiology (1 - 3)
The epidemiology, prevention and control of representative infectious disease models. Emphasis on the triad of agent, host, and environment and the molecular and genetic basis of agent and host interaction in the population. Recommended preparation: EPBI 490, EPBI 491, and a microbiology course or consent of instructor. Offered as EPBI 494, INTH 494, and MHPH 494.

INTH 551. World Health Seminar (1)
This seminar (also called the World Health Interest Group) examines a broad range of topics related to infectious disease research in international settings. Areas of interest are certain to include epidemiology, bioethics, medical anthropology, pathogenesis, drug resistance, vector biology, cell and molecular biology, vaccine development, diagnosis, and sociocultural factors contributing to or compromising effective health care delivery in endemic countries. Speakers will include a diverse group of local faculty, post-doctoral and graduate student trainees, as well as visiting colleagues from around the world.

OTHER CENTERS

Center for AIDS Research
The Case Western Reserve University/University Hospitals Center for AIDS Research (Case CFAR) has been continually funded by the National Institutes of Health since its initiation in April 1994. There are currently twenty CFAR’s in the United States. The Case CFAR is the only one located in the Midwest. The Case CFAR has a mandate to coordinate basic and clinical research activities and to promote interdisciplinary research in HIV infection and AIDS. Comprising more than 140 faculty researchers at the Schools of Medicine, Nursing, Arts and Sciences, and Law, the Case CFAR provides core resources, seminars, lectureships, publications and developmental funding to promote and strengthen the AIDS research programs at the University and its affiliated institutions. Case CFAR membership includes scientists and clinicians from Case, University Hospitals of Cleveland, MetroHealth Medical Center, The Cleveland Veterans Administration Center, the Cleveland Clinic Foundation, and several international locations. Current key areas of research strength include a) international aspects of AIDS; b) AIDS clinical research; c) HIV immunology; d) molecular virology; e) mycobacterial disease; f) AIDS-related malignancies; and g) HIV prevention.

For more information you may contact Robert Bucklew, Case CFAR Outreach Coordinator at 216-844-2247 or at rob2@case.edu. Additional information may be obtained on the CFAR’s website at www.clevelandactu.org.

Center For Stem Cell and Regenerative Medicine
Phone 216-368-3614
http://stemcellcenter.case.edu
Stanton L. Gerson, M.D., Director and Debra S. Grega, Ph.D., Executive Director

The Center for Stem Cell and Regenerative Medicine is a multi-institutional center composed of investigators from Case Western Reserve University, University Hospitals of Cleveland, the Cleveland Clinic, Athersys, Inc., and Ohio State University. Building on the 20 year history of adult stem cell research in northeast Ohio, the Center was created in 2003 with a $19.4 million award from the State of Ohio as a Wright Center of Innovation. An additional $8 million award in 2006 from the State of Ohio’s Biomedical Research and Commercialization Program further validated the Center’s ability to achieve its mission to utilize human stem cell and tissue engineering technologies to treat human disease.

The Center is providing a comprehensive and coordinated “bench to bedside” approach to regenerative medicine, including basic and clinical research programs, biomedical and tissue engineering programs, and the development and administration of new therapies to patients. Center members gain access to an impressive breadth of non-embryonic stem cell types including ASC (adipose stem cells), CTP (Connective Tissue Progenitors), HSC (hematopoietic stem cells), HBI (hemangioblast (AC133) from umbilical cord blood), MSC (mesenchymal stem cells), MAPC (multipotent adult stem cells), and NSC (neural stem cells/oligodendrocyte progenitors) as well as a number of core facilities located on the Case, Cleveland Clinic, and University Hospital campuses. Leveraging its investigators’ exceptional track records in stem cell, tissue engineering and “first in the nation” stem cell clinical trials, the Center is promoting cutting-edge research which is translating into clinical and commercial applications. Current clinical applications being investigated include heart disease, adult stem cell transplantation, cancer, genetic disorders, and neurodegenerative diseases such as multiple sclerosis.

Center for Translational Neuroscience
7th Floor, School of Medicine, Department of Neurosciences
Phone: 216-368-5473
Fax: 216-368-4650
Web site: http://case.edu/med/CTN/
Robert H. Miller, Ph.D., Director

The Center for Translational Neuroscience is an effort to develop scientific interactions between basic scientists and clinicians, with the goal that these interactions will promote understanding of the pathology of neurological diseases and develop novel therapeutic strategies for the treatment of those diseases. Monthly Translational Neuroscience Interest Group meetings facilitate discussions about current research in neurological development and diseases. Faculty of the center will eventually span three Cleveland institutions: Case Western Reserve University, University Hospitals of Cleveland, and the Cleveland Clinic Foundation.

The Cleveland Center for Structural Biology
The Cleveland Center for Structural Biology (CCSB) is an association of researchers at different Cleveland institutions who study structure-function relationships and proper-
ties of large molecules that are involved in disease states. The center serves as a focal point to bring together researchers with interest in Structural Biology, to generate a stimulating research and educational environment, and to facilitate and promote interactions between structural biologists and medical colleagues. In addition, the CCSB attracts high-caliber faculty, research associates and students to the area and generates resources for major research equipment. In these ways, the CCSB plays a key role in promoting biomedical research in Northern Ohio. For more information, visit http://structuralbiology.case.edu/.

The Heart and Vascular Research Center
The Heart and Vascular Research Center (HVRC) was established to promote excellence in cardiovascular research at MetroHealth Medical Center and Rammelkamp Center for Education and Research. The center was developed using a cross-disciplinary integrative approach to exploit the extraordinary range of outstanding investigative talent of the institution. Our aim is to develop novel insights to mechanisms, diagnosis, and treatment of cardiovascular disease by applying state-of-the-art engineering, molecular, cellular, organ level, and clinical investigative approaches to specific cardiac disease states. A very important aspect of the HVRC is its promotion of an outstanding training environment for developing the next generation of cardiovascular investigators. HVRC faculty are affiliated with the Departments of Biomedical Engineering, Physiology and Biophysics, Developmental Biology, and Neuroscience at Case Western Reserve University.

Mary Ann Swetland Center for Environmental Health
Dorr G. Dearborn, Ph.D., Director
http://casemed.case.edu/swetland/
Mt. Sinai Skills and Simulation Center
http://casemed.case.edu/msssc/

The Mt. Sinai Skills and Simulation Center (MSSSC) is one of a few locations worldwide that coordinate a standardized patient program and technical simulation at one location. It will benefit from a unique partnership with the Israeli National Center for Simulation, MSR, at the Chaim Sheba Medical Center. The MSSSC is currently located in a building owned by the Louis Stokes Cleveland VA Medical Center and situated at the corner of East 105th Street and Wade Park. This beautiful facility is only temporary. Eventually, the MSSSC will move to the West Quad area. Its permanent location on the site of the Mount Sinai Hospital will be an enduring tribute to our visionary benefactors. The MSSSC occupies the first floor of the building. The VA Medical Center is constructing a Learning X Change on the upper level.

Rammelkamp Center for Education and Research
Providing expert clinical care depends on medical research. Every aspect of treatment is based on this research. From its very start as one of the first public hospitals in our country, the MetroHealth Medical System (formerly Cleveland City Hospital and Cuyahoga County Metropolitan Hospital) has recognized that the fundamental building block for improving patient care is quality medical research-research that investigates the most difficult health problems faced by our community. And that has been the tradition of MetroHealth - what we have done and will continue to do. The MetroHealth System is among the ten largest employers in Cuyahoga County and comprises a 732-bed hospital, ten community health centers, and two nursing homes. The Rammelkamp Center is an 80,000-square-foot research building that houses Case investigators on the Metro campus.

From its beginning as a Bedlington city hospital in 1837, the MetroHealth Medical System has been dedicated to the science of improving health care. In 1914, Dr. Roy Scott, a cardiovascular researcher, became known for his excellence in clinical research and education. Throughout the 1930s, 1940s, and 1950s, MetroHealth’s prominent scientists advanced clinical care by conducting meaningful research to improve our community’s health. Dr. Robert Stecher, a prominent researcher in rheumatology; Dr. Frederick Robbins, who received the Nobel prize for research leading to isolation of the polio virus; and Dr. Charles Rammelkamp, a Lasker Award winner whose research led to eradication of rheumatic fever and glomerulonephritis as sequelae of streptococcal infection. Today Hunter Peckham, Ph.D., a member of the National Academy of Engineering, works with investigators in the Departments of Orthopedics and Physical Medicine and Rehabilitation to develop and pilot devices to improve function of spinal cord injury patients. Other prominent programs include centers focused on kidney disease research, heart and vascular disease research, health services research and reducing health disparities. Our ongoing commitment to academic and clinical excellence, coupled with extensive capabilities in biotechnology, bioengineering, genetics, and population science will assure that the Rammelkamp Center for Education and Research continues to grow as one of the major research and training centers in the country. For more information: http://www.metrohealthresearch.org/.

Tuberculosis Research Unit
W. Henry Boom, M.D., Director
http://www.tbresearchunit.org/

DEPARTMENT OF GENETICS

School of Medicine
Biomedical Research Building
Phone 216-368-3431
http://genetics.case.edu/

The Department of Genetics embraces a unified program devoted to outstanding research and teaching in all areas of genetics, with particular emphases on genomics, human genetics and animal models, development, and chromosome structure and function. Faculty conduct internationally recognized research programs in each of these areas. The also are committed to training the next generations of leading genetics researchers. The department has three special programs: the Center for Human Genetics, the Center for Computational Genomics, and the Genomic Medicine Institute (descriptions appear later in this narrative).

Programs offered lead to the Ph.D., combined M.D./Ph.D. degree, or M.S. with a special emphasis in either genetic counseling or bioinformatics and systems biology. Students are encouraged to pursue a program of research and study that meets their goals and interests. Advanced courses are offered in specialized areas as outlined later in this section.

Students participate in ongoing journal clubs, research seminars and grand rounds. A program of departmental and interdisciplinary seminars by outstanding visiting scientists provides regular exposure to a broad range of current research in genetics.

The department accepts direct on-line applications (see Genetics Web site) to the doctoral program by those who have significant prior research experience in genetics and are committed to careers in genetics research. Alternatively, the department also participates in the integrated Biomedical Sciences Training Program (BSTP, please see separate listing in this publication and/or BSTP Web site). Students interested in pursuing the combined M.D./
Ph.D. program are admitted through the Medical Scientist Training Program (MSTP), please see separate listing in this publication). Those students interested in careers in genetic counseling may apply directly to the Genetic Counseling Training Program in the department.

The Center for Human Genetics is an integral part of the Department of Genetics and consists of both research and clinical laboratories involved in human and clinical genetics. This center supports research and clinical programs focusing on the molecular basis of inherited disease, human genetic disease mapping, and the genetic dissection of complex disease, as well as providing clinical care and training for postdoctoral fellows and genetic counseling students.

The Center for Computational Genomics is an interdisciplinary research and training program involving faculty in the Department of Epidemiology and Biostatistics in the School of Medicine and in the Department of Electrical Engineering and Computer Science in the School of Engineering. The center provides opportunities to combine research in genetics, genomics, epidemiology, bioinformatics, computer science, and systems biology.

The Genomic Medicine Institute is a joint program involving the Cleveland Clinic Foundation and Case. Its emphasis involves translating discoveries in basic and clinical research to clinical practice. The mission is to exploit the discoveries in genomics, epidemiology, ethics, pharmacology, genetics and physiology to revolutionize the practice of medicine.

**COURSE DESCRIPTIONS (GENE)**

**GENE 367-1. Commercialization and Intellectual Property Management (0)**

This interdisciplinary course covers a variety of topics, including principles of intellectual property and intellectual property management, business strategies and modeling relevant to the creation of start-up companies and exploitation of IP rights as they relate to biomedical-related inventions. The goal of this two-semester course is to address issues relating to the commercialization of biomedical-related inventions by exposing law students, MBA students, and Ph.D. candidates in genomics and proteomics to the challenges and opportunities encountered when attempting to develop biomedical intellectual property from the point of early discovery to the clinic and market. Specifically, this course seeks to provide students with the ability to value a given technological advance or invention holistically, focusing on issues that extend beyond scientific efficacy and include patient and practitioner value propositions, legal and intellectual property protection, business modeling, potential market impacts, market competition, and ethical, social, and healthcare practitioner acceptance. The course will meet over two consecutive semesters—fall and spring—and is six credit hours (three credits each semester). During these two semesters, law students, MBA students, and Ph.D. candidates in genomics and proteomics will work in teams of five (two law students, two MBA students, and one Ph.D. candidate), focusing on issues of commercialization and IP management of biomedical-related inventions. The instructors will be drawn from the law school, business school, and technology-transfer office. To be eligible for this course, law students must also have a B.S. or equivalent in the life sciences, such as biology, biochemistry, genomics, molecular biology, etc. Offered as LAWS 367, MGMT 467, and GENE 467.

**GENE 367-2. Commercialization and Intellectual Property Management (6)**

This interdisciplinary course covers a variety of topics, including principles of intellectual property and intellectual property management, business strategies and modeling relevant to the creation of start-up companies and exploitation of IP rights as they relate to biomedical-related inventions. The instructors will be drawn from the law school, business school, and technology-transfer office. To be eligible for this course, MBA students and one Ph.D. candidate, focusing on issues of commercialization and IP management of biomedical-related inventions. The instructors will be drawn from the law school, business school, and technology-transfer office. To be eligible for this course, law students must also have a B.S. or equivalent in their primary discipline or field of study. Offered as LAWS 367, MGMT 467, and GENE 467.

**GENE 451. Principles of Genetic Epidemiology (1 - 3)**

A survey of the basic principles, concepts and methods of the discipline of genetic epidemiology, which focuses on the role of genetic factors in human disease and their interactions with environmental and cultural factors. Many important human disorders appear to exhibit a genetic component; hence the integrated approaches of genetic epidemiology bring together epidemiologic and human genetic perspectives in order to answer critical questions about human disease. Methods of inference based upon data from individuals, pairs of relatives, and pedigrees will be considered. The last third of the course (1 credit) is more statistical in nature. Offered as EPBI 451, GENE 451, and MHPH 451.

**GENE 467-1. Commercialization and Intellectual Property Management (0)**

This interdisciplinary course covers a variety of topics, including principles of intellectual property and intellectual property management, business strategies and modeling relevant to the creation of start-up companies and exploitation of IP rights as they relate to biomedical-related inventions. The goal of this two-semester course is to address issues relating to the commercialization of biomedical-related inventions by exposing law students, MBA students, and Ph.D. candidates (in genetics and proteomics) to the challenges and opportunities encountered when attempting to develop biomedical intellectual property from the point of early discovery to the clinic and market. Specifically, this course seeks to provide students with the ability to value a given technological advance or invention holistically, focusing on issues that extend beyond scientific efficacy and include patient and practitioner value propositions, legal and intellectual property protection, business modeling, potential market impacts, market competition, and ethical, social, and healthcare practitioner acceptance. The course will meet over two consecutive semesters—fall and spring—and is six credit hours (three credits each semester). During these two semesters, law students, MBA students, and Ph.D. candidates in genomics and proteomics will work in teams of five (two law students, two MBA students, and one Ph.D. candidate), focusing on issues of commercialization and IP management of biomedical-related inventions. The instructors will be drawn from the law school, business school, and technology-transfer office. To be eligible for this course, law students must also have a B.S. or equivalent in the life sciences, such as biology, biochemistry, genomics, molecular biology, etc. Offered as LAWS 367, MGMT 467, and GENE 467.
The Genetics Journal Club is a graduate-level course designed to encourage audience participation. The intent of this class is to expose students to cutting edge topics in Genetics and to instill teaching and leadership skills.

**GENE 508. Bioinformatics and Computational Genomics (3)**
This course is designed to provide an understanding of theory and application of computational methods for molecular biology research. The course will be divided into four primary sections: DNA methods, protein methods, structure analysis (RNA and protein) and phylogenetic analysis. Special emphasis will be placed on the use and development of tools to search and analyze large amounts of sequence data generated as part of the Genome Projects in human, Drosophila and other eukaryotic organisms. The course offers extensive hands-on computational training using UNIX, Web and PC-based software. As such, for every hour of lecture material there will be two corresponding hours of computational laboratory time. In the initial year, enrollment will be limited to five students. Preference will be given to senior-level genetics graduate students or post-doctoral fellows. Recommended preparation: GENE 500 and GENE 504 or permission of instructor.

**GENE 511. Grant Writing and Reviewing Skills Workshop (3)**
This is an introductory graduate course in grant writing and reviewing skills. During this course each student will write a research grant on a topic of his or her choice. Proposals may form the basis for the written component of the preliminary examination in the Genetics Department. Students will also participate in editing and reviewing the proposals of their classmates. Prereg: GENE 500 and GENE 504 or consent of instructor.

**GENE 513. Developmental Genetics (3)**
This course focuses on the genetic control of animal development. Topics covered include the organization of genetic regulatory circuits which govern the determination of embryonic axes, germ layers and cell fates as well as the cell interactions and cell movements which lead to emergence of the basic body plan of the organism. Emphasis is placed on the use of the genetic approach and genetic tools to uncover the molecular basis of these developmental processes. Recommended preparation: GENE 500 and GENE 504.

**GENE 516. Introduction to Clinical Genetics (3)**
The major focus of this course is to allow graduate students in Human Genetics to become familiar with the medical genetics and counseling aspect of the genetics evaluation and counseling process. It provides the student an opportunity to see an application of bench research in the clinical arena as well as to observe and appreciate the various functions, roles and responsibilities of different members of the medical genetics team. Course includes seminars and clinical observations.

**GENE 521. Chromatin Structure and Transcription (3)**
A critical review of selected topics and current literature on the role of chromatin structure in the regulation of gene expression. Offered as BIOL 521 and GENE 521.

**GENE 523. Embryonic Patternin g in Development (3)**
This course will focus on current understanding of patterning mechanisms in animal development. The seminal contributions of Turing, Crick, Lawrence, Wolpert, and Lewis will be covered, as will the most recent advances in the field. Models and theory will be considered, in addition to experimental analysis and the identification of patterning molecules. The course will end with a consideration of how development changes to create different adult morphologies over the course of evolution.

**GENE 524. Advanced Medical Genetics: Cytogenetics (2 - 3)**
Fundamental principles regarding clinical cytogenetics including discussion of autosomal numerical and structural abnormalities; sex chromosome abnormalities; population cytogenetics; mosaicism; uniparental disomy; contiguous gene deletions, and cancer cytogenetics.

**GENE 525. Advanced Medical Genetics: Clinical Genetics (2 - 3)**
Fundamental principles regarding congenital malformations, dysmorphology, and syndromes. Discussion of a number of genetic disorders from a systems approach: CNS malformations, neurodegenerative disorders, craniofacial disorders, skeletal dysplasias, connective tissue disorders, hereditary cancer syndromes, etc. Discussions also include diagnosis, etiology, genetics, prognosis and management.

**GENE 526. Advanced Medical Genetics: Molecular and Quantitative Genetics (2 - 3)**
Molecular: Fundamental principles of gene structure; mechanisms, detection and effects of mutations; imprinting; triplet repeat disorders; X-chromosome inactivation; application of molecular analysis to genotype/phenotype correlations and gene therapy. Quantitative: Fundamental principles of pedigree analysis, segregation analysis, Bays theorem; linkage analysis and disequilibrium; risk assessment and consanguinity.

**GENE 527. Advanced Medical Genetics: Biochemical Genetics (2 - 3)**
Fundamental principles of metabolic testing; amino acid disorders; organic acid disorders; peroxisomal disorders; mitochondrial disorders; etc. Discussion of screening principles and newborn screening as well as approaches to diagnosis, management and therapy for metabolic diseases.

**GENE 528. Principles and Practices of Genetic Counseling (3)**
Fundamental principles needed for the practicing genetic counselor. Topics include skills in obtaining histories (prenatal, perinatal, medical, developmental, psychosocial and family); pedigree construction and analysis, physical growth and development; the genetic evaluation; the physical examination and laboratory analyses; prenatal issues, prenatal screening and diagnosis; and teratogenicity.

**GENE 529. Psychosocial Issues in Genetic Counseling (3)**
Fundamental principles regarding the psychosocial aspects of genetic disease and birth defects, its psy-
chological and social impact on the individual and family. Topics include the genetic counseling interview process, issues regarding pregnancy and prenatal diagnosis, chronicity, death and loss. Cultural issues and their impact on the genetic counseling session are addressed. Resources for families are also explored. Basic interviewing skills are presented. Students will have an opportunity for practice of skills through role play and actual interviewing situations.

**GENE 530. Ethical and Professional Issues in Genetic Counseling (2)**
Professional issues inherent in medical genetics and genetic counseling are addressed, including ethical, legal, religious, and cultural concepts. Fundamental principles of ethics are explored in some depth as they relate to genetic issues, such as autonomy and informed consent; use of the NSGC Code of Ethics is emphasized. Genetic counseling roles and responsibilities and aspects of a career as a professional are explored.

**GENE 532. Clinical Practicum in Genetic Counseling (1 - 6)**
This clinical practicum provides the student an opportunity to function as a genetic counselor by preparing for cases; obtaining appropriate histories; determining risks; performing psychosocial assessments; discussing disease characteristics, inheritance, and natural history; providing anticipatory guidance and supportive counseling using medical and community resources; and follow-up. Students rotate through four clinical areas and one laboratory and will register for a total of 12 hours over the course of the program. Recommended preparation: Admission to Genetic Counseling Training Program.

**GENE 534. Neurogenetics (3)**
This course will explore how principles of genetics can be used as tools to study the complex organization of the nervous system. Examples will be drawn from all relevant model organisms including nematode, fruit fly, mouse, and human. Meant primarily for students with an interest in neuroscience, this course will offer a strong foundation in genetic principles using examples drawn from the neuroscience literature. Students in other disciplines, especially genetics, will benefit from the examples to learn important aspects of the neurosciences ranging from behavior to development. These interdisciplinary features make this course unique in its offerings and a valuable addition to many students’ course of study. Recommended preparation: CBIO 453 and CBIO 455. Offered as GENE 534 and NEUR 534.

**GENE 537. Microscopy-Principles and Applications (3)**
This course provides an introduction to various types of light microscopy, digital and video imaging techniques, and their applications to biological and biomedical sciences via lectures and hands-on experience. Topics covered include geometrical and physical optics: brightfield, darkfield, phase contrast, DIC, fluorescence and confocal microscopes; and digital image processing. Offered as GENE 537, MBIO 537, and PHOL 537.

**GENE 601. Research in Genetics (1 - 9)** (Credit as arranged.)
**GENE 651. Thesis M.S. (1 - 9)** (Credit as arranged.) Master’s Thesis Plan A.
**GENE 701. Dissertation Ph.D. (1 - 9)** (Credit as arranged.) Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

**INTEGRATED BIOLOGICAL SCIENCES**
Room T-401, School of Medicine
Phone 216-368-3404

These courses are open only to students in combined M.D./Ph.D. programs such as the Medical Scientist Training Program (MSTP) and the Health Services Research Program. These courses use the curriculum of the first two years of the School of Medicine to provide a general education in biomedical science and medicine for graduate credit. The courses do not provide specialized research training, which is provided by the curricula of specific graduate programs. Please see the separate listings for these programs in this General Bulletin. For more information, contact:

**MEDICAL SCIENTIST TRAINING PROGRAM**
Program Manager
School of Medicine
10900 Euclid Ave.
Cleveland, Ohio 44106-4936
Phone: 216-368-3404
E-mail: mstp@case.edu

**COURSE DESCRIPTIONS (IBIS)**

**IBIS 401. Integrated Biological Sciences I (1 - 9)**
A four-semester sequence encompassing anatomy, biochemistry, physiology, pharmacology, pathology, and microbiology.

**IBIS 402. Integrated Biological Sciences II (1 - 9)**
A continuation of IBIS 401.

**IBIS 403. Integrated Biological Sciences III (1 - 9)**
A continuation of IBIS 402.

**IBIS 404. Integrated Biological Sciences IV (0 - 9)**
A continuation of IBIS 403.

**IBIS 405. Integrated Biological Sciences I (1 - 9)**
**IBIS 406. Integrated Biological Sciences II (1 - 9)**
**IBIS 407. Integrated Biological Sciences III (1 - 9)**
**IBIS 408. Integrated Biological Sciences IV (1 - 9)**

**IBIS 411. Clinical Science I (2)**
**IBIS 412. Clinical Science II (2)**
**IBIS 413. Clinical Science III (2)**
**IBIS 414. Clinical Science IV (0 - 2)**
**IBIS 415. Clinical Science I (1 - 9)**
**IBIS 416. Clinical Science II (1 - 9)**
**IBIS 417. Clinical Science III (1 - 9)**
**IBIS 418. Clinical Science IV (1 - 9)**
**IBIS 424. Integrated Biological Sciences in Medicine (6)**
This course is open only to candidates enrolled in the M.D./M.S. program (University plan). Registration is for the Spring semester of the second year in medical school. The course will cover the areas of cardiology, pulmonary, hematology, renal physiology and gastroenterology. Assessment will be by examination (to include quizzes, multiple choice questions, and essays). Recommended preparation: First three semesters of medical school and currently a medical student in good standing.

**IBIS 434. Integrated Biological Sciences in Medicine (6)**
This course is open only to candidates enrolled in the M.D./M.S. program (College plan). Registration is for the Spring semester of the second year in medical school. The course content includes the areas of hematology, gastroenterology and renal physiology. Students will also be required to participate in Process of Discovery. Assessment of performance will be through reaching required levels of competency for the medical areas identified above and by the evaluation of a term paper. Recommended preparation: First three semesters of medical school and currently a medical student in good standing.

**IBIS 435. Integrated Biological Science in Medicine-University (6)**
This course is open only to candidates in the M.D./M.S. program (University plan). Registration is typically for the Spring semester of the second year in medical school. The course content includes the areas of hematology, gastroenterology and renal physiology. (Students will also be required to participate in Process of Discovery.) Assessment of performance will be through reaching required levels of competency for the medical areas identified above and by the evaluation of a term paper. Recommended preparation: First three semesters of medical school and currently a medical student in good standing.

**IBIS 451. Clinical Science (for M.D./M.A. Bioethics Students) (3)**
**IBIS 461. Clinical Science (for M.P.H./M.D. Students) (1 - 6)**
**IBIS 466. Medical School Electives (for M.P.H./M.D. Students) (1 - 6)**

**COURSE DESCRIPTIONS (IBMS)**

**IBMS 500. Being a Professional Scientist (0)**
The goal of this course is to provide graduate students with an opportunity to think through their
professional ethical commitments before they are tested, on the basis of the scientific community's accumulated experience with the issues. Students will be brought up to date on the current state of professional policy and federal regulation in this area, and, through case studies, will discuss practical strategies for preventing and resolving ethical problems in their own work. The course is designed to meet the requirements for "instruction about responsible conduct in research" for BSTP and MSTP students supported through NIH/ADAMHA institutional training grant programs at Case. Attendance is required.

IBMS 600. Exam in Biomedical Investigation (0)
Students are required to pass an examination established for each student, generally reflecting the preparation and oral defense of a written report on the project. Prereq: Must be enrolled in MD/MS Biomedical Investigation program.

DEPARTMENT OF MOLECULAR BIOLOGY AND MICROBIOLOGY
Room W200, School of Medicine
Phone 216-368-3420
http://www.case.edu/med/microbio/index.htm

The Department of Molecular Biology and Microbiology provides a focus within the School of Medicine for the study of the growth and development of microorganisms at the molecular level. Many of the research programs in the department concern fundamental mechanisms using the tools of molecular biology: How is gene expression controlled? What is the role of RNA processing and surveillance in gene expression? How do surface molecules regulate molecular signaling events? Other questions under investigation are specific to microorganisms: How do bacteria and viruses survive in their chosen environment? How do they deal with the host's potent immune response? What genes are responsible for their pathogenesis? How is the latency and reactivation of infection achieved? How can we use our results to improve prevention, diagnosis and treatment of infectious diseases?

We study microbial systems both for the insights that they bring to the study of molecular and cellular biology and to improve our understanding of infectious diseases. Viruses provide exquisitely adapted probes of the host cell's normal functions. Historically, studies of viruses have provided numerous insights into the control of gene expression at the transcriptional, post-transcriptional, and translational levels. Fundamental processes, such as repression of gene expression, splicing, reverse transcription, capping of messenger RNA, internal initiation of protein synthesis, processing of membrane proteins through the Golgi apparatus, and the identification of oncogenes, were all initially uncovered through studies of viruses. Despite the availability of potent anti-microbial drugs, microbial pathogenesis gives rise to severe complications including blindness, paralysis, and neurological defects and can lead to chronic diseases including cancer, heart, lung or kidney disease. Recently, the challenges posed by infectious disease have been exacerbated by the emergence of new pathogens, such as the SARS, AIDS and West Nile Viruses, but also of generation of new bacterial and viral strains that display increased resistance to antimicrobial drugs. It is only by developing a thorough understanding of the biology of pathogenic microbes, their host organisms, and how the two interact during infection that improved strategies for prevention and treatment of infectious diseases can be achieved.

Current faculty in the department and our distinguished adjunct faculty all have nationally-funded research programs. Many of our faculty serve on study sections of national agencies, publish in the most prestigious journals, serve as editors of journals, and take leadership positions in throughout Case School of Medicine. We also enjoy numerous collaborations with faculty in the Departments of Biochemistry, Neuroscience, and Genetics, the Case Comprehensive Cancer Center, the Center for AIDS Research, and the Center for RNA Molecular Biology, because of our shared research interests. All these activities create a vibrant scientific environment.

The department is currently in a period of rapid expansion. The School of Medicine has made a strong commitment to faculty recruitment in the areas of molecular virology and in bacterial development and pathogenesis. There is a tremendous opportunity for synergy among our faculty as we initiate new programs in microbial pathogenesis and virology that utilize genetic and molecular analysis of microorganisms. We will work toward the completion of the genomic sequence for a vast array of organisms, including man, the availability of transgenic animals with specific immunological defects, and advances in bacterial and viral genetics, we are in a unique position to understand the genetic basis for bacterial and viral pathogenesis. The development of multidisciplinary programs that provide for productive interactions with our clinical colleagues studying infectious diseases and exploit genetics, microbiology, and modern biochemistry, including structural biology, in the study of microorganisms will be the key to our long-term success.

COURSE DESCRIPTIONS (MBIO)
MBIO 399. Undergraduate Research (1 - 3)
Permits qualified undergraduates to work in a faculty member's laboratory.

MBIO 420. Molecular Genetics of Cancer (3)
Cancer is a genetic disease, not only in the Mendelian sense of inheritance, but also in the sense that it is caused by somatic mutation. The targets of mutation are a set of proto-oncogenes and tumor suppressor genes whose products govern cellular proliferation, death and differentiation. The objectives of this course are to examine the types of genes that are the targets of mutational activation or inactivation and the mechanistic outcome of mutational changes that lead to oncogenesis. The course will also probe viral mechanisms of oncogenesis related to the products of cellular proto-oncogenes or tumor suppressor genes. In the course of these examinations we will explore the genetic and molecular genetic approaches used to identify and study oncogenes and tumor suppressor genes. Students should be prepared to present and discuss experimental design, data and conclusions from assigned publications. There will be no exams or papers but the course will end with a full-day, student-run symposium on topics to be decided jointly by students and instructors. Grades will be based on class participation and symposium presentation. Offered as BIOC 420, MBIO 420, MVIR 420, PATH 422, and PHRM 420. Prereq: CBIO 453 and CBIO 455.

MBIO 434. Mechanisms of Drug Resistance (3)
Resistance to drugs is an important health concern in the new millennium. Over the past century, modern medicine has developed and prescribed drugs for various ailments and diseases with known therapeutic benefit. Since the discovery of antibiotics by Dr. Fleming, we have struggled with a new complication in infectious diseases, development of drug resistance. This course will focus on and compare the drug resistant mechanisms selected by viruses, bacteria, parasites, fungi, and tumor cells. Topics to be covered include antiretroviral resistance (e.g., AZT and protease inhibitors), antibiotic resistance (e.g., B-lactams), resistance to chemotherapeutic agents, and resistance to anti-malarial drugs (e.g., chloroquine). Offered as MBIO 434, MVIR 434, and PHRM 434.

MBIO 435. Seminar in Molecular Biology/ Microbiology (1)
Graduate students will attend the departmental seminar given by all graduate students in the Department of Molecular Biology and Microbiology, in the Molecular Virology Program, and in the Cell Biology Program, as well as give a seminar on their own thesis research. Students will be evaluated by the faculty member in charge of that student's seminar with input from the students' own thesis committee. After each student presenter will meet with other graduate students for peer-review of the content, delivery, and style of the
MBIO 445. Molecular Biology and Pathogenesis of RNA and DNA Viruses (3)
Through a combination of lectures by Case faculty and guest lecturers, along with student discussion of current literature, this course emphasizes mechanisms of viral gene expression and pathogenesis. RNA viruses to be discussed include positive, negative, and retroviruses. DNA viruses include SV40, adenovirus, herpes, papilloma, and others. Important aspects of host defense mechanisms, antiviral agents, and viral vectors will also be covered. Students will be evaluated based on their quality of presentation of course papers assigned to them and their overall participation in class discussions. Offered as MBIO 445 and MVIR 445.

MBIO 446. Virus–Host Interactions (3)
Viruses and their hosts have co-evolved for millions of years and, as a result, viruses have evolved intricate and fascinating mechanisms for evading host defenses. Understanding how viruses interact with the host is fundamental to counteracting or preventing viral infections. For example, viruses that fail to block host defenses are avirulent and candidates for vaccines. Emerging viral infections are a major public health concern and a subject of this course. The course consists of lectures and in-depth analysis of published studies on virus-host interactions. Outstanding local and external lecturers from across the U.S. will participate in teaching this course. In addition, students will deliver one presentation to the class during the course. Offered as MBIO 446 and MVIR 446.

MBIO 486. HIV Immunology (3)
This course will examine the unique immunology of HIV disease. The course content will include the study of HIV pathogenesis, immune control, immune dysfunctions, HIV prevention and immune restoration. Students will be expected to attend lectures and participate in class discussions. A strong emphasis will be placed on placing HIV research in the area of HIV immunology. Offered as PATH 486 and MBIO 486.

MBIO 488. Yeast Genetics and Cell Biology (3)
This seminar course provides an introduction to the genetics and molecular biology of the yeasts S. cerevisiae and S. pombe by a discussion of current literature focusing primarily on topics in yeast cell biology. Students are first introduced to the tools of molecular genetics and special features of yeasts that make them important model eukaryotic organisms. Some selected topics include cell polarity, cell cycle, secretory pathways, vesicular and nuclear/cytoskeletal transport, mitochondrial import and biogenesis, chromosome segregation, cytoskeleton, mating response and signal transduction. Offered as CLBY 488, GENE 488, MBIO 488, and PATH 488.

MBIO 513. Bacterial Virulence and Host Interactions (2)
The goal of this seminar course is to familiarize students with bacterial virulence mechanisms and how they interact with the host. The focus will be on current literature pertaining to this field. While the molecular basis of bacterial virulence mechanisms will be the main focus, some time will be spent on the host immune response. Topics covered will include adhesion/pili, secretion mechanisms, AB toxins, bacterial invasion and intracellular survival, regulation of virulence gene expression. Offered as CBIO 453 and CBIO 455 or equivalent courses.

MBIO 518. Signaling via Cell Adhesion (3)
Molecular mechanisms by which cells interact with and are regulated by extracellular matrices and other cells. Offered as CBIO 518, CLBY 518, MBIO 518, and NEUR 518. Prereq: CBIO 453 and CBIO 455.

MBIO 519. Molecular Biology of RNA (3)
Selected topics regarding editing, enzymatic function, splicing, and structure of RNA. Offered as BIOC 519, CLBY 519, and MBIO 519.

MBIO 520. Principles of Microbiology (3)
This course provides lectures and small group discussions of the cellular and molecular mechanisms by which certain bacterial viruses, and parasites execute normal and pathologic conditions in human hosts. The biology, genetics, and physiologic properties of these infectious agents are considered in light of the mechanisms by which they induce pathogenic conditions in their human hosts. The course is intended for graduate students advanced beyond the core curriculum of course work in molecular biology and microbiology areas of specialization. Offered as CBIO 453 and CBIO 455.

MBIO 521. HIV and AIDS: Research and Care (3)
AIDS and HIV disease represent a continuing medical challenge both here in the U.S. and abroad. Currently there are over 25 million people worldwide who are living with AIDS. Basic research into HIV also represents one of the major focuses of contemporary virus and immunological research. This course is designed to expose both M.D. and Ph.D. students to the major problems in HIV research. Because of the multidisciplinary nature of AIDS research, the course will span the spectrum from fundamental molecular biology to clinical translational research. All students (no matter what their degree course) will be given an opportunity to participate in outpatient HIV care and also to participate in a scientific research project. Offered as MBIO 521 and MVIR 521. Prereq: CBIO 453 and CBIO 455.

MBIO 522. Protein Phosphorylation and Cell Regulation (3)
This intensive seminar course will emphasize signaling pathways mediated by protein phosphorylation/dephosphorylation. Bacterial signaling mediated by histidine/asparragine phosphorylation and regulation of cellular physiological events will be reviewed. Then eucaryotic cell signaling will be reviewed from the surface of the cell and into the nucleus. This includes receptor-dependent phosphorylation/dephosphorylation reactions, cytoplasmic signaling intermediates, protein translation processes dependent upon phosphorylation, and nuclear regulatory pathways with emphasis on transcriptional mechanisms. In addition to faculty lectures, students will be reviewing the current literature and will present a research proposal based on the current concepts in the field that they choose to cover. Offered as MBIO 522 and MVIR 522. Prereq: CBIO 453 and CBIO 455.

MBIO 524. Trends in Prokaryotic Cell and Developmental Biology (3)
Did you know the (i) all building blocks for the eukaryotic cytoskeleton are also present in prokaryotes, that (ii) bacteria rely on dynamic actin-like structures to segregate chromosomes/plasmids and regulate cell polarity, that (iii) oscillating waves of cyclin-like regulators control progression of the bacterial cell cycle, that (iv) a novel secondary messenger, cyclic di-GMP, has been identified that triggers a physiological and morphological transition in bacteria and that (v) bacterial cell-cell interactions can elicit morphological changes that bear remarkable similarities to organogenesis in flies, worms, and vertebrates? In this advanced graduate course, recent insights on the cell and developmental biology of prokaryotes will be discussed and analogies drawn to those that exist in eukaryotes. Studies on the bacterial model organisms Escherichia coli, Bacillus subtilis, Caulobacter crescentus, Vibrio spp., Myxococcus xanthus and Streptomyces coelicolor have altered our view of the bacterial cell, demonstrating that at the most fundamental level cells operate in a remarkable similar way, regardless of whether they contain a nucleus or not.

MBIO 525. Advances in Biological Imaging (3)
Sometimes the smallest fish can make the biggest splash. Aeuroaea victoria is a tiny jellyfish that likes to turn blue light into green, and in doing so has inspired the greatest romance in Cell Biology since the invention of the electron microscope. The green fluorescent protein (GFP) from this bioluminescent hydromedusa has been used to light up everything from Christmas trees to bunny rabbits to viral particles. If a picture is worth a thousand words a movie is worth at least a few hundred pictures and GFP, as well as its many derivatives, affords the average molecular biologist the opportunity to direct the movie of his life’s study. This advanced graduate course will focus on the theory and application of fluorescent microscopy to modern Biology. Lectures will discuss microscope technologies, fluorescent probes, live cell reagents and practical limitations to current technologies. Student run sessions will review current literature and discuss innovative applications of the technology. Prereq: CBIO 453 and CBIO 455.

MBIO 537. Microscopy–Principles and Applications (3)
This course provides an introduction to various types of light microscopy, digital and video imaging techniques, and their applications to biological and biomedical sciences via lectures and hands-on experience. Topics covered include geometrical and...
physical optics; brightfield, darkfield, phase contrast, DIC, fluorescence and confocal microscopes; and digital image processing. Offered as GENE 537, MBIO 537, and PHOL 537.

MBIO 599. RNA Structure and Function (3)
This course will cover fundamental aspects of modern RNA biology with emphasis on the interplay of three dimensional structure of nucleic acids and their function. The main focus of the course is on the recent discoveries that indicate a prominent role of RNA as a major regulator of cellular function. Topics discussed will include an introduction to RNA structure, folding and dynamics, RNA/RNA and RNA-protein interactions, and role of RNA in catalysis of biological reactions in ribosome and the role of other catalytic RNAs in tRNA biogenesis, pre-mRNA splicing, and viral replication. The course also covers the recently discovered RNA regulatory switches, large noncoding regulatory RNAs, and the role of RNA in human diseases and novel, RNA-based therapeutics. Offered as BIOC 599, CLBY 599, and MBIO 599.

MBIO 601. Research in Molecular Biology and Microbiology (1 - 18)

MBIO 620. Transcription and Gene Regulation (3)
This course covers mechanisms of transcription that play critical roles in biological processes. It is designed to develop scientific thinking in designing experiments and evaluating the merits of research papers. Students will be able to present two to three 30-minute talks. Topics include: 1) structure and function of RNA polymerases; 2) accessory factors involved in initiation, elongation, and termination; 3) regulation transcription; 4) transcriptional co-activators and corepressors; 5) regulation of transcription factor activity. A take-home exam will be conducted at the final week. Grades will be based on presentations and take-home exam. Offered as BIOC 620 and MBIO 620. Prereq: CBIO 453 and CBIO 455.

MBIO 651. Thesis M.S. (1 - 18)
MBIO 701. Dissertation Ph.D. (1 - 18)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

MOLECULAR MEDICINE PROGRAM
Lerner Research Institute/ NA2-05
Phone 216-445-4593
E-mail: ticknoc@ccf.org

The Molecular Medicine Program provides educational and research opportunities leading to the Ph.D. degree. This program is designed to integrate clinical knowledge into a rigorous basic science curriculum and to foster translational research endeavors.

First-year graduate students follow the progressive Core Curriculum consisting of MMED 410 through 416, 501, and 612. They will complete three laboratory rotations (starting mid-July) among the laboratories of training faculty, which span the entire campus. Students will be exposed to trainer research projects during the Frontiers of Molecular Medicine seminar and journal club series taken the first summer and each semester thereafter. The goal of the rotations and the Frontiers of Molecular Medicine seminar series in the first year is to guarantee that the student has sufficient breadth of familiarity with Molecular Medicine faculty to allow him or her to make the best choice of a permanent research laboratory. In all cases, this selection must be made by the end of the second semester of year 1.

During subsequent years, students will devote the majority of their time to thesis research, while attending advanced graduate courses, seminars, and journal clubs. Advanced elective courses may be chosen from any department or program on campus, with the approval of the graduate program director and the student’s thesis committee. Students must take a total of 36 semester hours of courses and maintain a B average.

The qualifying exam will be comprised of preparing and defending a grant application in the NIH/NRSA format. The topics of the grant can be in a related area of investigation to the student’s research but cannot resemble projects that are ongoing in the laboratory of the Research Advisor. At least one aim of this proposal will consist of a specific translational or clinical aim.

All efforts should be made to complete the Ph.D. within four years. All students are expected to submit two or more first-authored primary research publications in peer-reviewed scientific journals. At least one manuscript should be accepted for publication prior to the thesis defense.

PH.D. PROGRAM

COURSEWORK

Students begin in July by first taking MMED410 Human Physiology and Disease. The student will follow a progressive curriculum including Proteins, Membranes, and Bioenergetics; Metabolism and Pharmacology; Nucleic Acids, Gene Expression, and Gene Regulation; Mammalian Genetics; Cell Biology; and Infection and Immunity. The core series concludes with a course in Principles of Clinical Research for the Ph.D. Investigator, and a one-semester mentored Clinical Experience.

RESEARCH ROTATIONS

The research rotations allow the student to sample areas of research and become familiar with faculty members and their laboratories. The main purpose of these rotations is to aid the student in selecting a laboratory for the thesis work. Students will begin their rotations in July. A minimum of three rotations must be completed during the year.

CHOOSING A THESIS ADVISOR

After the second semester of the first year students select an advisor for the dissertation research. The emphasis of the Ph.D. work is on research, culminating in the completion of an original, independent research thesis.

COURSE DESCRIPTIONS (MMED)

MMED 400. Research Rotations (0)
Research rotations are conducted to expose the student to several laboratory environments, a variety of research problems and numerous laboratory techniques as well as to assist them in the selection of their Research Advisor. Rotations will begin immediately upon enrollment and continue through the second semester of the first year. Usually rotations will last 12 weeks, however if a student decides that he/she is not interested in the assigned laboratory a shorter rotation is appropriate. The student is responsible for arranging each rotation with an approved trainer with the consultation of the graduate program director. To assist in this endeavor, the graduate program director will provide a list of approved trainers who have space, time and money to support a graduate student. During the rotation, students are expected to participate in all lab and departmental activities, e.g., lab meetings and seminars. At the completion of a rotation the student is required to submit a written Rotation Report including an outline of the problem being studied, a description of the experimental approaches, a discussion of the results of performed experiments as well as future directions.

MMED 401. Fundamentals of Molecular Medicine and Translational Research (8)
Overview of Molecular Biology and Cell Biology with emphasis on areas of relevance to human health and disease. Topics include: basic cell structure; protein structure and function; genomic organization and expression, including basic genetics, DNA repair and recombination, transcriptional regulation, RNA processing and translation; membrane structure and function, including membrane protein biosynthesis and function; cell signaling pathways, including hormone and drug action; metabolism and energetics.

MMED 404. Frontiers in Molecular Medicine Seminar (1)
In the Frontiers in Molecular Medicine Seminar
series, faculty from the department of Molecular Medicine and guest lecturers will discuss ongoing translational research.

MMED 410. Introduction to Human Physiology and Disease (4)
The purpose of this course is to give an introduction to the physiology of the major human organ systems, as well as selected associated pathophysiology. The course will provide a physiological basis for subsequent study and research in Molecular Medicine. The integration of clinical faculty into the course will emphasize the importance of bringing scientific knowledge to bear on clinical problems, a theme which will be stressed throughout the Molecular Medicine curriculum. The course will also acquaint students with medical terminology.

MMED 411. Lipids, Membranes and Proteins (2)
The course will include a combination of interactive lectures and problem-based interactive seminars. Each week will conclude with at least one clinical correlation where the weekly topic is presented in the context of a clinical problem. Topics to be covered include: protein structure, function, and enzymeology; protein synthesis, modification and turnover; biological membranes and transport through membranes; and bioenergetics.

MMED 412. Metabolism and Introduction to Principles of Pharmacology (2)
The course will include a combination of interactive lectures and problem-based interactive seminars. Each week will conclude with at least one clinical correlation where the weekly topic is presented in the context of a clinical problem. Topics to be covered include: carbohydrate metabolism; amino acid and nucleotide metabolism; lipid metabolism and lipoproteins; regulation of metabolism; and principles of pharmacology.

MMED 413. Nucleic Acids, Gene Expression, and Gene Regulation (2)
The course will include a combination of interactive lectures and problem-based learning. Each week will conclude with at least one clinical correlation where the weekly topic is presented in the context of a clinical problem. Topics to be covered include: DNA structure, chromosome structure, replication and repair; RNA synthesis and RNA processing, the organization of eukaryotic genes and the genetic code and translation; and gene regulation.

MMED 414. Mammalian Genetics (2)
The course focuses on genetics, genomics, and bioinformatics, and it will include a combination of interactive lectures, problem-based learning and a week-long group project. Topics to be covered include: genetic variation; linkage studies; association studies; complex traits, linkage disequilibrium, the Hap Map, pharmacogenetics; genome-wide expression studies; and mouse models for human disease, and bioinformatics.

MMED 415. Cell Biology (2)
The course will include a combination of interactive lectures and problem-based learning. Each week will conclude with at least one clinical correlation where the weekly topic is presented in the context of a clinical problem. Topics to be covered include: cell structure and organelles, prokaryotes/eukaryotes; intracellular compartments and protein sorting; receptors/endocytosis/rafts; the nucleus; cell communication; and mechanics of cell division.

MMED 416. Host Defense: Infection and Immunity (2)
The course will include a reading program, lectures, and weekly problem-based student-led presentations. Weeks 1 and 2 are dedicated to establishing the scope of the field and forming vocabulary. Week 3 and part of Week 4 will cover immune mechanisms. The remainder of the course will deal with clinical aspects of immunobiology. On a regular basis Clinical Correlations, relevant to weekly topics, are integrated into the material. Topics to be covered include: biology and molecular biology of infectious agents; fundamentals of immunology; innate and adaptive responses to infection, immune effector mechanisms; and clinical aspects of immunobiology.

MMED 501. Principles of Clinical and Translational Research for Laboratory-Based Investigators (4)
To give an introduction to the ethical, statistical, methodologic and informatics basis of clinical and translational research. Topics will include the history of clinical and translational research, regulatory aspects of human subjects research, clinical trials study design, conflicts of interest, human subjects recruitment, research and publication ethics, technology transfer, biobank construction and utilization, and clinical and research database construction and utilization. In addition, students will be introduced to principles of biostatistics and clinical epidemiology relevant to clinical and translational research and gain expertise in statistical tool use through problem based learning sets.

MMED 504. Seminars in Advanced Research in Medicine (1)
The goal of Advanced Research in Medicine 2, Friday Research Seminars (ARM2), is to facilitate student understanding of the bidirectional nature of research and to instill excitement about the way in which novel research results in advances in clinical medicine. A series of 18 accomplished, well-respected researchers will interact with students for 60 minutes per week, challenging the students to think about novel research questions and their relationships to current clinical challenges linked thematically to the theme of the week. The emphasis of ARM2 Friday Research Seminars is on the content of the research and how this research may impact and change clinical practice in the future. Each week, a student from the class will be assigned to moderate the session. The student moderator will introduce the speaker and will be responsible for ensuring that adequate interactive discussion occurs. In addition, four sets of 2-week sessions each will be devoted to small group sessions. The goal of the 2-week sessions is for the students to develop a research plan directly related to the organ system featured in the presentations.

MMED 601. Dissertation Research (1 - 9)
Research leading toward the Ph.D. dissertation in Molecular Medicine.

MMED 612. Clinical Experience (2)
Each student will be assigned a Clinical Mentor who will co-advice the student and serve on both the Qualifying Examination Committee and Thesis Committee. The Clinical Mentor will develop an individualized curriculum for the student in consultation with the thesis research mentor and program director. The curriculum will be organized around the integrated, multidisciplinary disease groups at the Clinic. The students will attend and actively participate in the regularly scheduled multidisciplinary clinical conference organized by their disease group (most meet for one hour every week or every other week), usually involving a combination of case presentations and research presentations. At the conclusion of the semester the student will make a presentation to the group focused on a relevant translational research problem. The Clinical Mentor will also organize a series of supervised site visits (with Mentor) to various locations where students will observe clinician interactions with patients to better understand the disease from the patient perspective and to disease-related diagnostic and research laboratories.

MMED 701. Dissertation Ph.D. (1 - 9)
Research leading toward the Ph.D. dissertation in Molecular Medicine. Recommended preparation: Advancement to candidacy in MMED. Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

MOLECULAR VIROLOGY PROGRAM
The last two decades have witnessed the development of molecular virology as one of the most productive, rewarding and clinically important avenues of biomedical research. The study of viruses has never been more important than it is today due to the recognition of human immunodeficiency virus as the etiologic agent of AIDS and to the role of viruses, such as other retroviruses and human papillomaviruses, in causing cancer. Molecular virology, however, is no less exciting on a purely scientific level. The relatively small sizes of viral genomes coupled with their use of most cellular machinery to replicate has led to the selection of viruses as model systems to study biological processes such as transcription, translation, splicing, and DNA replication. Furthermore, because viruses introduce genetic material into cells as part of their life cycle, they are being used as vectors for gene therapy. Areas of strength of molecular virology program faculty include viral replication; virus-cell interactions, including mechanisms of interferon action; viral oncogenesis; and the use of viral vectors for gene therapy. Advanced-course subjects include RNA viruses, DNA viruses, immunology of infectious diseases, and
RNA and DNA biosynthesis.

The Molecular Virology Program is part of the Biomedical Sciences Training Program. For more information about the Molecular Virology Program, please visit the Biomedical Sciences Training Program website at http://www.case.edu/med/BSTP/index.html.

Write: Biomedical Sciences Training Program, School of Medicine, Case Western Reserve University, 10900 Euclid Ave., Cleveland Ohio 44106-4934
call: 216-368-3347; or
e-mail Deborah Noureddine, BSTP coordinator, at drn2@case.edu.

MOLECULAR VIROLOGY (MVIR)

Course Descriptions

MVIR 420. Molecular Genetics of Cancer (3)
Cancer is a genetic disease, not only in the Mendelian sense of inheritance, but also in the sense that it is caused by somatic mutation. The targets of mutation are a set of proto-oncogenes and tumor suppressor genes whose products govern cellular proliferation, death and differentiation. The objectives of this course are to examine the types of genes that are the targets of mutational activation or inactivation and the mechanistic outcome of mutational changes that lead to oncogenesis.

The course will also probe viral mechanisms of oncogenesis related to the products of cellular proto-oncogenes or tumor suppressor genes. In the course of these examinations we will explore the genetic and molecular genetic approaches used to identify and study oncogenes and tumor suppressor genes. Students should be prepared to present and discuss experimental design, data and conclusions from assigned papers. There will be no exams or papers but the course will end with a full-day, student-run symposium on topics to be decided jointly by students and instructors. Grades will be based on class participation and symposium presentation.

Offered as BIOC 420, MBIO 420, MVIR 420, PATH 422, and PHRM 420. Prereq: CBIO 453 and CBIO 455.

MVIR 434. Mechanisms of Drug Resistance (3)
Resistance to drugs is an important health concern in the new millennium. Over the past century, medicine has developed and prescribed drugs for various ailments and diseases with known therapeutic benefit. Since the discovery of antibiotics by Dr. Fleming, we have struggled with a new complication in infectious diseases, development of drug resistance. This course will focus on and compare the drug resistant mechanisms selected by viruses, bacteria, parasites, fungi, and tumor cells. Topics to be covered include antiretroviral resistance (e.g., AZT and protease inhibitors), antibiotic resistance (e.g., B-lactams), resistance to chemotherapeutic agents, and resistance to anti-malarial drugs (e.g., chloroquine). Offered as MBIO 434, MVIR 434, and PHRM 434.

MVIR 435. Seminar in Molecular Biology/Microbiology (1)
Graduate students will attend the departmental seminar given by all graduate students in the Department of Molecular Biology and Microbiology, in the Molecular Virology Program, and in the Cell Biology Program, as well as give a seminar on their own thesis research. Students will be evaluated by the faculty member in charge of that student's seminar with input from the students' own thesis committee. After each seminar, the student presenter will meet with other graduate students for peer-review of the content, delivery, and style of the seminar. Peer reviewers will also be evaluated for the quality of their input. Offered as CLBY 435 and MBIO 435 and MVIR 435.

MVIR 445. Molecular Biology and Pathogenesis of RNA and DNA Viruses (3)
Through a combination of lectures by Case faculty and guest lecturers, along with student discussion of current literature, this course emphasizes mechanisms of viral gene expression and pathogenesis. RNA viruses to be discussed include positive, negative, and retroviruses. DNA viruses include SV40, adenovirus, herpes, papilloma, and others. Important aspects of host defense mechanisms, antiviral agents, and viral vectors will also be covered. Students will be evaluated based on their quality of presentation of course papers assigned to them and their overall participation in class discussions. Offered as MBIO 445 and MVIR 445. Prereq: CBIO 453 and CBIO 454 and CBIO 455 and CBIO 456.

MVIR 446. Virus-Host Interactions (3)
Viruses and their hosts have co-evolved for millions of years and, as a result, viruses have evolved intricate and fascinating mechanisms for evading host defenses. Understanding how viruses interact with the host is fundamental to countering or preventing viral infections. For example, viruses that fail to block host defenses are avirulent and candidates for vaccines. Emerging viral infections are a major public health concern and a subject of this course. The course consists of lectures and in-depth analysis of published studies on virus-host interactions. Outstanding local and external lecturers from across the U.S. will participate in teaching this course. In addition, students will deliver one presentation to the class during the course. Offered as MBIO 446 and MVIR 446. Prereq: MVIR 445.

MVIR 481. Immunology of Infectious Diseases (3)
Lectures and discussion on the immune response to infectious organisms, including bacteria, viruses and parasites. Emphasis on human responses but includes discussions of animal models. Other topics include vaccines and infections in immune-compromised hosts. Recommended preparation: PATH 416 or consent of instructor. Offered as MVIR 481 and PATH 481.

MVIR 521. HIV and AIDS: Research and Care (3)
AIDS and HIV disease represent a continuing medical challenge both here in the U.S. and abroad. Currently there are over 25 million people worldwide who are living with AIDS. Basic research into HIV also represents one of the major focuses of contemporary virus and immunological research.

This course is designed to expose both M.D. and Ph.D. students to the major problems in HIV research. Because of the multidisciplinary nature of AIDS research, the course will span the spectrum from fundamental molecular biology to clinical translational research. All students (no matter what their degree course) will be given an opportunity to participate in outpatient HIV care and also to participate in a scientific research project. Offered as MBIO 521 and MVIR 521.

MVIR 522. Protein Phosphorylation and Cell Regulation (3)
This intensive seminar course will emphasize signaling pathways mediated by protein phosphorylation/dephosphorylation. Bacterial signaling mediated by histidine/asparrate phosphorylation and regulation of cellular physiological events will be reviewed. Then eucaryotic cell signaling will be reviewed from the surface of the cell and into the nucleus. This includes receptor-dependent phosphorylation/dephosphorylation reactions, cytoplasmic signaling intermediates, protein translation processes dependent upon phosphorylation, and nuclear regulatory events with emphasis on transcriptional mechanisms. In addition to faculty lectures, students will be reviewing the current literature and will present a research proposal based on the current concepts in the field that they choose to cover. Offered as MBIO 522 and MVIR 522.

MVIR 601. Research (1 - 18)
Grade of S/U only.

MVIR 701. Dissertation Ph.D. (1 - 18)
Grade of S/U only. Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF NEUROSCIENCES

Room E-653, School of Medicine
Phone 216-368-6251
http://neurowww.case.edu/

Neurosciences are the last great frontier in the biological sciences. How the nervous system functions to process information and mediate behavior, and how it forms during embryonic development and is modified to encode experience, are central questions in the neurosciences. Answering these questions requires a multidisciplinary approach combining the tools of electrophysiology, anatomy, biochemistry and molecular biology in studies of animals and tissue culture models.

The department offers a Ph.D. program that provides interdisciplinary training in modern neurosciences through a combination of course work, seminars and research experience. Medi-
al students are encouraged to pursue research projects with neuroscience faculty and/or to make neurosciences an area of concentration.

Neuroscientists at Case are using state-of-the-art techniques and instrumentation to study several aspects of nervous system function, including neural circuitry and plasticity, development and regeneration, and cellular and molecular neurobiology. Techniques used include patch and voltage-clamping neuronal membranes to study ion channels, gene cloning, sequencing and other molecular and genetic approaches to study the structure, function and regulation of neuronal proteins; electron microscopy, confocal and other imaging methods to study development and function of synapses; immunocytochemical techniques to study the molecular and biochemical basis of nervous system development and plasticity; and traditional anatomical, biochemical and physiological techniques.

**COURSE DESCRIPTIONS (NEUR)**

**NEUR 402. Principles of Neural Science (3)**
Lecture/discussion course covering concepts in cell and molecular neuroscience, principles of systems neuroscience as demonstrated in the somatosensory system, and fundamentals of the development of the nervous system. This course will prepare students for upper level Neuroscience courses and is also suitable for students in other programs who desire an understanding of neurosciences. Recommended preparation: CBIO 453. Offered as BIOL 402 and NEUR 402.

**NEUR 405. Cellular and Molecular Neurobiology (3)**
Cell biology of nerve cells, including aspects of synaptic structure physiology and chemistry. The application of molecular biological tools to questions of synaptic function will be addressed. Recommended preparation: BIOL 473.

**NEUR 408. Functional Neuroanatomy (3)**
This course is designed to give students a broad appreciation of the various subdivisions, nuclear groups, and axon tracts in the human brain and spinal cord. There will not only be an emphasis on the understanding of the 3-dimensional arrangement of neuroanatomical pathways that constitute the major circuits in the CNS but also a current perspective of their functions. Lectures in this course will be a selected subgroup of those that constitute the Nervous System Committee of the 2nd year medical school curriculum. Students taking NEUR 408 will also participate in selected review session, small group conferences as well as lab, which includes a dissection of a human brain.

**NEUR 411. Neurobiology of Disease (3)**
Designed to show how basic research in neuroscience has contributed to the management of clinical problems in human neurology and to discuss some of the further challenges posed by human disease for research in neurobiology. The general format will include clinical descriptions of patient presentation, discussion of the disease mechanisms and an analysis of contributions of cellular and systems neuroscience to understanding of the human disorder. Specific topics to be discussed include ischemia and Stroke, Neurodegenerative Diseases such as Alzheimer's Parkinson's Brain Tumors, Mood Disorders, and Demyelinating diseases such as Multiple Sclerosis. Recommended preparation: NEUR 402 or NEUR 405.

**NEUR 415. Neuroscience Seminars (1)**
Current topics of interest in neurosciences. Students attend weekly seminars. From this series, students prepare critiques. No credit is given for less than 75% attendance.

**NEUR 425. Stem Cell Biology and Therapeutics (3)**
This course is intended to teach current understanding of stem cells as it relates to their characterization, function, and physiologic and pathological states. The course will expose students to the current understanding of various types of stem cells, including embryonic and adult stem cells of various tissues, techniques for their isolation and study. Experimental models and potential biomedical therapeutic applications will be discussed. The course will be taught by the faculty of the “Center for Stem Cell and Regenerative Medicine” who are affiliated with multiple departments of Case Western Reserve University, Cleveland Clinic Foundation and the partnering biomedical companies. Offered as NEUR 425 and PATH 425.

**NEUR 427. Neural Development (3)**
Topics include cell commitment, regulation of proliferation and differentiation, cell death and trophic factors, pathfinding by the outgrowing nerve fiber, synapse formation, relationships between center and periphery in development and the role of activity. Offered as BIOL 427 and NEUR 427.

**NEUR 432. Biochemical and Molecular Aspects of Vision (3)**
Increasingly, progress in the study of visual science is requiring multidisciplinary approaches that draw from the areas of biochemistry, genetics, molecular biology, neuroscience and pathology. We have recognized this fact and have adapted this course to fit the needs of tomorrow's scientists. This course encompasses the basic science aspects of the eye. Subjects include retinal anatomy and function; biochemical, molecular aspects of retinal disease and cataract; cellular and molecular neuroscience aspects pertinent to the visual system. Offered as NEUR 432, PATH 432, and PHRM 432.

**NEUR 435. Vision: Molecules to Perception (3)**
The organization, physiology, and function of the vertebrate visual system are considered in detail. The visual pathway from retina to LGN and visual cortex is described with an emphasis on circuits that produce successively more complex receptive field properties. Classic papers and current literature form the basic course material. Assessment is based on student presentations, class participation, and a term paper. Recommended preparation: NEUR 402 or consent of department.

**NEUR 473. Introduction to Neurobiology (3)**
How nervous systems control behavior. Biophysical, biochemical, and molecular biological properties of nerve cells, their organization into circuitry, and their function within networks. Emphasis on quantitative methods for modeling neurons and networks, and on critical analysis of the contemporary technical literature in the neurosciences. Term paper required for graduate students. Offered as BIOL 373, BIOL 473, and NEUR 473.

**NEUR 474. Neurobiology of Behavior (3)**
In this course, students will examine how neurobiologists interested in animal behavior study the linkage between neural circuitry and complex behavior. Various vertebrate and invertebrate systems will be considered. Several exercises will be used in this endeavor. Although some lectures will provide background and context on specific neural systems, the emphasis of the course will be on classroom discussion of specific journal articles. In addition, students will each complete a project in which they will observe some animal behavior and generate both behavioral and neurobiological hypotheses related to it. In lieu of examinations, students will complete three written assignments, including a theoretical grant proposal, a one-page Specific Aims paper related to the project, and a final project paper. These assignments are designed to give each student experience in writing biologically-relevant documents. Classroom discussions will help students understand the content and format of each type document. They will also present their projects orally to the entire class. Recommended preparation: BIOL 216. Offered as BIOL 374, BIOL 474, and NEUR 474.

**SAGES Dept Seminar**

**NEUR 475. Protein Biophysics (3)**
This course focuses on in-depth understanding of the molecular biophysics of proteins. Structural, thermodynamic and kinetic aspects of protein function and structure-function relationships will be considered at the advanced conceptual level. The application of these theoretical frameworks will be illustrated with examples from the literature and integration of biophysical knowledge with description at the cellular and systems level. The format consists of lectures, problem sets, and student presentations. A special emphasis will be placed on discussion of original publications. Offered as BIOC 475, CHEM 475, PHOL 475, PHRM 475, and NEUR 475.

**NEUR 476. Neurobiology Laboratory (3)**
Introduction to the basic laboratory techniques of neurobiology. Intracellular and extracellular recording techniques, forms of synaptic plasticity, patch clamping, immunohistochemistry and confocal microscopy. During the latter weeks of the course students will be given the opportunity to conduct an independent project. One laboratory and one discussion session per week. Recommended preparation for BIOL 476 and NEUR 476: BIOL 216. Offered as BIOL 376, BIOL 476 and NEUR 476.
NEUR 477. Cellular Biophysics (4)
This course focuses on a quantitative understanding of cellular processes. It is designed for students who feel comfortable with and are interested in analytical and quantitative approaches to cell biology and cell physiology. Selected topics in cellular biophysics will be covered in depth. Topics include theory of electrical and optical signal processing used in cell physiology, thermodynamics and kinetics of enzyme and transport reactions, single ion channel kinetics and excitability, mechanotransduction, and transport across polarized cell layers. The format consists of lectures, problem sets, computer simulations, and discussion of original publications. The relevant biological background of topics will be provided appropriate for non-biology science majors. Offered as BIOL 476, NEUR 477, PHOL 476, PHRM 476.

NEUR 478. Computational Neuroscience (3)
Computer simulations and mathematical analysis of neurons and neural circuits, and the computational properties of nervous systems. Students are taught a range of models for neurons and neural circuits, and are asked to implement and explore the computational and dynamic properties of these models. The course introduces students to dynamical systems theory for the analysis of neurons and neural learning, models of brain systems, and their relationship to artificial and neural networks. Term project required. Students enrolled in MATH 478 will make arrangements with the instructor to attend additional lectures and complete additional assignments addressing mathematical topics related to the course. Recommended preparation: MATH 223 and MATH 224 or BIOL 300 and BIOL 306. Offered as BIOL 378, COGS 378, MATH 378, BIOL 478, EME 478, ECES 478, MATH 478 and NEUR 478.

NEUR 479. Seminar in Computational Neuroscience (3)
Readings and discussion in the recent literature on computational neuroscience, adaptive behavior, and other current topics. Offered as BIOL 479, EME 479, ECES 479, and NEUR 479.

NEUR 482. Drugs, Brain, and Behavior (3)
This course is concerned with the mechanisms underlying neurochemical signaling and the impact of drugs on those mechanisms. The first half of the course emphasizes the fundamental mechanisms underlying intra- and extracellular communication of neurons and the basic principles of how drugs interact with the nervous system. The second half of the course emphasizes understanding the neural substrates of disorders of the nervous system, and the mechanisms underlying the therapeutic effects of drugs at the cellular and behavioral levels. This course will consist of lectures designed to give the student necessary background for understanding these basic principles and class discussion. The class discussion will include viewing video examples of behavioral effects of disorders of the nervous system, and analysis of research papers. The goal of the class discussions is to enhance the critical thinking skills of the student and expose the student to contemporary research techniques. Offered as BIOL 382, BIOL 482, and NEUR 482.

NEUR 518. Signaling via Cell Adhesion (3)
Molecular mechanisms by which cells interact with and are regulated by extracellular matrices and other cells. Offered as CBIO 518, CLBY 518, MBIO 518, and NEUR 518.

NEUR 534. Neurogenetics (3)
This course will explore how principles of genetics can be used as tools to study the complex organization of the nervous system. Examples will be drawn from all relevant model organisms including nematode, fruit fly, mouse, and human. Meant primarily for students with an interest in neuroscience, this course will offer a strong foundation in genetic principles using examples drawn from the neuroscience literature. Students in other disciplines, especially genetics, will benefit from the examples to learn important aspects of the neurosciences ranging from behavior to development. These interdisciplinary features make this course unique in its offerings and a valuable addition to many students’ course of study. Recommended preparation: CBIO 453 and CBIO 455. Offered as GENE 534 and NEUR 534.

NEUR 540. Advanced Topics in Neuroscience Ethics (0)
This course offers continuing education in responsible conduct of research for advanced graduate students. The course will cover the nine defined areas of research ethics through a combination of lectures, on-line course material and small group discussions. Six 2-hr meetings per semester. Maximum enrollment of 15 students with preference given to graduate students in the Neurosciences program. All neurosciences graduate students must complete this course during their 3rd or 4th year.

NEUR 601. Research in Neuroscience (1 - 18)
NEUR 651. Master’s Thesis (M.S.) (1 - 6)
(Credit as arranged.) Recommended preparation: M.S. candidates only.

NEUR 701. Dissertation Ph.D. (1 - 18)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF NUTRITION
School of Medicine, Room WG 48
Henri Brunengraber, M.D., Ph.D., Chair
Edith Lerner, Ph.D., Vice Chair
Phone 216-368-2440
Fax 216-368-6644
http://www.case.edu/med/nutrition/home.HTML

The department’s focus is on human nutrition and the application of the science of nutrition to the maintenance and improvement of health. Undergraduate programs are designed for students interested in nutritional biochemistry and metabolism, molecular nutrition, professional study in dietetics, public health nutrition, medicine, dentistry or nursing. Graduate programs emphasize dietetics, public health nutrition, nutritional biochemistry and molecular nutrition.

The Department of Nutrition offers programs leading to the bachelor of science degree in nutrition, bachelor of arts degree in nutrition, bachelor of arts degree in nutritional biochemistry and metabolism, bachelor of science degree in nutritional biochemistry and metabolism, master of science degree in nutrition, master of science degree in public health nutrition, and doctor of philosophy degree. A nutrition minor is available. Specialty programs are available in areas such as maternal and child nutrition or gerontology. The specialty is in addition to the basic graduate degree.

Special announcements describing the various programs and providing additional information are available from the department.

FACULTY
Henri Brunengraber, M.D., Ph.D.
(Université de Liege)
Professor and Chair of Department

Edith Lerner, Ph.D.
(University of Wisconsin Madison)
Associate Professor and Vice Chair of Department

Hope Barkoukis, Ph.D.
(Case Western Reserve University)
Assistant Professor

Colleen Croniger, Ph.D.
(Case Western Reserve University)
Assistant Professor

Paul Ernsberger, Ph.D.
(Northwestern University)
Associate Professor

Maria Hatzoglou, Ph.D.
(University of Athens)
Professor

Takhir Kasumov, Ph.D.
(Moscow State)
Instructor

Mary Beth Kavanagh, M.S.
(Case Western Reserve University)
Instructor

Janos Kerner, Ph.D.
(Hungarian Academy of Sciences)
Assistant Professor

Jane Korsberg, M.S.
(Case Western Reserve University)
Instructor

Danny Manor, Ph.D.
(Yeshiva University)
Associate Professor
Duna Massillon, Ph.D. (Montreal)
Assistant Professor

Isabel M. Parraga, Ph.D. (Case Western Reserve University)
Associate Professor

Stephen Previs, Ph.D. (Case Western Reserve University)
Assistant Professor

Tamara Randall, M.S. (Case Western Reserve University)
Instructor

Alison Steiber, Ph.D. (Michigan State University)
Assistant Professor

James Swain, Ph.D. (Iowa State University)
Assistant Professor

Kou-Yi Tserng, Ph.D. (Illinois at Chicago)
Associate Professor

Jonathan Whittaker, M.R.C.P. (University College School of Medicine, London, U.K.)
Associate Professor

Associate Faculty

SECONDARY APPOINTMENTS

Saul Genuth, M.D. (Case Western Reserve University)
Professor

Sharon Groh-Wargo, Ph.D. (Case Western Reserve University)
Assistant Professor

Richard W. Hanson, Ph.D. (Brown University)
Professor

Douglas S. Kerr, M.D., Ph.D. (Case Western Reserve University)
Professor

John Kirwan, Ph.D. (Ball State)
Associate Professor

Laura Nagy, Ph.D. (University of California – Berkeley)
Professor

William Stanley, Ph.D. (University of California-Berkeley)
Associate Professor

Anthony Tavill, M.D. (Manchester-England)
Professor

ADJUNCT/CLINICAL APPOINTMENTS

Phyllis Allen, M.S. (Case Western Reserve University)
Adjunct Instructor

Janet Anselmo, M.S. (Case Western Reserve University)
Adjunct Instructor

Johanna Asarian-Anderson, M.P.H. (University of California -Los Angeles)
Adjunct Instructor

Casey Atkinson, B.S. (Youngstown State University)
Adjunct Instructor

Joan Atkinson, M.S. (Case Western Reserve University)
Adjunct Instructor

Anika Avery-Grant, M.S. (Case Western Reserve University)
Adjunct Instructor

Cynthia Bayerl, M.A. (Boston University)
Adjunct Instructor

Cynthia Blackburn, M.S. (Kent State University)
Adjunct Instructor

Carmen Blakely-Adams (Michigan State University)
Adjunct Instructor

Elizabeth Boone, B.S. (Ohio University)
Adjunct Instructor

Josephine Ann Cialone, M.S. (Case Western Reserve University)
Adjunct Instructor

Nenita Clemente, M.S. (Case Western Reserve University)
Adjunct Instructor

Cheri Collier, M.S. (Case Western Reserve University)
Adjunct Instructor

Susan Comfort, M.S. (Case Western Reserve University)
Adjunct Instructor

Janice Davis, M.S. (Case Western Reserve University)
Adjunct Instructor

Helen Dumski, B.S. (Ohio State University)
Adjunct Instructor

Denise Ferris, Ph.D. (University of Pittsburgh)
Adjunct Instructor

Karen M. Fiedler, Ph.D. (University of Tennessee)
Adjunct Associate Professor

Evangeline Fowler, M.S. (Case Western Reserve University)
Adjunct Instructor

Lorna Fuller, M.S. (Kent State University)
Adjunct Instructor

Deborah Gammell, M.S. (Miami University of Ohio)
Adjunct Instructor

Brenda Garritsen, M.S. (Texas Women's University)
Adjunct Instructor

Peggy Gates, M. Ed. (Cleveland State University)
Adjunct Instructor

Melinda Gedeon, B.S. (Ohio State University)
Adjunct Instructor

Martha Halko, M.S. (University of Akron)
Adjunct Instructor

Cathy Hastings, M.P.H. (South Florida)
Adjunct Instructor

Valerie Heimbach, M.S. (Indiana University of Pennsylvania)
Adjunct Instructor

Karen Horvath, B.S. (University of Akron)
Adjunct Instructor

Claire Hughes, Dr.PH (University of Hawaii)
Adjunct Instructor

Lisa Isham, M.S. (Case Western Reserve University)
Adjunct Instructor

Elvira Jarca, M.P.H. (University of Illinois)
Adjunct Instructor

Jan Kallio, M.S. (Case Western Reserve University)
Adjunct Instructor

Jennifer Kerns, B.S. (University of Akron)
Adjunct Instructor

Natalia Kliszczuk-Smolio, B.S. (University of Cincinnati)
Adjunct Instructor

Richard Koletsky, M.D.
Adjunct Assistant Clinical Professor

Jennifer Kravec, B.S. (Ohio State University)
Adjunct Instructor

Perri Kushan, B.S. (University of Akron)
SCHOOL OF MEDICINE

Adjunct Instructor
Lois Lenard, B.S. (Kent State University)
Adjunct Instructor
Mary A. McGuckin, M.S.
(Case Western Reserve University)
Adjunct Instructor
Anita Martin, M.P.H.
(University of North Carolina)
Adjunct Instructor
Linda Novak-Eedy, B.S.
(Bowling Green State University)
Linda Novak-Eedy, B.S.
(University of North Carolina)
Linda Novak-Eedy, B.S.
(Bowling Green State University)
Linda Novak-Eedy, B.S.
(Bowling Green State University)
Anita Spinks, M.S.
(Ohio State University)
Mary A. McGuckin, M.S.
(Ohio State University)
Sara Snow, M.S.
(Case Western Reserve University)
Lara Beth Spinks, M.S.
(Ohio State University)
Margaret Tate, M.S. (Colorado State)
Norliza Tayag, B.S.
(San Diego State University)
Anita Ullman, M.S.
(Case Western Reserve University)
Melissa Wilson, B.S. (Mercyhurst College)
Diane Ohama Yates, B.S. (Hawaii)
Mary Zyga, B.S. (Ohio State University)

UNDERGRADUATE (NTRN)

Major Programs
The undergraduate degree in nutrition is appropriate for students who wish to: (1) pursue graduate programs in nutritional biochemistry, molecular nutrition, dietetics, public health nutrition or other biomedical sciences; (2) enter professional schools of dentistry, medicine, or nursing; (3) apply to dietetic internships or approved experience programs in order to prepare for the professional practice of dietetics; (4) pursue technical careers in the food or pharmaceutical industry. This major offers flexibility in course selection within a framework of general program requirements. The selection of courses depends on the student's choice of emphasis. Students wishing to qualify for admission to professional or graduate programs need to include specific courses considered prerequisites for admission. Students interested in applying to dietetic internships must meet specific course requirements (Didactic Program in Dietetics) as required by the Commission on Accreditation for Dietetics Education of the American Dietetic Association. These requirements are met in the courses that comprise the Didactic Program in Dietetics (DPD). The DPD at Case Western Reserve University is currently granted Accreditation by the Commission on Accreditation for Dietetics Education of the American Dietetic Association, 216 W. Jackson Blvd., Chicago, IL 60606-6995, 312-899-5400. A department advisor should be consulted in the freshman year to plan the dietetics course work.

Nutrition
Bachelor of Science degree requires the completion of SAGES, PHED 101, 102, and the following courses:
NTRN 201, 342, 343, 363, 364, 397, 398, and three NTRN electives
CHEM 105, 106, 113, 223
BIOL 214; BIOL 216 or BIOL 348; BIOC 307; STAT 201 or 243 or 312 or 313 or ANTH 319 or PSCL 282 or EPBI 431
Bachelor of Arts degree requires the completion of SAGES, PHED 101, 102, and the following courses:
NTRN 201, 342, 343, 363, 364, 397, 398 and two NTRN electives
CHEM 105, 106, 223
BIOL 214; BIOL 216 or BIOL 348
BIOC 307

Nutritional Biochemistry and Metabolism
Bachelor of Arts degree requires the completion of SAGES, PHED 101, 102, and the following courses:
NTRN 201, 342, 363, 364, 397, 398, 452 and one NTRN elective: 3hrs at 300-level or above
MATH 125, 126 (or 121, 122)
CHEM 105, 106, 113, 223 (or 323), 224 (or 324), 233, 234
BIOL 214, 215
BIOL 216 or BIOL 348
PHYS 115, 116
BIOC 307, 334
Bachelor of Science degree requires the completion of SAGES, PHED 101, 102, and the following courses:
NTRN 201, 342, 363, 364, 397, 398, 452 and one NTRN elective: 3 hours at 300-level or above
MATH 121 (or 123), 122 (or 124), 223 (or 227), 224 (or 228)
ENGR 131
CHEM 105, 106, 113, 223 (or 323), 224 (or 324), 233, 234
BIOL 214, 215
BIOL 216 or BIOL 348
PHYS 121 and 122 or 123 and 124; 221 or 223
BIOC 307, 334

Minor Programs
The basic sequence for a minor program consists of NTRN 201, Nutrition (3); NTRN 343, Dietary Patterns (3); and an additional 9 hours of nutrition courses, selected from:
# Bachelor of Science in Nutrition - Human Nutrition Major

## First Year

### Fall
- **CHEM 105** Principles of Chemistry I 3
- **SAGES** First Seminar 4
- **NTRN 201** Nutrition 3
- **PHED 101** Physical Education 0

### Spring
- **CHEM 106** Principles of Chemistry II 3
- **CHEM 113** Principles of Chemistry Laboratory 2
- **BIOL 214** Genes and Evolution 4
- **PHED 102** Physical Education 0

## Second Year

### Fall
- **NTRN 342** Food Science 5
- **CHEM 223** Introductory Organic Chemistry I 3
- **SAGES** University Seminar *Strongly recommended, but not required* 3

### Spring
- **CHEM 233** Introductory Organic Chemistry Lab * 2
- **NTRN 343** Dietary Patterns 3
- **CHEM 224** Introductory Organic Chemistry II * 3
- **CHEM 234** Introductory Organic Chemistry Lab * 2
- **SAGES** University Seminar 3
- **STAT 201** Statistics for Social & Life Sciences *Strongly recommended, but not required* 3

## Third Year

### Fall
- **BIOL 348** Human Anatomy and Physiology 4
- **BIOC 307** General Biochemistry 4
- **PHED 102** Physical Education 0

### Spring
- **CHEM 224** Introductory Organic Chemistry II 3
- **CHEM 234** Introductory Organic Chemistry Lab II 2
- **SAGES** University Seminar 2
- **Elective** 3

## Fourth Year

### Fall
- **NTRN 363** Human Nutrition I: Energy, Protein, Minerals 3
- **NTRN 398** Senior Capstone Experience 3
- **NTRN 397** Capstone Proposal Seminar 3
- **NTRN Elective** 3

### Spring
- **CHEM 224** Introductory Organic Chemistry II 3
- **BIOL 348** Human Anatomy and Physiology 4
- **PHYS 115** Introductory Physics I 4
- **NTRN 397** Capstone Proposal Seminar 3

## Bachelor of Arts in Nutrition - Nutritional Biochemistry and Metabolism Major

## First Year

### Fall
- **MATH 125** Mathematics I 4
- **CHEM 105** Principles of Chemistry I 3
- **SAGES** First Seminar 4
- **PHED 101** Physical Education 0

### Spring
- **MATH 126** Mathematics II 4
- **CHEM 106** Principles of Chemistry II 3
- **CHEM 113** Principles of Chemistry Lab 2
- **CIOL 214** Genes and Evolution 4

## Second Year

### Fall
- **BIOL 348** Human Anatomy and Physiology 4
- **BIOC 307** Biochemistry 4

## Master of Science in Nutrition Degree

This degree program offers two options. For those pursuing the thesis option, 30 semester hours of a planned program of study are required, including six to nine semester hours of...
research, as well as a final oral defense of the thesis. The non-thesis option requires 30 semester hours and a final written, comprehensive examination.

All candidates are required to take 15 semester hours of nutrition, including six hours of advanced human nutrition. In addition, students are encouraged to pursue complementary studies in the biomedical, social and behavioral sciences. The plan of study may vary considerably depending on the education, goals and specific interests of each student. Students may elect to focus on nutritional biochemistry and metabolism, and molecular nutrition. The individual program also may be planned to fulfill the academic requirements for dietetic registration (Didactic Program in Dietetics).

Master of Science in Public Health Nutrition/Internship Degree

The primary goal of this program is to prepare nutrition specialists to function in public health/community agencies. A minimum of 30 semester hours of combined academic work and field experience is required to earn the degree. Course work focuses on human nutrition, dietetics, and the public health sciences. Field experience is concurrent with course work utilizing local community agencies for direct application of theory to practice. The final phase of the program is an eight-week, full-time experience with a public health agency that has a strong nutrition component. The student works closely with an advisor throughout the program, on an individual basis.

In addition to the general public health program, students may elect to specialize in maternal and child nutrition or gerontology. The gerontology specialty is certified through the Center on Aging and Health located on campus. Each specialty requires additional semester hours of academic work. A portion of the field experience is specified for either population group.

For students wishing to become eligible to take the registered dietitian (R.D.) examination, the program also currently is granted accreditation by the Commission on Accreditation for Dietetics Education (CADE) of the American Dietetic Association as an internship. CADE is a specialized accrediting body recognized by the Commission on Recognition of Post-secondary Accreditation and the United States Department of Education.

Coordinated Dietetic Internship/ Master's Degree Program

The Coordinated Dietetic Internship/Master's Degree Program combines academic work with clinical practice at either of the dietetic internships at University Hospitals of Cleveland or the Louis Stokes Cleveland Department of Veterans Affairs Medical Center. A minimum of 27 semester hours is required. Admission is contingent on the student's being selected and matched to one of the hospitals. Appointment to these internships follows the admission procedure outlined by the Commission on Accreditation for Dietetics Education of the American Dietetic Association. Contact the Department of Nutrition for information regarding application.

Doctor of Philosophy in Nutrition Degree

The Doctor of Philosophy degree in nutrition is awarded for study and research in nutrition. Areas of concentration are nutritional biochemistry and metabolism, and molecular nutrition. Additional information about graduate degree programs may be obtained from the department.

COURSE DESCRIPTIONS (NTRN)

NTRN 201. Nutrition (3)
The nutrients, their functions, food sources, and factors affecting human needs throughout life.

NTRN 328. Child Nutrition, Development and Health (3)
The relationship between nutrition and physical/cognitive growth and development of the child from the prenatal period through adolescence, including individuality, maturation and biological needs. Nutritional influences (nutrient requirements, food choices, and nutritional/feeding problems) and effects on health are emphasized.

NTRN 342. Food Science (3)
Chemical, physical and biological properties of food constituents and their interactions in food preparation and processing and practical application of processing methods and their effect on nutritional quality and acceptability. Laboratory and lecture. Prereq: CHEM 106.

NTRN 343. Dietary Patterns (3)
Examination of the food supply in the United States as it is affected by production, processing, marketing, government programs, regulation, and consumer selection. Nutritional evaluation of dietary patterns of different cultures. Recommended preparation: NTRN 201 or consent.

NTRN 351. Food Service Systems Management (3)
The application of organizational theory and skills in the preparation and service of quantity food. Laboratory experience in professional food service are included. Graduate students will analyze one aspect of food service management in depth. Offered as NTRN 351 and NTRN 451. Prereq: Nutrition major or consent of instructor.

NTRN 360. Guided Study in Nutrition Practice (3)
Methods for the provision of nutrition services to individuals and groups. Principles of professional practice including ethics, standards, and regulatory issues. Recommended preparation: NTRN 363 or NTRN 433 or consent.

NTRN 363. Human Nutrition I: Energy, Protein, Minerals (3)
Chemical and physiological properties of specific nutrients, including interrelationships and multiple factors, in meeting nutritional needs throughout the life cycle. Recommended preparation: NTRN 201, CHEM 223 and BIOL 348 or equivalent.

NTRN 364. Human Nutrition II: Vitamins (3)
Chemical and physiological properties of vitamins, including interrelationships and multiple factors, in meeting nutritional needs throughout the life cycle. Prereq: NTRN 363.

NTRN 365. Nutrition in Disease (4)
Application of nutrition principles to the problems of diet in disease. Prereq: NTRN 363 and BIOL 307 or equivalent or consent of instructor.

NTRN 371. Special Problems (1–3)
Independent reading, research, or special projects supervised by a member of the nutrition faculty. Prereq: Junior or senior standing.

NTRN 372. Special Problems (1–3)
Independent reading, research, or special projects supervised by a member of the nutrition faculty. Prereq: Junior or senior standing.

NTRN 388. Seminar in Nutrition (1–3)
Prereq: Junior or senior standing.

NTRN 390. Undergraduate Research (3–9)
Guided laboratory research in nutritional biochemistry or molecular nutrition under the sponsorship of a nutrition faculty member.

NTRN 397. Capstone Proposal Seminar (3)
In this departmental seminar course, students will conceptualize, develop and prepare a written plan, known as the “Capstone Proposal,” for their senior Capstone project (NTRN 398: Senior Capstone Experience). Discussion will include, but not be limited to basic research principles, different types of research, ethics and IRB procedures. The Capstone Proposal shall include the project design, aims, methodology, budget, data analysis and presentation. Upon completion of this course, students will have confirmed student/Capstone advisor and, if applicable, mentor relationships, written a Capstone proposal and given an oral presentation of their proposal at a departmental colloquium. Prereq: NTRN 201 and NTRN 342. SAGES Dept Seminar

NTRN 398. Senior Capstone Experience (3)
Students will implement their “Capstone Proposal” projects as designed in NTRN 397: Capstone Proposal Seminar. Pertinent research activities will
depend on the nature of the student’s “Capstone Proposal” project. The student will meet regularly with their Capstone advisor, at least twice monthly, to provide progress reports, discuss the project, and for critique and guidance. By the end of this course, the student will have completed their SAGES Senior Capstone research project and presented their project results/findings orally at the Senior Capstone Fair and at a departmental colloquium. Pre-req: NTRN 397. SAGES Senior Cap

NTRN 399. Senior Project (3)

NTRN 433. Advanced Human Nutrition I (4)
Emphasis on reading original research literature in energy, protein and minerals with development of critical evaluation and thinking skills. Recommended preparation: NTRN 201 and CHEM 223 and BIOL 348 or equivalent.

NTRN 434. Advanced Human Nutrition II (3)
Emphasis on reading original research literature on vitamins with development of critical evaluation and thinking skills. Recommended preparation: NTRN 433 or consent.

NTRN 435. Maternal and Child Nutrition (3)
Study of current research literature on nutrition for pregnancy, lactation, infancy and childhood, including assessment and requirements. Recommended preparation: Nutrition major or consent of instructor.

NTRN 437. Evaluation of Nutrition Information for Consumers (3)
Reading and appraisal of food and nutrition literature written for the general public, including books, periodicals, and audio and visual sources. Pre-req: Graduate standing and Nutrition or Public Health Nutrition major or consent of instructor.

NTRN 438. Trends in Diet Therapy (3)
Evaluation and interpretation of modern concepts of nutrition related to abnormalities requiring dietary modifications. Pre-req: NTRN 365.

NTRN 440. Nutrition for the Aging and Aged (3)
Consideration of the processes of aging and needs which continue throughout life. The influences of food availability, intake, economics, culture, physical and social conditions and chronic disease as they affect the ability of the aged to cope with living situations. Recommended preparation: Nutrition major or consent of instructor.

NTRN 446. Advanced Maternal Nutrition: Special Topics (3)
Analysis of the problems commonly associated with high-risk pregnancies and fetal outcome. Discussion of causes, mechanisms, management and current research. Recommended preparation: NTRN 435 or consent.

NTRN 451. Food Service Systems
Management (3)
The application of organizational theory and skills in the preparation and service of quantity food. Laboratory experience in professional food services are included. Graduate students will analyze one aspect of food service management in depth. Offered as NTRN 351 and NTRN 451. Pre-req: Nutrition major.

NTRN 452. Nutritional Biochemistry and Metabolism (3)
Mechanisms of regulation of pathways of intermediary metabolism; amplification of biochemical signals; substrate cycling and use of radioactive and stable isotopes to measure metabolic rates. Recommended preparation: BIOC 307 or equivalent. Offered as BIOC 452 and NTRN 452.

NTRN 454. Isotope Trace Methodology (3)
Stable and radioactive isotopes in metabolic research concentrating on the design of in-vitro and in-vivo investigative protocols using mostly stable isotopes and mass spectrometric analysis; critical interpretation of data from the recent literature; and pathway identification and kinetics. Recommended preparation: BIOC 407.

NTRN 455. Molecular Nutrition (3)
Nutrient control of gene expression in mammalian cells and deregulation of expression of these genes. The molecular basis of nutrition-related diseases, such as diabetes mellitus, PKU, and LDL-receptor deficiency, will be discussed. The application of genetic manipulation to metabolism and nutrition will be evaluated. Recommended preparation: BIOC 407.

NTRN 460. Sports Nutrition (3)
Study of the relationships of nutrition and food intake to body composition and human performance. Laboratory sessions include demonstrations of body composition and fitness measurements and participation in a research project. Recommended preparation: NTRN 363 or NTRN 433 or consent.

NTRN 516. Seminar in Dietetics I (4)
Study of scientific basis for clinical and community nutrition practice and developments in food service systems management. Recommended preparation: Dietetic internship.

NTRN 517. Seminar in Dietetics II (4)
Study of scientific basis for clinical and community nutrition practice and developments in food service systems management. Recommended preparation: Dietetic internship.

NTRN 528. Introduction to Public Health Nutrition (3)
Philosophy, objectives, organization, and focus of government and voluntary agencies with emphasis on nutrition components. Recommended preparation: Public health nutrition majors only.

NTRN 529. Nutritional Epidemiology (3)
This course uses epidemiology as a tool for assessing potential causal associations between dietary excesses, deficiencies and imbalances to the prevalent chronic diseases. It addresses the epidemiologic aspects of nutrition related chronic diseases, for example, the multi-factorial nature of etiology.

Recommended preparation: Statistics and Public Health Nutrition students only.

NTRN 530. Public Health Nutrition (3)
Analysis of public health programs in government and voluntary health agencies and the effect of legislation. Emphasis on integration with other disciplines working in public health settings and the role of a public health nutritionist.

NTRN 531. Public Health Nutrition Field Experience (1 - 6)
Individually planned public health experience. May be concurrent with course work in local agencies or in blocks of full-time work with a city, county, or state health agency. Pre-req: Open to public health nutrition students only. Consent of instructor.

NTRN 532A. General Nutrition Care (1 - 3)
Individually arranged clinical experience.

NTRN 532C. Specialized Public Health Nutrition Field Experience (1 - 3)
Individually arranged clinical experience. Pre-req: Public Health Nutrition students only. Consent of instructor.

NTRN 532D. Hospital Dietetics (1 - 3)
Individually arranged clinical experience.

NTRN 532E. Clinical Research: Methods in Nutrition and Metabolism (3)
Individually arranged.

NTRN 533. Nutritional Care of Neonate (3)
Nutritional assessment and management of high-risk newborns with emphasis on prematurity and low birth weight. Review of current literature coordinated with clinical experience in the neonatal intensive care unit. Issues on follow-up included. Recommended preparation: NTRN 435 or consent.

NTRN 534. Advanced Public Health Nutrition Field Experience (1 - 6)
Individually planned advanced public health experience. Pre-req: Open to public health nutrition students only.

NTRN 550A. Advanced Community Nutrition (3)
Development of skills needed by the community dietitian. Emphasis on effective tools for service development and delivery. Recommended courses of action for the professional.

NTRN 550B. Seminar: Dietetics (1)

NTRN 551. Seminar in Advanced Nutrition (1)
Ph.D. students meet weekly to discuss topical journal articles. Students gain experience in critical evaluation of research and develop presentation and communication skills. Discussion of research integrity and ethics. Students participate in departmental seminars with invited speakers.

NTRN 561. Investigative Methods in Nutrition (1 - 4)
Research methods appropriate for nutrition research. Methods for conducting research in nutrition and food sciences, food service management and dietetics. Designing research proposals. Pre-req: Nutrition
DEPARTMENT OF PATHOLOGY
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Increasingly, progress in the study of visual science includes pathological aspects, neurodegeneration, genetic aspects, protein conformation and cell biology in conditions such as Alzheimer’s disease, Parkinson’s disease, amyotrophic lateral sclerosis and prion diseases. Students read assigned primary literature and present and discuss these in class.

PATH 425. Stem Cell Biology and Therapeutics (3)
This course is intended to teach current understanding of stem cells as it relates to their characterization, function, and physiologic and pathological states. The course will expose students to the current understanding of various types of stem cells, including embryonic and adult stem cells of various tissues, techniques for their isolation and study. Experimental models and potential biomedical therapeutic applications will be discussed. The course will be taught by the faculty of the “Center for Stem Cell and Regenerative Medicine” who are affiliated with multiple departments of Case Western Reserve University, Cleveland Clinic Foundation and the partnering biomedical companies. Offered as NEUR 425 and PATH 425.

PATH 430. Oxidative Stress and Disease Pathogenesis (1)
Oxidative stress and free radicals are implicated in a number of disease processes including aging, arthritis, emphysema, Alzheimer’s disease and cancer. Lecture course with discussion of recent studies concerning the formation and destructive mechanisms of free radicals in the context of various disease processes. Students read assigned papers and discuss them in class.

PATH 432. Biochemical and Molecular Aspects of Vision (3)
Increasingly, progress in the study of visual science is required multidisciplinary approaches that draw from the areas of biochemistry, genetics, molecular biology, neuroscience and pathology. We have recognized this fact and have adapted this course to fit the needs of tomorrow’s scientists. This course encompasses the basic science aspects of the eye. Subjects include retinal anatomy and function; biochemical, molecular aspects of retinal disease and cataract; cellular and molecular neuroscience aspects pertinent to the visual system. Offered as NEUR 432, PATH 432, and PHRM 432.

PATH 435. Tissue Engineering and Regenerative Medicine (3)
This course will provide advanced coverage of tissue engineering with a focus on stem cell-based research and therapies. Course topics of note include stem cell biology and its role in development, modeling of stem cell function, controlling stem cell behavior by engineering materials and their microenvironment, stem cells’ trophic character, and state-of-the-art stem cell implementation in tissue engineering and other therapeutic strategies. Offered as EBME 425 and PATH 435. Prereq: EBME 325 or equivalent and graduate standing.

PATH 444. Neurodegenerative Diseases: Pathological, Cell. & Molecular Perspectives (3)
This course, taught by several faculty members, encompasses the full range of factors that contribute to the development of neurodegeneration. Subjects include pathological aspects, neurodegeneration, genetic aspects, protein conformation and cell biology in conditions such as Alzheimer’s disease, Parkinson’s disease, amyotrophic lateral sclerosis and prion diseases.

PATH 477. Cellular and Molecular Basis of Immune Dysfunction (3)
Lectures and student presentations focusing on immunologic mechanisms of tissue injury, disorders of the immune response and diseases of immunocompetent cells. Hypersensitivity, allergy, immune complex disease, immune deficiency, lymphoma and multiple myeloma discussed from chemical, cellular and physiological perspectives. Recommended preparation: PATH 416 or consent of instructor.

PATH 480. Logical Dissection of Biomedical Investigations (3)
Path 480 is an upper level graduate course encompassing discussion and critical appraisal of both published and pre-published research papers, book chapters, commentaries and review articles. Emphasis will be placed on evaluating the logical relationship between experimental design and experimental data to conclusions drawn. Thus, the course will aim to develop students’ capacities for independent thinking and critical analysis. Half of the course will be devoted to an analysis of fundamental conceptual issues pertaining to immunology, but this material will be applicable to a wide variety of fields. The other half of the course will be devoted to the analysis of papers that have been submitted for publication (with the students acting as primary reviewers of these papers). Our expectation is that this course will have practical relevance for students by providing them with methods to review their own prepublication manuscripts and eliminate common errors. It should also give students the tools to question widely held beliefs in diverse biomedical fields. Recommended preparation is completion of the C3MB curriculum and 2nd year or higher graduate school training. Previous exposure to immunology and molecular biology will be helpful but not required.

PATH 481. Immunology of Infectious Diseases (3)
Lectures and discussion on the immune response to infectious organisms, including bacteria, viruses and parasites. Emphasis on human responses but includes discussions of animal models. Other topics include vaccines and infections in immuno-compromised hosts. Recommended preparation: PATH 416 or consent of instructor.
Offered as MVIR 481 and PATH 481.

PATH 486. HIV Immunology (3)
This course will examine the unique immunology of HIV disease. The course content will include the study of HIV pathogenesis, immune control, immune dysfunctions, HIV prevention and immune restoration. Students will be expected to attend lectures and participate in class discussions. A strong emphasis will be placed on reviewing scientific literature. Students will be asked to help organize and to administer an HIV immunology journal club and will be asked to prepare a written proposal in the area of HIV immunology. Offered as PATH 486 and MBIO 486. Prereq: PATH 416 or permission from the instructor.

PATH 487. Cell Biology of the Nucleus (3)
Discussion of current cell biology research on the structure and functions of the nuclear envelope, the matrix and chromatin. Recommended preparation: CBIO 453 and CBIO 454 or consent of instructor. Offered as CLBY 487 and PATH 487.

PATH 488. Yeast Genetics and Cell Biology (3)
This seminar course provides an introduction to the genetics and molecular biology of the yeasts S. cerevisiae and S. pombe by a discussion of current literature focusing primarily on topics in yeast cell biology. Students are introduced to the tools of molecular genetics and special features of yeasts that make them important model eukaryotic organisms. Some selected topics include cell polarity, cell cycle, secretory pathways, vesicular and nuclear/cytosolic transport, mitochondrial import and biogenesis, chromosome segregation, cytoskeleton, mating response and signal transduction. Offered as CLBY 488, GENE 488, MBIO 488, and PATH 488.

PATH 510. Basic Pathologic Mechanisms (4)
An interdisciplinary introduction to the fundamental principles of molecular and cellular biology as they relate to the pathologic basis of disease. Lectures, laboratories, conferences.

PATH 511. Experimental Pathology Seminar I (1)
Weekly discussions of current topics and research by students, staff and distinguished visitors.

PATH 512. Experimental Pathology Seminar II (1)
Weekly discussions of current topics and research by students, staff and distinguished visitors.

PATH 520. Basic Cancer Biology and the Interface with Clinical Oncology (3)
This is an introductory cancer biology course that is intended to give students a broad and basic overview of Cancer Biology and Clinical Oncology. The course will cover not only fundamental principles of cancer biology, but will also highlight advances in the pathobiology and therapeutics of cancer. Classes will be of lecture and discussion format, with emphasis on critically reading original journal articles. The specific topics presented will include carcinogenesis, oncogenes, tumor suppressor genes, genetic epidemiology, DNA repair, growth factor action/signal transduction, apoptosis, cell cycle control, cell adhesion, angiogenesis, tumor cell heterogeneity, metastasis, chemotherapy, photodynamic therapy, gene therapy, signal transduction inhibitor therapy, chemoprevention, and clinical oncology of the breast, prostate, lymphatic tissue, colon and other related malignancies. Course grades will be from participation/discussion, presentation and mid-term/final exams. Recommended preparation: CBIO 453 and CBIO 455. Offered as PATH 520 and PHRM 520.

PATH 521. Special Topics in Cancer Biology and Clinical Oncology (1)
This one credit hour course in Cancer Biology is in-
tended to give students an opportunity to do independent literature research while enrolled in PHRM 520/PATH 520. Students must attend weekly Hematology/Oncology seminar series and write a brief summary of each of the lectures attended. In addition, students must select one of the seminar topics to write a term paper which fully reviews the background related to the topic and scientific and clinical advances in that field. This term paper must also focus of Clinical Oncology, have a translational research component, and integrate with concepts learned in PHRM 520/PATH 520. Pharmacology students must provide a strong discussion on Therapeutics, while Pathology students must provide a strong component on Pathophysiology of the disease. Recommended preparation: CBIO 453 and CBIO 455, or concurrent enrollment in PHRM 520 or PATH 520. Offered as PATH 521 and PHRM 521.

PATH 523. Histopathology of Organ Systems (3)
Comprehensive course covering the underlying basic mechanisms of injury and cell death, inflammation, immunity, infection, and neoplasia followed by pathology of specific organ systems. Material will include histological (structure) and physiological (function) aspects related to pathology (human emphasis). Recommended preparation: ANAT 412 or permission of instructor. Offered as ANAT 523 and PATH 523.

PATH 525. Transport and Targeting of Macromolecules in Health and Disease (3)
Each class includes introductory lecture, followed by student participation in interactive discussion of 3 to 5 research publications. At the end of the course, the students are expected to submit a paper or a short research proposal on any of the topics discussed during the course. Recommended preparation: CBIO 453, CBIO 454, CBIO 455, and CBIO 456. Offered as CBIO 525 and PATH 525.

PATH 555. Emerging Concepts in Cell Regulation (3)
This course will cover the general principles of cell regulation with an emphasis on the emerging novel mechanisms of signal transduction. The traditional areas of receptor tyrosine kinases, G-protein coupled receptors will be examined but the focus will be on the novel mechanisms that regulate proteolysis, ubiquitin proteosomal degradation, protein acetylation etc. in signal transduction and gene expression. This will be a literature-based course which will depend on critical evaluation of research papers, reviews and accompanied with in-depth discussion. Recommended preparation: CBIO 453. Offered as CBIO 555, CLBY 555, and PATH 555.

PATH 601. Special Problems (1 - 18)
Research on the nature and causation of disease and on host factors which tend to protect against disease. Special courses and tutorials in subspecialty areas of general and/or systemic anatomic and/or clinical pathology.

PATH 651. Thesis M.S. (1 - 18)
PATH 701. Dissertation Ph.D. (1 - 18)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

DEPARTMENT OF PHARMACOLOGY
Room W-357, School of Medicine
Phone 216-368-4617
http://pharmacology.case.edu/

The Department of Pharmacology offers training leading to M.S., Ph.D. or M.D./Ph.D. degrees for highly qualified post-undergraduate candidates committed to academic research careers in the biomedical sciences. Adequate preparation in the biological sciences, mathematics, organic chemistry, and physics or physical chemistry is a prerequisite for admission.

Multidisciplinary training, carried out by faculty in pharmacology and other basic science departments, emphasizes molecular, cellular, physiological, and clinical aspects of the pharmacological sciences. Areas of faculty expertise include drug/xenobiotic metabolism; receptor-ligand interactions, and biochemical reaction mechanisms; cell biology of signaling pathways; structure-function of membrane components; endocrine and metabolic regulation; cell surface and nuclear receptors, hormonal regulation of gene expression; cancer biology and therapeutics, bacterial and viral pathogenesis, neuroscience/neuropsychopharmacology, and drug resistance.

Students seeking the Ph.D. degree are admitted directly into the Department of Pharmacology through the Molecular Therapeutics Training Program or through the Biomedical Sciences Training Program (BSTP, please see separate listing in this publication), each of which provides an introduction to many related training areas within the biomedical field during the first year. The training program is divided into three phases. The first phase allows students to follow an integrated first-year sequence of course work that involves a core curriculum in cell and molecular biology. In addition, the first year includes three research rotations that allow the students to sample areas of research and become familiar with faculty members and their laboratories. Selection of a specific training program and thesis advisor is made before the end of the first year. The second phase involves a two part course in intensive Pharmacology study, oral presentations and laboratory experience, which cumulates in a comprehensive written exam designed to challenge students to apply key concepts in new context.

After advancing to Ph.D. candidacy by passing the comprehensive written exam, students select one of four advanced tracks in Pharmacology. Choice among the tracks is based on the area of research expertise of the thesis advisor and the student’s interest in specific coursework. The four tracks are: Cancer Therapeutics, Membrane Biology and Pharmacology, Molecular Pharmacology and Cell Regulation, and Translational Therapeutics.

The Ph.D. degree is awarded to students who complete a research project leading to two original and meritorious scientific contributions that are submitted for publication to leading journals in the field of study. At least one manuscript must be accepted for publication before scheduling the Ph.D. thesis defense.

Students who desire the combined M.D./Ph.D. degrees are admitted to the Medical Scientist Training Program (MSTP, please see separate listing in this publication). These students participate in the two-year integrated preclinical curriculum of the School of Medicine (University Program), which features clinical correlation of basic biologic concepts. Combined degree students who select the Ph.D. in pharmacology undertake a series of advanced courses, research rotations, preliminary examinations and dissertation research in the same manner as that described above.

Although training efforts by the Department of Pharmacology are primarily directed toward the award of the Ph.D. degree, training for the M.S. degree is offered also in a variety of contexts. For example, research assistants in the Department who seek educational advancement may pursue the M.S. degree via Plan A (thesis) or Plan B (coursework only). Medical students who seek to specialize in Pharmacology during the scholarly research component of their preclinical program may pursue the M.S. degree. Employees in the Biotechnology Industry may seek advanced training in Pharmacology by pursuing the M.S. degree at Case. Finally, a Ph.D. candidate who is unable to complete the Ph.D. requirements for extraordinary reasons may petition to have earned credits transferred to fulfill M.S. degree requirements.

Facilities
The Department of Pharmacology occupies about 25,000 net square feet distributed among several locations, namely the Biomedical Research Building, the School of Medicine Harland Goff Wood Building and the adja-
酚木医学研究塔。设施包括广泛的显微镜和组织学研究设备，以及专门研究化学技术和方法，涉及基因和染色体技术，包括分子杂交、细胞荧光和X射线晶体学。

**COURSE DESCRIPTIONS (PHRM)**

**PHRM 301. Undergraduate Research (1 - 18)**

This course will examine the interdependence of scientific investigation and discovery with the society it occurred in. What is the effect of science on society and, importantly, what is the effect of society on science? An introduction will consider the heliocentric controversy with focus on Galileo. Two broad areas, tuberculosis and the Frankenstein myth, will then be discussed covering the period 1800-present. With tuberculosis, fiction, art, and music will be examined to understand the changing views of society towards the disease, how society's perception of tuberculosis victims changed, and how this influenced their treatments and research. With Frankenstein, the original novel in its historical context will be examined. Using fiction and film, the transformation of the original story into myth with different connotations and implications will be discussed. Most classes will be extensive discussions coupled with student presentations of assigned materials. Offered as PHRM 340, BETH 440, PHRM 440, and HSTY 440.

**PHRM 400. Research Experience in Pharmacology (0 - 1)**

Research rotation in pharmacology.

**PHRM 401. Principles of Pharmacology I (3)**

This course focuses on human physiology of organ systems that are involved in determining the time course of drug action in vivo (pharmacokinetics). Emphasis will be placed on fundamental principles of pharmacokinetics, including the absorption, distribution, metabolism, and excretion of drugs. Mathematical concepts needed to understand appropriate administration of drugs and maintaining therapeutic concentrations of drugs in the body will be discussed. A second broad area of emphasis is on fundamental principles of drug action within the body (pharmacodynamics), including drug-receptor theory, log dose-response relationships, therapeutic index, receptor turnover, and signal transduction mechanisms. This is a highly interactive course in which faculty lectures are minimized and student-directed learning is emphasized. An animal laboratory explores the actions of cardiovascular drugs in an in vivo setting. This 3-credit hour course meets 6 hours per week during the first half of the Spring semester (January through mid-February).

**PHRM 402. Principles of Pharmacology II: The Molecular Basis of Therapeutics (3)**

This course focuses on the chemical and biochemical properties of therapeutic agents, molecular mechanisms of therapeutic action including kinetic and thermodynamic principles of enzyme catalysis and drug-receptor interactions, signal transduction, the genetic basis of disease states, and interindividual variation in response to drugs. The primary learning objective is to develop a self-directed, critical approach to the evaluation and design of experimental research in the broad context of specific diseases. This is a team-taught course involving focal lectures by faculty followed by student-directed learning experiences including discussion, problem solving applications, and primary literature presentations. A laboratory exercise introduces experimental methodologies widely applied during the study of molecular interactions between therapeutic agents and receptor targets to reinforce fundamental principles of molecular drug action. This 3 credit hour course meets 6 hours per week mid-February through April.

**PHRM 403. Public and Professional Views of Modern Therapeutics (3)**

This course will present the students with headline news stories from the popular press along with pertinent published articles from the scientific literature. The object is to engage the student in critical evaluation of the scientific literature and news reports to discern the scientific basis for decisions such as removal of drugs from the market. The course will focus on topics such as Cox-2 Inhibitors and Heart Disease, Antidepressant Use for Adolescents, and Parkinson's Disease and Stem Cell Therapy, among others. Evaluation will be based on participation in student-led discussion sessions, weekly topical quizzes, and on written critiques of the primary literature.

**PHRM 412. Membrane Transport Processes (3)**

Membranes and membrane transporters are absolutely required for all cells to take up nutrient, maintain membrane potential and efflux toxins. This course will consider the classification and structure of membrane transport proteins and channels, examine the common mechanistic features of all systems and the specific features of different classes of transporter. Understanding the physiological integration of transport processes into cell homeostasis and consideration of transporters and channels as drug targets will be a goal. Course format is minimal lecture, primarily student presentations of primary literature papers. Offered as PHOL 412, PHRM 412. Prereq: CBIO 453 and CBIO 455.

**PHRM 420. Molecular Genetics of Cancer (3)**

Cancer is a genetic disease, not only in the Mendelian sense of inheritance, but also in the sense that it is caused by somatic mutation. This course will consider the interactions and structure of membrane transport proteins and channels, examine the common mechanistic features of all systems and the specific features of different classes of transporter. Understanding the physiological integration of transport processes into cell homeostasis and consideration of transporters and channels as drug targets will be a goal. Course format is minimal lecture, primarily student presentations of primary literature papers. Offered as PHOL 412, PHRM 412. Prereq: CBIO 453 and CBIO 455.

**PHRM 431. Advanced Methods in Structural Biology (3)**

Provides students with an in-depth introduction to biophysical techniques used to quantify macromolecular structures. A major part of the course will deal with the use of nuclear magnetic resonance to derive 3-D structures of macromolecules in solution. Other topics include electron spin resonance, absorption, fluorescence and circular dichroism spectroscopy, Raman and infrared spectroscopy, and methods used in modeling. Offered with BIOL 431, "Advanced Methods Biology II" in alternate years. BIOL 430 deals with protein hydrodynamics and thermodynamics, crystallography, and mass spectrometry. The course will be mostly lecture based. This course will provide an extensive overview for graduate students specializing in structural biology. Offered as BIOL 430, CHEM 430, PHOL 430 and PHRM 430.

**PHRM 432. Biochemical and Molecular Aspects of Vision (3)**

Increasingly, progress in the study of visual science is requiring multidisciplinary approaches that draw from the areas of biochemistry, genetics, molecular biology, neuroscience and pathology. We have recognized this fact and have adapted this course to fit the needs of tomorrow's scientists. This course encompasses the basic science aspects of the eye. Subjects include retinal anatomy and function, biochemical and molecular aspects of retinal disease and cataract; cellular and molecular neuroscience aspects pertinent to the visual system. Offered as NEUR 432, PATH 432, and PHRM 432.

**PHRM 434. Mechanisms of Drug Resistance (3)**

Resistance to drugs is an important health concern in the new millennium. Over the past century, modern medicine has developed and prescribed drugs for various ailments and diseases with known therapeutic benefit. Since the discovery of antibiotics by Dr. Fleming, we have struggled with a new complication in infectious diseases, development of drug resistance. This course will focus on and compare the drug resistant mechanisms selected by viruses, bacteria, parasites, fungi, and tumor cells. Topics to be covered include antiretroviral resistance (e.g., AZT and protease inhibitors), bacterial resistance (e.g., B-lactams), resistance to chemotherapeutic agents, and resistance to anti-malarial drugs (e.g., chloroquine). Offered as MBIO 434, MVIR 434, and PHRM 434.
PHRM 440. Science and Society Through Literature (3)
This course will examine the interaction of scientific investigation and discovery with the society it occurred in. What is the effect of science on society and, importantly, what is the effect of society on science? An introduction will consider the heliocentric controversy with focus on Galileo. Two broad areas, tuberculosis and the Frankenstein myth, will then be discussed covering the period 1800-present. With tuberculosis, fiction, art and music will be examined to understand the changing views of society towards the disease, how society's perception of tuberculosis victims changed, and how this influenced their treatments and research. With Frankenstein, the original novel in its historical context will be examined. Using fiction and film, the transformation of the original story into myth with different connotations and implications will be discussed. Most classes will be extensive discussions coupled with student presentations of assigned materials. Offered as PHRM 340, BETH 440, PHRM 440, and HSTY 440.

PHRM 466. Cell Signaling (3)
This is an advanced lecture/journal/discussion format course that covers cell signaling mechanisms. Included are discussions of neurotransmitter-gated ion channels, growth factor receptor kinases, cytokine receptors, G protein-coupled receptors, steroid receptors, heterotrimic G proteins, ras family GTPases, second messenger cascades, protein kinase cascades, second messenger regulation of transcription factors, microtubule-based motility, actin/myosin-based motility, signals for regulation of the cell cycle, signals for regulation of apoptosis. Offered as CLBY 466 and PHOL 466 and PHRM 466.

PHRM 475. Protein Biophysics (3)
This course focuses on in-depth understanding of the molecular biophysics of proteins. Structural, thermodynamic and kinetic aspects of protein function and structure-function relationships will be considered at the advanced conceptual level. The application of these theoretical frameworks will be illustrated with examples from the literature and integration of biophysical knowledge with description at the cellular and systems level. The format consists of lectures, problem sets, and student presentations. A special emphasis will be placed on discussion of original publications. Offered as BIOL 475, CHEM 475, PHOL 475, PHRM 475, and NEUR 475.

PHRM 476. Cellular Biophysics (4)
This course focuses on a quantitative understanding of cellular processes. It is designed for students who feel comfortable with and are interested in analytical and quantitative approaches to cell biology and cell physiology. Selected topics in cellular biophysics will be covered in depth. Topics include theory of electrical and optical signal processing used in cell physiology, thermodynamics and kinetics of enzyme and transport reactions, single ion channel kinetics and excitability, mechanotransduction, and transport across polarized cell layers. The format consists of problem sets, computer simulations, and discussion of original publications. The relevant biological background of topics will be provided appropriate for non-biology science majors. Offered as BIOC 476, NEUR 477, PHOL 476, PHRM 476.

PHRM 506. Central Nervous System Pharmacology (3)
Principles of neurotransmission in the central nervous system: the pharmacology of drug-induced alterations in these central systems and neurochemical basis of behavior and selected neurological and psychiatric diseases. Lecture seminar.

PHRM 511. Pharmacology Seminar Series (1 - 0)
Current topics of interest in the pharmacologist sciences.

PHRM 513. Structural Journal Club (1)
Current topics of interest in structural biology, and protein biophysics. Offered as PHOL 513 and PHRM 513.

PHRM 515. Endocrine Pharmacology (3)
Seminar lecture course on regulation at the molecular level of selected interrelated endocrine systems. Offered as BIOL 515 and PHRM 515.

PHRM 520. Basic Cancer Biology and the Interface with Clinical Oncology (3)
This is an introductory cancer biology course that is intended to give students a broad and basic overview of Cancer Biology and Clinical Oncology. The course will cover not only fundamental principles of cancer biology, but will also highlight advances in the pathobiology and therapeutics of cancer. Classes will be of lecture and discussion format, with emphasis on critically reading original journal articles. The specific topics presented will include carcinogenesis, oncogenes, tumor suppressor genes, genetic epidemiology, DNA repair, growth factor action/signal transduction, apoptosis, cell cycle control, cell adhesion, angiogenesis, tumor cell heterogeneity, metastasis, chemotherapy, photodynamic therapy, gene therapy, signal transduction inhibitors, and clinical oncology of the breast, prostate, lymphatic tissue, colon and other related malignancies. Course grades will be from participation/discussion, presentation and mid-term/final exams. Recommended preparation: CBIO 453 and CBIO 455. Offered as PATH 520 and PHRM 520.

PHRM 521. Special Topics in Cancer Biology and Clinical Oncology (1)
This one credit hour course in Cancer Biology is intended to give students an opportunity to do independent literature research while enrolled in PHRM 520/PATH 520. Students must attend weekly Hematology/Oncology seminar series and write a brief summary of each of the lectures attended. In addition, students must select one of the seminar topics to write a term paper which fully reviews the background related to the topic and scientific and clinical advances in that field. This term paper must also focus of Clinical Oncology, have a translational research component, and integrate with concepts learned in PHRM 520/PATH 520. Pharmacology students must provide a strong discussion on Therapeutics, while Pathology students must provide a strong component on Pathophysiology of the disease. Recommended preparation: CBIO 453 and CBIO 455, or concurrent enrollment in PHRM 520 or PATH 520. Offered as PATH 521 and PHRM 521.

PHRM 525. Topics in Cell and Molecular Pharmacology (0 - 18)
Individual laboratory research project under the guidance of a pharmacology sponsor. Projects will reflect the research interest of the faculty sponsor, including molecular endocrinology, neuropharmacology, receptor activation and signal transduction, molecular mechanisms of enzyme action and metabolic regulation.

PHRM 527. Pathways to Personalized Medicine (3)
This is a course of independent study designed to take the student from the bedside to the bench and back again. Students will select a problem from a list of important therapeutic issues related to variability in drug responsiveness and design a research program to elucidate its molecular, biochemical, genetic and pathophysiological basis. The resulting research proposal is expected to be multidimensional and include molecular, cellular, whole animal and clinical investigations. To guide the process students will assemble a mentoring group including at least one member of the Translational Therapeutics Track Faculty, a clinician working in the clinical realm in which the problem originates and a basic scientist with relevant experience. The written proposal will be defended orally. Recommended preparation: 1st year Pharm Graduate required courses.

PHRM 528. Classic and Contemporary Approaches to Drug Discovery (3)
This course will provide the student with a deeper understanding of the mechanism of drug action and target validation. The first portion of the course will describe the basis for classical approaches in drug discovery that include kinetic and thermodynamic analyses for small molecule interactions with enzymes and receptors. The second portion of the course will describe new technologies and agents such as interference RNA and peptoids as therapeutic agents. The final section will describe pre-clinical and clinical trials as well as practical issues for start-up companies and licensing agreements.

PHRM 555. Current Proteomics (3)
This course is designed for graduate students across the university who wish to acquire a better understanding of fundamental concepts of proteomics and hands-on experience with techniques used in current proteomics. Lectures will cover protein/peptide separation techniques, protein mass spectrometry, bioinformatics tools, and biological applications which include quantitative proteomics, protein modification proteomics, interaction proteomics, structural genomics and structural proteomics. Laboratory portion will involve practice on the separation of proteins by two-dimensional gel electrophoresis, molecular weight measurement of proteins by mass spectrometry, peptide structural characterization by tandem mass spectrometry and protein identification using computational tools. The instructors’ research topics will also be discussed. Recommended preparation: CBIO 453 and
CBIO 455.

PHRM 601. Independent Study and Research (1 - 18)

PHRM 651. Thesis M.S. (1 - 18)

PHRM 701. Dissertation Ph.D. (1 - 18)

Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.

Department of Physical Medicine and Rehabilitation

Phone 216-778-3205
Gary S. Clark, M.D., C.P.E.
Professor, Chair, and
Residency Program Director

Physical medicine and rehabilitation (P M & R) is a medical specialty devoted to restoring people's maximal functional ability following a wide variety of disabling medical conditions, from traumatic brain injury and spinal cord injury to acute and chronic back or knee pain. In 1995, the Center for Physical Medicine and Rehabilitation was created to coordinate and expand the research and training activities of the medical school that are devoted to the rehabilitation of people with disabling conditions and injuries. In 2002, a full academic department was established in recognition of the significant growth in the scope of education and research in the field.

The goals of the department:

1) To foster high-quality, innovative research that concerns impairments, disabilities and handicaps resulting from illness, injury and developmental processes and that focuses on health-related improvement (physical, cognitive, behavioral and social) in human functioning and quality of life.

2) To promote and conduct effective teaching and training of principles and methods for rehabilitation of people with disabling chronic conditions and injuries at the undergraduate, graduate and post-graduate levels of medical education.

3) To enhance the quality and access to physical medicine and rehabilitation clinical services at university-affiliated medical centers.

4) To foster collaborative rehabilitation training and research among clinicians and basic scientists from a wide range of disciplines within the university.

The department's faculty includes physicians and psychologists with varied backgrounds who have a broad array of clinical and research interests. Current areas of research focus include 1) enhancing motor recovery and functional ability following paralysis from spinal cord injury, brain injury and stroke; 2) improving methods for managing bladder and bowel dysfunction following spinal cord injury; and 3) outcomes research related to health and human functioning, from specific functional abilities that can be enhanced by individual therapy methods to the cost-benefit of integrated trauma and rehabilitation care systems. Many opportunities are available for physicians, graduate students and allied health trainees to gain knowledge and skills related to clinical rehabilitation and/or related research areas.

Graduate Programs

The Department of Physiology and Biophysics at Case is a multidisciplinary department ranked among the top in the country. The department includes 60 active faculty members, more than 100 post-doctoral associates, and sixty, full-time Ph.D., M.D./Ph.D., and Master of Science degree students. The training programs are designed to provide a mentored training environment that maximizes faculty-student interaction.

As outlined below, the department offers Ph.D., M.D./Ph.D. and Master of Science degrees. These programs are tailored to prepare students for successful careers in biomedical, pharmaceutical and industrial research. The department offers multiple graduate-level programs, each of which uses state-of-the-art molecular, cell biology, and biophysical approaches to study physiological questions at a variety of different organizational levels. The goal is to provide an outstanding training opportunity. The major goals of the Ph.D. programs are to provide students with a broad knowledge base in organ systems and integrated physiology and in-depth expertise and outstanding research potential in the fields of cellular and molecular physiology and molecular and cellular biophysics. These goals are accomplished using a series of foundation and advanced topic courses, skill development courses, laboratory rotations and thesis research.

Admission Requirements for the Ph.D. Programs

Applications to the program are available from and should be submitted to the Department of Physiology and Biophysics. Typically, entering students will have a B.A., B.S. or M.Sc. degree in physical or life sciences. Requirements for admission:

- An appropriate undergraduate or master's degree.
- Undergraduate/graduate transcripts.
- GRE scores (plus TOEFL for international students).
- Three letters of recommendation.

Status of admission to the program is determined by a committee of faculty members based on application information and (often) candidate interviews. Normally, students enter the program in the fall semester.

Students should apply for financial assistance when they apply to the program. A majority of admitted students receive cost-of-living stipend support, health insurance and full tuition remission for the duration of their studies in the program.

Ph.D. and M.S. Programs

New students are advised and mentored by the Physiology Graduate Education Committee until they pass their Ph.D. qualifying exam (usually at the end of their second fall semester). After passing the qualifying exam, the student initiates thesis research under the direction of a specific mentor. Progress is then monitored by a graduate thesis committee.

The program of study consists of a core of courses that are completed during the first year. In addition, the students participate in three laboratory rotations by the end of their first full year of study. These rotations enable the student to sample the diverse research areas represented in the program and assist the student in making a well-informed choice of a thesis laboratory. Students also are required to attend the seminar series of either or both of the sponsoring departments throughout the duration of their studies, to gain wide exposure to cutting-edge research.

Elective courses provide an opportunity for advanced study relevant to the student's particular research interest.

Near the beginning of their second year of study, students in good standing (>3.1 G.P.A. and a minimum of 1 "C") choose their research preceptor and take their Ph.D. qualifying exam, a written/oral exam. The written segment involves preparing a qualifying exam research proposal, the topic for which is chosen from several provided by the faculty. The
oral exam tests the student on general course knowledge, understanding of laboratory rotation research, and a defense of the qualifying exam research grant.

Following satisfactory completion of the qualifying exam, the student and research advisor submit a list of four to six faculty to serve on the student’s thesis committee. This list is submitted to the director of graduate education for approval/revision in consultation with the Committee on Graduate Education. The research progress of the student is then overseen by this committee through a series of periodic progress report meetings.

Specific requirements for graduation include satisfactory general knowledge in cell and molecular biology, and molecular/cellular biophysics, specific expertise in the student’s chosen area of research, completion of the dissertation, and completion and acceptance of two first authored manuscripts in an excellent to outstanding peer-reviewed scientific journal.

Ph.D. in Cell and Molecular Physiology
This program is designed to provide students with training in state-of-the-art molecular and cellular technologies including gene cloning, transgenic methodology, and advanced microscopy. Research programs within the department span diverse fields focusing on fundamental cell and molecular biological questions in the context of normal cell physiology and pathology of disease states.

Ph.D. in Molecular and Cellular Biophysics
This program emphasizes quantitative methods and equips students to study cell and protein structure and function using state-of-the-art instrumentation and computing. The Department hosts outstanding research programs in the areas of structural biology and on cellular ion channels and ion transporters.

Ph.D. in Systems and Integrated Physiology
This program focuses on studies of the response of cells and organs in the whole-body environment. Researchers apply state-of-the-art methodologies to study cardiovascular, neuronal, gastrointestinal, renal, integumental, immune biology. The program supports a thriving graduate training program designed to train the next generation of systems biologists.

Ph.D. for M.D.s
To address the need to train M.D.-scientists, the Department of Physiology and Biophysics has instituted an accelerated Ph.D. program specifically geared to physicians interested in research. The key features of the program are its selectivity in terms of admissions qualifications—it is open only to those holding medical degrees—and its accelerated nature based on accelerated course learning and research training. The program is subdivided into advanced specialty courses (cell physiology electives) and hands-on research training and problem-solving (laboratory rotations, departmental seminars, qualifying examination, and thesis research). All students enrolled in the program must fulfill the general academic regulations for doctoral degrees as set forth by the School of Graduate Studies. Application is open to any individual holding a medical degree or expecting to receive one before entry into the program. Selection for admission is based on the applicant’s potential for independent and innovative research as evidenced by an outstanding academic record in basic science disciplines, previous research experience, and three letters of recommendation. The full-time plan of study consists of a minimum of 22 semester hours of course work and 18 semester hours of thesis research. The program can be linked to research-oriented residency programs such as the Clinical Investigator Pathway, approved by the American Board of Internal Medicine, and similar programs in pediatrics and surgery.

M.D./Ph.D.
This program consists of the core medical training in the Case School of Medicine with advanced graduate research training in any of the disciplines outlined above, leading to a combined M.D./Ph.D. degree. The program consists of the core medical training plus advanced graduate courses during the first two to three years, and finally clinical training leading to the M.D. degree. The combined degree program strives to optimize coursework and research experience for future physicians interested in medical research and academic careers.

Master of Science in Physiology
This program offers an excellent foundation for future careers in biomedical professions, academic or pharmaceutical research, by providing cell, molecular, and systems level coursework and research experience. The program includes one year of advanced coursework and hands-on laboratory experience, followed by a year of intensive laboratory investigation in a mentored environment. Students help choose their own research focus from a wide array of research areas represented within the Department. The program also is intended to serve as a stepping-stone for individuals seeking preparation for entry into Ph.D. or M.D. programs.

Program of Study for Ph.D. in Cell and Molecular Physiology

FIRST YEAR FALL

COURSE (CREDIT HOURS)
- PHOL 432 Cell Structure and Function (3)
- PHOL 456 Proteins and Nucleic Acids (3)
- PHOL 468 Membrane Physiology (3)
- PHOL 498-01 Physiology and Biophysics Seminar (1)
- PHOL 505-01 Laboratory Research Rotation (3)

FIRST YEAR SPRING

COURSE (CREDIT HOURS)
- PHOL 466 Cell Signaling (3)
- PHOL 480 Physiology of Organ Systems (3)
- PHOL 498-02 Physiology and Biophysics Departmental Seminar (1)
- PHOL 500 Translational Cell Physiology (1)
- IBMS 500 Ethics and Biomedical Research (0)
- PHOL 505-02 Laboratory Research Rotation (3)
- PHOL 505-03 Laboratory Research Rotation (3)
- Elective (3)

Program of Study for Ph.D. in Molecular and Cellular Biophysics

FIRST YEAR FALL

COURSE (CREDIT HOURS)
- PHOL 432 Cell Structure and Function (3)
- PHOL 456 Proteins and Nucleic Acids (3)
- PHOL 468 Membrane Physiology
- PHOL 498-01 Physiology and Biophysics Departmental Seminar (1)
- PHOL 505-01 Laboratory Research Rotation (3)

FIRST YEAR SPRING

COURSE (CREDIT HOURS)
- PHOL 475 Cell Biophysics (3)
- PHOL 476 Protein Biophysics (3)
- PHOL 498-02 Physiology and Biophysics Departmental Seminar (1)
- PHOL 500 Translational Cell Physiology
- IBMS 500 Ethics and Biomedical Research (0)
• PHOL 505-02 Laboratory Research Rotation (3)
• PHOL 505-03 Laboratory Research Rotation (3)
• Elective (3)

Program of Study for Ph.D. in Systems and Integrated Physiology

FIRST YEAR FALL

COURSE (CREDIT HOURS)
• PHOL 432 Cell Structure and Function (3)
• PHOL 456 Proteins and Nucleic Acids (3)
• PHOL 468 Membrane Physiology (3)
• PHOL 498-01 Physiology and Biophysics Seminar (1)
• PHOL 505-01 Laboratory Research Rotation (3)

FIRST YEAR SPRING

• PHOL 465 Physiology of Organ Systems (3)
• PHOL 500 Translational Cell Physiology (1)
• IBMS 500 Ethics and Biomedical Research (0)
• PHOL 514 Advanced Cardiovascular Physiology (3)
• PHOL 519 Advanced Respiratory Physiology (3)
• PHOL 498-02 Physiology and Biophysics Seminar (1)
• PHOL 505-02 Laboratory Research Rotation (3)
• PHOL 505-03 Laboratory Research Rotation (3)

Program of Study for Master of Science in Physiology

YEAR 1 FALL:

COURSE (CREDIT HOURS)
• PHOL 432 Cell Structure and Function (3)
• PHOL 456 Proteins and Nucleic Acids (3)
• PHOL 468 Membrane Physiology (3)
• PHOL 498-01 Physiology and Biophysics Seminar (1)
• PHOL 505-01 Laboratory Research Rotation (3)

YEAR 1 SPRING:

COURSE (CREDIT HOURS)
• PHOL 466 Cell Signaling (3)
• PHOL 480 Physiology of Organ Systems
• PHOL 498-02 Physiology and Biophysics Seminar (1)
• IBMS 500 Ethics and Biomedical Research (0)
• PHOL 505 Laboratory Research Rotation (3)

COURSE DESCRIPTIONS (PHOL)

PHOL 351. Independent Study (1 - 6)
This course is a guided program of study in physiology textbooks, reviews, and original articles. Guided laboratory projects to reproduce and extend classical physiological experiments are offered to the undergraduate science major. This course is being offered in conjunction with the Graduate level course PHOL 451. Students are required to consult with the faculty member whose work they have interest in and plan their individual experience.

PHOL 398. Physiology and Biophysics Departmental Seminar (1)
Weekly one-hour reviews from invited speakers describing their research. Students will present literature reviews or summaries of their research.

PHOL 411. Membrane Transport Processes (3)
Membranes and membrane transporters are absolutely required for all cells to take up nutrient, maintain membrane potential and efflux toxins. This course will consider the classification and structural features of membrane transport proteins and channels, examine the common mechanistic features of all transport systems and the specific features of different classes of transporter. Understanding the physiological integration of transport processes into cell homeostasis and consideration of transporters and channels as drug targets will be a goal. Course format is minimal lecture, primarily student presentations of primary literature papers. Offered as PHOL 411, PHRM 412.

PHOL 419. Applied Probability and Stochastic Processes for Biology (3)
Applications of probability and stochastic processes to biological systems. Mathematical topics will include: introduction to discrete and continuous probability spaces (including numerical generation of pseudo random samples from specified probability distributions), Markov processes in discrete and continuous time with discrete and continuous sample spaces, point processes including homogeneous and inhomogeneous Poisson processes and Markov chains on graphs, and diffusion processes including Brownian motion and the Ornstein-Uhlenbeck process. Biological topics will be determined by the interests of the students and the instructor. Likely topics include: stochastic ion channels, molecular motors and stochastic ratchets, actin and tubulin polymerization, random walk models for neural spike trains, bacterial chemotaxis, signaling and genetic regulatory networks, and stochastic predator-prey dynamics. The emphasis will be on practical simulation and analysis of stochastic phenomena in biological systems. Numerical methods will be developed using both MATLAB and the R statistical package. Student projects will comprise a major part of the course. Offered as BIOL 319, ECECS 319, MATH 319, BIOL 419, EBME 419, and PHOL 419.

PHOL 430. Advanced Methods in Structural Biology (3)
Provides students with an in-depth introduction to biophysical techniques used to quantify macromolecular structures. A major part of the course will deal with the use of nuclear magnetic resonance to derive 3-D structures of macromolecules in solution. Other topics include electron spin resonance, absorption, fluorescence and circular dichroism spectroscopies, Raman and infrared spectroscopies and methods used in modeling. Offered with BIOC 431, “Advanced Methods Biology II” in alternate years. BIOC 430 deals with protein hydrodynamics and thermodynamics, crystallography, and mass spectrometry. The course will be mostly lecture based. This course will provide an extensive overview for graduate students specializing in structural biology. Offered as BIOC 430, CHEM 430, PHOL 430 and PHRM 430.

PHOL 432. Cell Structure and Function (3)
This course provides knowledge regarding cell structure and function, chiefly in mammalian cells but also in relevant model systems. The basic structure of the cell is discussed, as are various systems that regulate this structure. Topics to be covered include DNA transcription, translation and protein synthesis, intracellular transport, cell interaction with the external environment, cell cycle regulation, cell death and differentiation, signal transduction, and cell specialization and organization into tissues. The course emphasizes lectures and problem-based discussions with an emphasis on faculty-directed student self-learning. The major goals of this course are to provide students with a working knowledge of the cell to facilitate understanding of the scientific literature, and to familiarize students with current techniques in cell biology.

PHOL 451. Independent Study (1 - 18)
Guided program of study using physiology textbooks, research reviews, and original research articles. An independent laboratory research project may also be included.

PHOL 456. Proteins and Nucleic Acids (3)
The goal of this course is to provide a basic working knowledge of protein structure/function and molecular biology. The course begins with a discussion of protein structure and enzyme catalysis followed by protein purification and characterization. The course then addresses concepts relating to the application of modern molecular biology techniques. Students are taught how to clone genes and use these clones in animal and cell-based studies. The overall goal is to provide students with an understanding of proteins and genetic approaches that can be used in experimental work and to facilitate comprehension of the scientific literature. Offered as BIOC 457 and PHOL 456.

PHOL 466. Cell Signaling (3)
This is an advanced lecture/journal/discussion format course that covers cell signaling mechanisms. Included are discussions of neurotransmitter-gated ion channels, growth factor receptor kinases, cytokine receptors, G protein-coupled receptors, steroid receptors, heterotrimetric G proteins, ras family GTPhases, second messenger cascades, protein kinase cascades, second messenger regulation of transcription factors, microtubule-based motility, actin/myosin-based motility, signals for regulation of cell...
cycle, signals for regulation of apoptosis. Offered as CLBY 466 and PHOL 466 and PHRM 466.

PHOL 468. Membrane Physiology (3)
This student-guided discussion/journal course focuses on biological membranes. Topics discussed include thermodynamics and kinetics of membrane transport, oxidative phosphorylation and bioenergetics, electro-physiology of excitable membranes, and whole and single channel electrophysiology, homeostasis and pH regulation, volume and calcium regulation. Offered as CLBY 468 and PHOL 468.

PHOL 475. Protein Biophysics (3)
This course focuses on in-depth understanding of the molecular biophysics of proteins. Structural, thermodynamic and kinetic aspects of protein function and structure-function relationships will be considered at the advanced conceptual level. The application of these theoretical frameworks will be illustrated with examples from the literature and integration of biophysical knowledge with description at the cellular and systems level. The format consists of lectures, problem sets, and student presentations. A special emphasis will be placed on discussion of original publications. Offered as BIOC 475, CHEM 475, PHOL 475, PHRM 475, and NEUR 475.

PHOL 476. Cellular Biophysics (4)
This course focuses on a quantitative understanding of cellular processes. It is designed for students who feel comfortable with and are interested in analytical and quantitative approaches to cell biology and cell physiology. Selected topics in cellular biophysics will be covered in depth. Topics include theory of electrical and optical signal processing used in cell physiology, thermodynamics and kinetics of enzyme and transport reactions, single ion channel kinetics and excitability, mechanotransduction, and transport across polarized cell layers. The format consists of lectures, problem sets, computer simulations, and discussion of original publications. The relevant biological background of topics will be provided appropriate for non-biology science majors. Offered as BIOC 476, NEUR 477, PHOL 476, PHRM 476.

PHOL 480. Physiology of Organ Systems (3)
This course presents an advanced introduction to the fundamental physiological principles governing the major organ systems in mammals. The function of the nervous, endocrine, digestive, muscle, circulatory, respiratory, and urinary systems are discussed. At the conclusion of the semester, integrative aspects of the major organ systems will be illustrated through consideration of exercise and high altitude physiology. Offered as BIOL 480 and PHOL 480.

PHOL 498. Physiology and Biophysics Departmental Seminar (1)
Weekly one-hour reviews by invited speakers of their research. Students present literature reviews or summaries of their research.

PHOL 505. Laboratory Research Rotation (3)
One-semester experience in a selected faculty research laboratory designed to introduce the student to all aspects of modern laboratory research including the design, execution and analysis of original experimental work. Recommended preparation: Consent of instructor and scheduled laboratory.

PHOL 512. Skeletal Biology (3)
This is an advanced graduate level course for students interested in the morphogenesis, structure, function, and maintenance of the skeletal system taught jointly by faculty from Case Western Reserve University (CWRU), Cleveland Clinic Foundation (CCF), and the Northeastern Ohio Universities College of Medicine (NEOUCOM). It will meet twice per week for 90 minutes per session. The format will include an overview of the topic by the responsible faculty, followed by a discussion of important papers on the topic. The students will be expected to discuss the papers for each session and grading will be based on those discussions. The intent of the course is to enable students to understand the important problems in skeletal biology and both classical and modern approaches for solving them.

PHOL 513. Structural Journal Club (1)
Current topics of interest in structural biology, and protein biophysics. Offered as PHIL 513 and PHRM 513.

PHOL 514. Cardiovascular Physiology (3)
The goal of this course is to provide the student with a solid foundation in cardiovascular physiology and pathophysiology. The course will begin by providing a solid foundation in the structure, phenotype and function of cardiac and vascular muscle. In addition, electrophysiology and metabolism will be addressed. Both basic physiology and more advanced topics, such as pathophysiology, will be covered using a journal club format. (Twice weekly; 1.5hrs/ class.) Student participation is required.

PHOL 519. Cardio-Respiratory Physiology (3)
This course is designed to integrate systemic, cellular and molecular aspects of cardio-respiratory systems in physiological and pathophysiological states. The course requires prior knowledge of basic physiology of the cardiovascular systems. Extensive student participation is required. Instructors provide a brief overview of the topic followed by presentation and critical appraisal of recent scientific literature by students.

PHOL 522. Special Topics in Cardiac Electrophysiology (3)
Introduction to current topics in cellular cardiac electrophysiology and cardiac ion channel structure, function, and regulation. The format includes informal lectures as well as student presentations and class discussion of current literature.

PHOL 530. Technology in Physiological Sciences (3)
This lecture/discussion/journal course focuses on techniques in the physiological sciences. Topics include spectroscopy, microscopy, and electrophysiology. The theory and practice are covered with an emphasis on examples taken from the scientific literature.

PHOL 537. Microscopy-Principles and Applications (3)
This course provides an introduction to various types of light microscopy, digital and video imaging techniques, and their applications to biological and biomedical sciences via lectures and hands-on experience. Topics covered include geometrical and physical optics; brightfield, darkfield, phase contrast, DIC, fluorescence and confocal microscopes; and digital image processing. Offered as GENE 537, MBIO 537, and PHOL 537.

PHOL 601. Research (1 - 18)
Cellular physiology laboratory research activities that are based on faculty and student interests.

PHOL 610. Oxygen and Physiological Function (3)
Lecture/discussion course which explores the significance and consequences of oxygen metabolism in living organisms. Topics to be covered include oxygen transport by blood tissues, oxygen toxicity, and mitochondrial metabolism. Emphasis will be placed on mammalian physiology with special reference to brain oxidative metabolism and blood flow as well as whole body energy expenditure and oxidative stress related to disease. Offered as ANAT 610 and PHOL 610.

PHOL 651. Thesis M.S. (1 - 18)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.
FRANCES PAYNE BOLTON SCHOOL OF NURSING

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HISTORY

The Frances Payne Bolton School of Nursing has a proud heritage beginning with the Lakeside Hospital Training School for Nurses established in 1898. With a generous endowment from Frances Payne Bolton, who was the first congresswoman from Ohio, the School of Nursing was established in 1923 as a school within Western Reserve University. In 1969, Western Reserve University and Case Institute of Technology merged forming the current university, Case Western Reserve University. Consistently, the Bolton School is ranked among the leading schools in U.S. News and World Report and in funding from the National Institutes of Health. Graduate-level specialty majors have been in the top 10.

The Bolton School is noted for its innovation, leadership and excellence in education, research and practice. To support this mission, the school has thirteen endowed chairs, the largest number in the world for a school of nursing. The Bolton School is a World Health Organization Collaborating Center in Home Care. The Sarah Cole Hirsh Center for Best Nursing Practices Based on Evidence was established in 1998 was the first national center of its kind.

STRATEGIC VISION

Mission

Within the mission of Case Western Reserve University, the Frances Payne Bolton School of Nursing builds on a tradition of innovation and a commitment to the highest standards of excellence to provide the very best nursing education, research, clinical scholarship, and professional service locally, nationally, and internationally.

Priorities

The Frances Payne Bolton School of Nursing is committed to global leadership in nursing. The discovery, transmission, and use of knowledge are at the core of our work. Knowledge of health and illness in individuals, families, groups, and communities, both locally and internationally, provides the context for our work. The ultimate test of the validity of our vision is the results, over time, of the contributions of our faculty and graduates.

Purpose

The purpose of the Frances Payne Bolton School of Nursing is to provide an environment that permits individuals to develop their personal and professional capabilities, including the sense of responsibility for continued learning; to learn as efficiently and effectively as possible; to find enjoyment, excitement, and challenge in the pursuit of knowledge and its application; and to develop behaviors that enable them to function in a changing, complex society. As an integral component of Case Western Reserve University, the school assumes responsibility for the preparation of individuals committed to excellence and leadership in professional nursing. The faculty of the school accepts the responsibility for teaching and scholarly inquiry as integral parts of the educational process.

Philosophy

The School of Nursing has set forth the following philosophy to accomplish the stated mission.

Nursing is an academic discipline and profession. Nursing as an academic discipline is a distinctive branch of human knowledge fundamental to nursing practice, nursing education, and nursing administration, and to the continuous development of the profession. The distinctive perspective of nursing includes a focus on the metaparadigm concepts of persons, environment and nursing. The specific conceptual focus within the Bolton School is the health-seeking mechanisms and behaviors of human beings. Some of those mechanisms and behaviors are innate; others are learned or developed and may be subject to the influence of nurses’ knowledgeable ministrations. The body of nursing knowledge is continuously advanced, structured, and restructured as a consequence of a range of methods including scientific inquiry, philosophic inquiry, historiographical inquiry, and clinical evaluation.

Scientific inquiry within nursing is designed to discover, advance, and clarify knowledge about determinants and correlates of optimal biological, psychological, and social functioning; physical, emotional and spiritual comfort; and individual and group attainment of health goals in multiple environments and under a variety of circumstances (including illness and injury) attendant to birth, living, development, decline and death. Philosophic inquiry is undertaken to clarify the values that underlie consumers’ and nurses’ responsibilities for human health promotion, the ethics of nursing practice, and the nature of the body of knowledge known as nursing. Historical inquiry is undertaken to document significant influences (by events and individuals) on the development of nursing over time as a body of knowledge and as a profession. Clinical evaluation is designed to test and verify the relative efficacy of strategies used in nursing administration, consultation, education, and practice, and the means employed to advance nursing knowledge.

Professional nurses have mastery over a body of scientific and humanistic knowledge that is fundamental to their particular kinds of practice. They selectively use this knowledge in the execution of their professional responsibilities and in the attainment of professional goals. Those involved in differentiated nursing practices employ nursing technologies (skills and approaches that represent the application of scientific knowledge), using artistry in the execution of their professional responsibilities. Professional nurses’ several, particular practices are guided by a code of professional ethics and also by knowledge about the individuals and groups whom they serve. The nurse’s professional goal is to appraise accurately and to enhance effectively the health status, health assets, and health potentials of individuals, groups, families, and communities and to promote the initiative and independence of those they serve in the attainment of reasonable health goals, mutually agreed upon by consumers and by nurses as their health care providers. Nursing practice includes assisting persons in the maintenance of health, detecting deviations from health, assisting persons in the restoration of health, and supporting persons during life. These responsibilities are
accomplished through a systematic and deliberative process. Nursing practice includes independent and interdependent functions and nurses are an integral part of the health care system.

Other beliefs essential to nursing that are shared by the faculty are stated below:

Individuals and Groups
- Individuals have commonalities, but each person is unique and has worth.
- Individuals are in constant interaction with the environment.
- Individuals have a capacity to grow and develop.
- Human behavior is purposeful and involves choices that are directed toward meeting the individual’s needs.
- Individuals and groups have rights and responsibilities in relation to the promotion of optimal health.
- Individuals have the responsibility for making decisions about their health and have the potential to act on these decisions.
- Most individuals possess the capability for making appropriate decisions, although there are times when these abilities are diminished or absent.

Learning
- Individuals are capable of changing their behavior through the process of learning.
- The need and ability to learn continues throughout life.
- Learning is affected by interaction between the individual and the environment.
- Learning is enhanced when consideration is given to individual differences in cognitive styles.
- The responsibility for learning resides in the individual learner.
- The learning process is an individual endeavor; stimulation of the process is a joint responsibility of teacher and learner working toward common goals.

Cultural Diversity
- Learning is affected by interaction between the individual and the environment.
- Learning is enhanced when consideration is given to individual differences in cognitive styles as well as cultural background and influences.

Health
- Health is a dynamic, ever-changing state.
- Health is influenced by an individual’s heredity, environment, and lifestyle.

Health Care
- Health care encompasses all activities necessary to promote optimal physiological, psychological, and social functioning.
- Health care is rendered by the individual alone or in collaboration with health care providers, including nurses, and extends throughout the life span of the individual.
- Health care is complex and depends on the skills, resources, and cooperative efforts of consumers and health care providers.
- A recognized need exists in society to organize effectively the delivery of health care services.
- A variety of providers, each offering a unique and specific service, may be present in an organized health care system.
- The primary contribution of nursing to the health care system is to assist individuals and groups to attain, maintain, and regain optimal health.
- Health care professionals (including nurses) and consumers collaborate to define health; to identify factors inimical to health; to limit, reduce, or eliminate threats to health; to determine human and material resources necessary to provide health care services; and to evaluate and improve health services.
- Collaboration among health professionals and consumers can lead to the achievement of health care delivery systems that provide care that is available, accessible, feasible, acceptable, of optimal quality, sustained, and cost effective.
- Relevant concepts are further defined by faculty as follows:

Optimal Level of Health
The highest achievable level of function and security. This includes physiological function and environmental (physical security, psychosocial function, and security), and personal growth.

Health-Seeking Behaviors
The range of mental and physical activities consciously performed to maintain, attain, or regain optimal health.

Environment of Care
The “place” and phenomenal field where a nurse encounters clients who need assistance in maintaining, attaining, or regaining competence in striving for health, and where the nurse performs acts for clients to facilitate health-seeking behaviors (when they cannot do for themselves).

Professional Encounter
A person’s competence in matters related to health is dynamic and is influenced by genetic endowment and life experiences. At times a person requires assistance in improving competence. At these times, the nurse may enter into a relationship with the person (client) to facilitate the client’s health-seeking behaviors as he/she strives toward an achievable level of health. The client and nurse may view this relationship differently. The professional encounter requires a reciprocal relationship in which the nurse, as a professional expert with the client’s assent, influences the behavior of the client. The client in turn evokes responses from the nurse. The professional encounter is the initiation of a relationship between a nurse and a person requiring nursing care. The relationship is reciprocal in nature and may be initiated by either the client or nurse. Through the relationship mutual goal setting regarding health attainment is sought. When a nurse and client interact within the professional relationship, each performs functions deriving from their positions within a particular social context. The context (human-physical environment) in which the encounter occurs will have varying influence on both the client and nurse based on the cognitive, perceptual and emotional capacities of both. Although the environment in its physical representation is essentially the same for both, the perceptions of the client and nurse are different. The attributes that they bring to the relationship are shaped by intervening variables.

Nursing Strategies
Nursing strategies can be categorized according to the function they serve in facilitating clients’ health-seeking behaviors. A tentative classification scheme according to the function strategies is set forth below. Within each category there are multiple behaviors from which the nurse can select depending on the nature of the clients’ assets and deficits. Also, each category is open to the discovery of more activities than are presently known. Each category focuses on facilitating health-seeking behaviors.

Compensating: Performing selected activities
or measures (including monitoring) for clients when they are unable to do these activities.

Teaching: Performing actions intended to induce learning.

Counseling: Assisting clients to examine alternative course of action.

Supporting: Promoting clients’ ability to cope, adapt and change.

Stimulating: Promoting clients’ desire to perform health-seeking behaviors.

Advocating: Intervening on behalf of the client to overcome obstacles that are interfering with health-seeking behaviors.

Comforting: Providing an environment that promotes ease and well being.

The choice of nursing strategies for enhancing client’s health-seeking behaviors is based on assessment of these behaviors and the intervening variables to determine the assets and deficits and potential for engaging in behaviors that are directed toward attaining, maintaining or regaining an optimal level of health.

CENTERS OF EXCELLENCE

SARAH COLE HIRSH INSTITUTE FOR BEST NURSING PRACTICES BASED ON EVIDENCE

Established in 1998, the Sarah Cole Hirsh Institute for Best Nursing Practices Based on Evidence develops and promotes evidence-based practice in nursing. Historically, nursing and medical practices have been based, in part, on expert opinion and tradition, creating variations in practice and often subjectivity in judgment. Through the integration of research and practice, the Hirsh Institute stimulates the use of best nursing practices based on evidence as a basis for delivering superior health care, and shaping the next phase of nursing research.

CENTER FOR RESEARCH AND SCHOLARSHIP

The Center for Research and Scholarship provides a variety of services to support the research and scholarship efforts of faculty, students, and postdoctoral fellows, including management of the internal and external funding process. The center provides faculty and students with current funding opportunities that are available, assists in the development of research proposals, and disseminates research results regionally, nationally, and internationally. The center staff assists in the submission of Human Subjects Research reviews to the affiliated institutional review boards. The center provides support for all stages of faculty members’ manuscript submission including submission and tracking. Four full-time employees staff the center. A conference room and a workroom are available within the center for both faculty and student investigators.

INTERNATIONAL HEALTH PROGRAMS

The Bolton School houses a World Health Organization Collaborating Center for Nursing, one of only 12 in the United States. The focus of the Collaborating Center is home care nursing education and research. In addition, there are a variety of international health opportunities for students of all levels, including study abroad programs and short-term programs for international health experiences. Short study programs are offered to international nurses, specifically designed to meet their individual objectives.

ACCREDITATION

The Bachelor of Science in Nursing and Master of Science in Nursing programs are accredited by the National League for Nursing Accrediting Commission

National League For Nursing Accrediting Commission
61 Broadway-33rd Floor
New York, NY 10006
212-363-5555 Ext. 153
www.nlac.org

The Council on Accreditation of Nurse Anesthesia Programs accredits the nurse anesthesia program.

American Association of Nurse Anesthetists
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(847) 692-7050
www.aana.com

The nurse midwifery program is accredited by the Accreditation Commission of Midwifery Education.

American College of Nurse-Midwives
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The School of Nursing is approved by the State of Ohio Board of Nursing.

Ohio Board of Nursing

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www.state.oh.us/nur

The North Central Association of Colleges and Schools, Commission on Institutions of Higher Education accredits the university.

North Central Association of Colleges and Schools
Higher Learning Commission
30 N. LaSalle Street, Suite 2400
Chicago, IL 60602-2504
(800) 621-7440
www.ncalhcc.org

The School of Nursing is a member of the Council of Baccalaureate and Higher Degree Programs of the National League for Nursing and the American Association of Colleges of Nursing

FACILITIES

Instructional Facilities

With a highly qualified faculty engaged in teaching, research, and community service, the Bolton school offers high quality academic programs. Instruction includes lectures, seminars, individual conferences and small group discussions, and clinical experiences under the guidance of a preceptor. Modern research and educational facilities include computer and skills laboratories.

Clinical Facilities

Instructional facilities are abundant and varied. The University Hospitals of Cleveland is a 947-bed academic medical center and is an aggregate of specialized hospitals that includes Alfred and Norma Lerner Tower, Samuel Mather Pavilion and Lakeside Hospital for adult medical/surgical care; Rainbow Babies and Children’s Hospital; University MacDonald Women’s Hospital; University Ireland Cancer Center; and skilled nursing and rehabilitation services. University Hospitals is part of the University Hospitals Health System with services provided at 100 locations in 40 northern communities. The Cleveland Clinic Health System has 2,957 beds and is comprised of the Cleveland Clinic Foundation and Fairview Hospital, Health Hill Hospital for Children, Lakewood Hospital, Lutheran Hospital, Maryland Hospital, Euclid Hospital, Hillcrest Hospital, Huron Hospital, and South Pointe Hospital. MetroHealth Medical Center is a regional referral center with 690-
beds for medical/surgical care to adults and children. It is a trauma I center with a burn center and 143-bed rehabilitation facility specializing in spinal cord injuries, only one of 19 in the nation. MetroHealth also has the Clement Center for Family Care, a neighborhood outpatient center, and a 291 bed skilled nursing care center. These hospitals are major clinical resources.

Additional opportunities are available in a variety of health, social, and educational agencies. These include, for example, American Red Cross, Benjamin Rose Institute, Hospice of the Western Reserve, Cleveland Psychiatric Institute, Kenneth W. Clement Center for Family Health Care, Judson Park Retirement Community, Hospice of the Western Reserve, Visiting Nurses Association, Cleveland Public Health Department, the Ohio Permanente Medical Group and many others.

Libraries

The Kelvin Smith Library, a 144,000 square foot building completed in 1996, houses most of the collections of Case Western Reserve University. This includes over 1,290,000 monographs, 7,363 serial titles, U.S. Government publications, company annual reports, newspapers, CDs, technical reports, over 12,000 DVDs and videos, and more. The library enables users to integrate both traditional resources and state-of-the-art technology into teaching, research, and learning. A variety of seating styles accommodates 900 people and provide electrical ports for connecting personal laptop computers. Case Western Reserve's wireless network enables personal laptops to have internet access throughout the library. Two multimedia rooms include scanners and sound and video digitizers. Available are individual study spaces, meeting rooms, conference areas, and social gathering places. Thirty miles of compact movable shelving allows the library to keep much of its collection onsite for immediate access to print materials. The user-friendly interface to the online catalog, databases, and other resources allows library staff to focus their attention on working in-depth with faculty and students.

In addition to the Kelvin Smith Library, students and faculty have access to the following libraries located on campus: the Cleveland Health Sciences Libraries, supporting programs in dentistry, medicine and nursing; the School of Law Library; the Lillian and Milford Harris Library in the Mandel School of Applied Social Sciences; the Kulas Music Library; and the Astronomy Library. Altogether, collections at the Case Western Reserve libraries encompass more than 1.8 million volumes, nearly 14,000 serials and periodicals, and a wide range of electronic information resources, including a CD-ROM reference database that is accessible through the Case Western Reserve network. These include OhioLINK, a state-funded network that links the libraries of 17 public universities, 23 community/technical colleges, 44 private colleges, and the State Library of Ohio and also offers access to research databases and other information resources.

The Health Sciences Libraries, which consist of the Health Center Library and the Allen Memorial Library, serve as the major libraries for holdings related to nursing, medicine, dentistry, nutrition, and biology. The Health Center Library adjacent to the School of Nursing houses nearly 350,000 volumes, 2,780 current periodicals, and audiovisual materials. Approximately 8,800 volumes are specifically nursing texts, and more than 100 journals are nursing publications. The library also houses a historical collection of nursing materials. The most current and heavily used books are placed on reserve to insure their availability to students. Faculty also place materials on reserve for use in the library. There are 18 public workstations to access the internet, and the library also provides wireless access for those with properly-equipped laptop computers.

UNIVERSITY INFORMATION TECHNOLOGY SERVICES

Information Technology Services (ITS) stewards, manages, and protects the university’s extensive technology resources and supports innovative, state-of-the-art technology applications, tools, and services to enrich learning, teaching, and research at Case Western Reserve.

Services managed include:

- The university’s high-speed network, which provides switched gigabit ethernet to each and every student, faculty and staff computers
- Wireless (802.11g) deployment with over 1300 access points to the campus community and beyond
- The Software Center that provides personal productivity and general-purpose software packages, including e-mail, calendaring and other applications
- Help Desk and support services to assist users in maximizing use of technology resources
- Deployment and operation of academic and instructional systems such as Blackboard
- Operation of application software such as e-mail and group calendaring
- Delivery off, including Voice over IP
- Delivery of audio/video services (including cable TV and videoconferencing)
- Development and operation of internal administrative systems
- University archives and records.

Help Desk

The Help Desk, powered by PerceptIS, provides computing support to the university community. It is open seven days a week. Services include:

- Troubleshooting and technical assistance through e-mail, telephone and walk-ins
- Dispatching, if necessary, of technical assistants to residence halls to resolve user problems
- Case management record to track problems and ascertain satisfactory closure of technical issues
- Technical support for television and video users
- Management of networked high speed laser printers in Wade and Fribley Commons.

Instructional Technology and Academic Computing (ITAC)

ITAC supports current technologies that enhance teaching and learning at Case Western Reserve University. Through technology support and professional development, ITAC supports the university community in its endeavor to experience, explore, collaborate and extend learning beyond its traditional bounds.

Services include:

- MediaVision – Video conferencing, streaming media, online
- Courseware and IP Television
- New Media Studio - digital technology to create interactive learning environments
- 3D experiences and innovative multimedia
- Faculty Support - Provides support for faculty in using teaching technologies.
- Student Technology Consultants - Employ students to assist faculty.

Software Services

Faculty, staff and registered students are eligible to download a variety of software packages that the university has purchased and made

650
available through site licenses with software manufacturers. Packages and tools include:

- Personal productivity and general-purpose software packages, including:
- Microsoft Office Suite
- E-mail
- Spam controls
- Enterprise calendaring
- Virus protection
- Operating systems
- Desktop publishing
- Drawing and painting systems
- CAD
- Mathematical and statistical packages and tools, and programming languages
- Courseware and collaborative tools providing online assessments and simulations (e.g., notes, exam keys, syllabi, text, and reference materials), scanned images and digital movies
- Online databases providing reference works, access to library holdings, locator materials, and a wide variety of both general purpose and specific databases.

**Telephone Services**

Telephone Services offers phone service, cell service, and Voice over IP.

Services include:

- On-campus, local and long-distance service
- High-speed Internet service and discounts
- Electronic access to account information, billing, and payment services
- Voicemail notification via e-mail and audio access to voicemail via computer
- Caller ID and other optional features
- Sprite cellular service at preferential and discounted rates

**Television Services**

ITS Television Services provides on-campus users, including students in residence halls, who have cable-ready televisions and video receivers to access the following services:

40 channels, including two on campus channels with local original programming

The university’s enterprise streaming media solution and production facilities designed and deployed by ITS Television Services.

**FRANCES PAYNE BOLTON SCHOOL OF NURSING INFORMATION TECHNOLOGY SERVICES**

The Frances Payne Bolton School of Nursing has its own Information Technology Services Department. This department manages and oversees all computer related operations within the school. Furthermore, the team assists faculty, staff and students with any computer problems, issues, needs, or equipment purchase. The Bolton School has its own Help Desk and provides troubleshooting of problems and repairs to all school-owned equipment. The School of Nursing has two computer laboratories and a Cyber-Café where student have access to computers and network-access connection for hooking up their laptops along with wireless network access. The main computer lab is located on the second floor and the Cyber-Café is located on the ground floor. These two areas are available during the weekdays, evenings, and weekend on a 24 hours basis. The second lab (Center for Bioinformatics) is located within the Learning Resource Center (LRC) on the ground floor and is only available when not used for classroom activities during weekdays from 9:00 a.m. to 5:00 p.m.

**Learning Resource Center (LRC)**

The Learning Resource Center (LRC) is a state of the art facility comprised of four academic support units, the Cyber Café, the Center for Bioinformatics and Health Promotion, the Multi-media Simulation Center and the Clinical Teaching Center. The School of Nursing students have the opportunity to advance their nursing skills by active participation in hands-on training sessions that demonstrate the real-life aspects of nursing. Our experienced learning support staff strives for competence, confidence and excellence. The staff is available by appointment to meet with students individually in order to review a particular skill, practice with SimMan, CathSim, SimBaby, or utilize the Bioinformatics lab to work with various nursing software packages. SimMan and SimBaby are high-tech human patient simulators that breathe, have a pulse, and maintain heart-rhythm and blood pressure. They simulate almost any patient emergency situation and are programmable to provide the most life-like responses with immediate feedback for student learning. CathSim is an intravenous trainer, which uses virtual reality-based patients to teach intravenous (IV) catheterization. They give students the ability to choose the patient they will start an IV on, depending on their particular clinical setting. The program offers immediate feedback and opportunities for review to enhance the nursing skills needed in real life environments.

The School of Nursing is equipped with four technology-enhanced classrooms, which allow our faculty to use powerful tools in teaching to engage the students with learning. The classrooms are equipped with a Dell computer, VHS DVD combo player, a ceiling mounted video projection system, a document camera, wall-mounted speakers, and a touch panel controlled LCD Monitor.

**ORGANIZATIONS**

**Student Organizations**

All enrolled students are members of their respective undergraduate or graduate student organizations that promote collegialship among students and provide social, cultural activities and educational. They are also members of the National Student Nurses’ Association, and after paying dues, member of the Bolton School’s chapter of this organization. Ph.D. students elect one member and one alternate to the Graduate Student Senate of the School of Graduate Studies. All minority undergraduate nursing students are automatically members of the Minority Student Nurses Association, which fosters collegialship among minority students. The Nurses’ Christian Fellowship is an affiliate of the Inter-Varsity Christian Fellowship. Selected by the student organizations, students also are members of some standing committees of the Bolton School. There are a variety of international student associations on campus as well.

**SIGMA THETA TAU**

Sigma Theta Tau is an international professional honor society, and Alpha Mu is the chapter at the Bolton School. Members are selected from students enrolled in one of the school’s nursing programs or nurses in the community with a B.S.N., M.S.N., Ph.D. or N.D. degree. Candidates are chosen based on superior scholastic achievement, potential for leadership and desirable personal qualities.

**ALUMNI ASSOCIATION**

Upon graduation, all nursing students are inducted into the Alumni Association. This begins a life-long membership and relationship with the School of Nursing. An elected board of directors and officers administer the association. Alumni are generous in their support of the school and provide funds for students and the Bolton School through the Annual Fund and other gifts and bequests. Activities of the alumni are reported in the FPB Nursing mag-
azine published by the nursing school.

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Instructor of Nursing

Mary de Haan, M.S.N., A.P.R.N., BC
(Ursinus College)
Instructor of Nursing

Laura Distelhorst, M.S.N., R.N.
(Kent State University)
Instructor of Nursing

Kimberly A. Edwards, M.S.N., G.N.P.
(Case Western Reserve University)
Instructor of Nursing

Laurine A. Gajkowski, N.D., R.N.
(Case Western Reserve University)
Instructor of Nursing

Heather J. Hawkins, M.S.N., C.R.N.A.
(Case Western Reserve University)
Instructor of Nursing

Gloria L. Hilton, D.N.P., M.S.N., R.N.C.,
F.N.P.
(Case Western Reserve University)
Instructor of Nursing

Melissa A. Horn, M.S.N., R.N., C.N.P.
(Case Western Reserve University)
Instructor of Nursing

Marcella T. Hovancek, M.S.N., R.N.
(Case Western Reserve University)
Instructor of Nursing

freshman Coordinator

Sandra L. Jorgensen, M.S.N., R.N.
(Case Western Reserve University)
Instructor of Nursing

Rachel N. Kay, M.S.N., M.P.H., R.N.,
C.N.M.
Connie S. Kelling, M.S.N., R.N., C.N.M.
Instructor of Nursing (Case Western Reserve University) 
Melissa Seman, M.S.N., R.N., C.R.N.A. 
Instructor of Nurse Anesthesia (Case Western Reserve University) 
Tamara Schurigyn, M.S.N., C.R.N.A. 
Instructor of Nursing 
Patricia Satariano-Hayden, M.S.N., (Case Western Reserve University) 
Henry T. Prijatel, M.S.N. C.R.N.A. 
Instructor of Nursing 
Joy Sedlock Naughton, M.S.,R.N., C.N.M. (University of Akron) 
Instructor of Nursing 
Kathleen Massoli, M.S.N., C.R.N.A. (University of Akron) 
Instructor of Nursing 
Sharon A. Mathie, M.S.N., C.R.N.A. (Case Western Reserve University) 
Instructor of Nursing 
Kelly K. McConnell, M.S.N., R.N. (University of Phoenix) 
Instructor of Nursing 
Gretchen Mettler, M.S., C.N.M. (University of Minnesota) 
Instructor of Nursing 
Kathleen Meyers, D.N.P., R.N.,C.L.N.C. (Case Western Reserve University) 
Instructor of Nursing 
Sonya D. Moore, M.S.N., R.N., C.R.N.A. (University of Akron) 
Instructor of Nursing 
Joy Sedlock Naughton, M.S.,R.N., C.N.M. (University of Michigan) 
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Instructor of Nursing 
Rita M. Sfiligoi, B.S.N., M.P.A., R.N. (Cleveland State University) 
Instructor of Nursing 
Valerie Toly, M.S.N., P.N.P., R.N. (Case Western Reserve University) 
Instructor of Nursing 
Margaret A. Wheatley, Ph.D., R.N. (Case Western Reserve University) 
Instructor of Nursing and Minority Fellow, SAMHSA at ANA

**BACHELOR OF SCIENCE IN NURSING**

The B.S.N. program emphasizes intensive and early clinical experience, a strong foundation in acute and critical care nursing and a commitment to service to our community. Our students begin their clinical experience in the first term of the freshman year and complete their program with a 300-hour clinical preceptorship in the senior year. Students graduate with 1600 hours of clinical experience, far exceeding that of other schools of nursing.

The student-learning environment includes traditional classrooms, world-class clinical facilities, community settings and the Learning Resource Center (LRC). The LRC consists of four activity centers: the Clinical Teaching Center; the Center for Bio-informatics and Health Promotion; the Multimedia Simulation Center; and the Cyber Café. Clinical experiences occur in Cleveland’s nationally and internationally renowned health care facilities including the University Hospitals of Cleveland, the Cleveland Clinic and the Metropolitan Health System. Students also have extensive experience in community health departments, community centers and the Cleveland Municipal School District.

The opportunities available to students are limitless. Students are encouraged to participate in interdisciplinary research projects with senior faculty. They have the opportunity to explore health issues in the global arena, to study in international sites as part of their standard curriculum. International activities are supported by the Bolton School’s World Health Organization (WHO) Collaborating Center.

Graduates have a foundation in the discipline of nursing, demonstrate leadership in clinical practice, use clinical inquiry to advance practice, become involved in research, and assume responsibility for their own professional development.

**Characteristics of the Graduate**

- Teaches and counsels individuals, families and other groups about health, illness and health seeking behaviors
- Critiques and applies research findings to clinical practice
- Provides direct patient care and assumes leadership role in directing nursing care to individuals, groups and families
- Participates and assumes beginning leadership roles
- Uses principles of ethics and the professional code as a framework for decision making
- Works effectively as a member of an interdisciplinary health care team
- Uses effective communication techniques with diverse clients, colleagues, and information systems
- Describes process of health care policy development

**Admission Requirements**

**FRESHMAN**

- Application for undergraduate admission to the Case Western Reserve University
- Recommendation from secondary school report/counselor
- Secondary school transcript
- Writing sample
- SAT/ACT scores

**TRANSFER**

- Application for undergraduate admission to the Case Western Reserve University
- Secondary school transcript
- Teacher recommendation
- Statement of good standing
- College transcripts
- Personal statement
- SAT/ACT scores

**Degree Requirements**

Candidates for the Bachelor of Science in Nursing degree must complete the following:

1. Minimum of 125 hours as specified by the requirements with a 2.0 GPA
2. A minimum of C for all courses taken in nursing and science
3. A minimum of 50 credit hours in 300 and 400 level courses
4. Both the university mandated general education requirements and the nursing major as prescribed by the School of Nursing.

**Progression in the B.S.N. Program**

Progression in the Bachelor of Science in Nursing program is contingent upon satisfactory academic achievement in all required courses. To maintain satisfactory academic standing, ...
students must attain a GPA of 2.0 or above by the end of their junior year and must obtain a C or above in all nursing and science courses. Although the university accepts a D as a passing grade, the grading policy of the Bolton School is A, B, C, F. Students who receive two unsatisfactory grades (D or F) in nursing and/or natural and behavioral science courses will be subject to separation from the School of Nursing. See the Undergraduate Student Handbook for a description of the criteria for academic standing.

Students who receive a grade of Incomplete (I), given at the discretion of the instructor for the course, must complete course requirements by the eleventh week of the following semester. It is the student's responsibility to notify the instructor of the circumstances preventing completion of all assigned work. In the absence of notification or adequate justification, the instructor may give the student a final grade that assumes a failing grade for the missing work. If a student fails to submit the work required for removing the Incomplete by the date established by the instructor or by the eleventh week of the following semester, the grade will convert from I to F.

Students who receive an F for a nursing course must register for that course the next semester it is offered. If the overall GPA falls below the required cumulative GPA, the student is placed on academic probation. If the GPA does not improve the next semester, the Academic Standing Committee will review the student's record to determine whether extenuating circumstances warrant an additional semester of probation or separation from the university.

Curriculum
This four-year generic program for high school graduates leads to a B.S.N. degree. Upon successful completion of the program, graduates will be eligible to sit for the examination for licensure as a registered nurse (R.N.). The School of Nursing has the right to determine a student's readiness to sit for the NCLEX-RN examination and the right to restrict testing until the student demonstrates a readiness to pass this examination. This examination is given by State Boards of Nursing, and satisfactory completion of this examination enables the graduate to practice as a R.N. in the state for which the examination was written.

The B.S.N. program includes nursing, science and liberal arts courses. A minimum 125 credit hours, with at least 50 credits from upper division courses, are required for awarding of the B.S.N. degree. Students must meet the university requirements for graduation. The ratio of clinical hours to credit hours is 4 to 1, and for laboratory hours, it is 2 to 1. The program plan for entry-level students to the B.S.N. program is located on the next page.

Program Plan for Generic Baccalaureate Students

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td><strong>General Year – Fall Semester</strong></td>
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<tr>
<td>General Education Requirement</td>
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<tr>
<td>NURS 110 Foundations of the Discipline</td>
<td>1</td>
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<tr>
<td>NURS 111 Foundations of the Practice</td>
<td>3</td>
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<tr>
<td>BIOL 114 Principles of Biology</td>
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</tr>
<tr>
<td>BIOL 116 Anatomy &amp; Physiology I</td>
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<tr>
<td>SAGES University First Seminar</td>
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<td><strong>Total</strong></td>
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<tr>
<td><strong>Freshman Year – Spring Semester</strong></td>
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<tr>
<td>NURS 120 Nursing Informatics: Introduction</td>
<td>2</td>
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<td>NURS 122 Nursing Assessment</td>
<td>3</td>
</tr>
<tr>
<td>NURS 201 Nutrition</td>
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<tr>
<td>NURS 160 Community Seminar I</td>
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<tr>
<td>BIOL 119 Molecular View of Biology</td>
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<tr>
<td>BIOL 117 Anatomy &amp; Physiology II</td>
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<tr>
<td>SAGES University Seminar</td>
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<td><strong>Total</strong></td>
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<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td><strong>Sophomore Year - Fall Semester</strong></td>
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<tr>
<td>NURS 230 Nursing Care of the Adult</td>
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<td>NURS 211 Pharmacology</td>
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<tr>
<td>NURS 250 Aging in Health and Illness</td>
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<th>Course</th>
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<tr>
<td><strong>Sophomore Year - Spring Semester</strong></td>
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<tr>
<td>SOCI 203 Human Development: Medical and Social</td>
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<tr>
<td>NURS 342 Medical Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>NURS 317 Psych/Mental Health</td>
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<td>NURS 240 Nursing Care of the Adult II</td>
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<td>NURS 260 Community Seminar III</td>
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<th>Course</th>
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<tbody>
<tr>
<td><strong>Junior Year - Fall Semester</strong></td>
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<tr>
<td>NURS 351 Acute Care II</td>
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<tr>
<td>NURS 353 Critical Care</td>
<td>4</td>
</tr>
<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>NURS 315 Parents &amp; Neonates in Health &amp; Illness</td>
<td>4</td>
</tr>
<tr>
<td>NURS 316 Children &amp; Adolescents in Health &amp; Illness</td>
<td>4</td>
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<tr>
<td>STAT 201 Basic Statistics</td>
<td>3</td>
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<tr>
<td>General Education Requirement</td>
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<tr>
<td>NURS 310 Community Seminar IV</td>
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<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td><strong>Junior Year - Spring Semester</strong></td>
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</tr>
<tr>
<td>NURS 351 Acute Care II</td>
<td>4</td>
</tr>
<tr>
<td>NURS 353 Critical Care</td>
<td>4</td>
</tr>
<tr>
<td>OR</td>
<td></td>
</tr>
<tr>
<td>NURS 315 Parents &amp; Neonates in Health &amp; Illness</td>
<td>4</td>
</tr>
</tbody>
</table>
FRANCES PAYNE BOLTON
SCHOOL OF NURSING

NURS 316
Children & Adolescents in Health & Illness 4

General Education Requirement 3

NURS 320
Theoretical & Empirical Bases for Practice 3

NURS 345
Informatics III: NIS 2

NURS 360
Community Seminar V 1

Total 17

Senior Year - Fall Semester
NURS 370
Informatics 1

NURS 371
Public Health Nursing 3

NURS 372*
Health in the Global Community 3

NURS 373
Community Practice /Capstone 5

Total 12

Senior Year - Spring Semester
NURS 343
Issue and Ethics in Health Care 2

NURS 341
Concepts of Management 3

Senior Preceptorship (NURS 350,352,354,356) 9

Total 14

R.N./B.S.N. Entry Option
Registered nurse graduates of an associate or diploma program in nursing can obtain their B.S.N. by fulfilling the core requirements of the university and the upper division nursing courses developed specifically for this program.

ADMISSION REQUIREMENTS
• Completion of an accredited program in nursing with a minimum GPA of 2.5
• Current R.N. licensure in the State of Ohio
• Transcripts of all academic work
• No preadmission testing

PROGRAM REQUIREMENTS
Based on successful performance on the NCLEX-RN, 30 semester hours of proficiency in clinical nursing will be granted. Sixty semester hours of course work is the maximum amount that can be accepted as transfer credit toward the 62 hours of the university’s core requirements. However, only 15 semester hours of course work will be accepted for transfer credit after matriculation. Upon the satisfactory completion of the required 30 hours of upper division division courses and the 32 hours of proficiency in clinical nursing (total of 124 credits), students will be granted a Bachelor of Science in Nursing degree. Transfer credit will be evaluated for content and equivalence to university courses by the appropriate academic department. To be considered by transfer, course syllabi may have to be provided along with the academic transcript.

NURSING CORE REQUIREMENTS
To satisfy university core requirements, 62 semester hours of coursework must be completed in the following areas:
• English Composition
• Natural and Mathematical Sciences
• Arts and Humanities
• Social Sciences
• Global and Cultural Diversity
• Physical Education

Upper Division Nursing Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>NURS 318 Nursing in the Community</td>
<td>4</td>
</tr>
<tr>
<td>NURS 320 Nursing Research</td>
<td>3</td>
</tr>
<tr>
<td>NURS 345 Nursing Informatics III</td>
<td>2</td>
</tr>
<tr>
<td>NURS 346 Nursing Informatics IV</td>
<td>2</td>
</tr>
<tr>
<td>NURS 391 Home Health Care Nursing</td>
<td>5</td>
</tr>
<tr>
<td>NURS 392 Dynamics of Nursing</td>
<td></td>
</tr>
<tr>
<td>Practice Management</td>
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New Applications of Nursing

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Practice Management</td>
<td>4</td>
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<tr>
<td>NURS 443 Professionalism in Nursing (A,B,C)</td>
<td>3</td>
</tr>
<tr>
<td>NURS 444 Health Care Delivery, Legal and (A, B, C) Ethical Issues in Advanced Practice</td>
<td>3</td>
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</tbody>
</table>

Total 30

MASTER OF SCIENCE IN NURSING (M.S.N.)
The Master of Science in Nursing program prepares registered nurses for advanced practice specialization either as a nurse practitioner, clinical specialist, nurse midwife or nurse anesthetist. In addition, an M.S.N. in nursing informatics is offered. Dual-degree programs are offered in bioethics (M.S.N./M.A.), anthropology (M.S.N./M.A.), business administration (M.S.N./M.B.A.), and public health (M.S.N./M.P.H.).

Characteristics of the Graduate
• Develops and teaches educational offerings and provides consultation with other professionals/populations and communities about health, illness and health-seeking behavior
• Identifies clinical research problems, initiates utilization of research and participates in scientific inquiry
• Assumes functions and role of the Advanced Practice Nurse
• Assumes leadership positions in organizations at the local/state/national level
• Applies ethical principals in Advanced Practice Nursing
• Initiates interdisciplinary teams to enhance practice
• Establishes effective communication systems among clients and colleagues
• Contributes to health policy development through active participation in legislative processes

Entry Options
R.N. WITH NATIONAL CERTIFICATION IN ADVANCED NURSING PRACTICE
This M.S.N. completion program is designed to assist certified advanced practice nurses to complete a Masters of Science in Nursing degree. Registered nurse applicants must have a Bachelor in Nursing Science from an accredited nursing program. Applicants must have certification from a national accrediting organization as a nurse practitioner, clinical nurse specialist, nurse midwife, nurse anesthetist or AORN first assistant. The national certification in advanced nursing practice takes the place of the clinical coursework in the specialty where the person holds certification. A Master of Science in Nursing can be obtained by completing 18 credits at the Bolton School of Nursing. These include the core courses in Inquiry, Professional Development and Advanced Practice.

Course Hours

656

CASE WESTERN RESERVE UNIVERSITY
R.N./M.S.N. Entry Option
Registered nurse graduates of an associate degree or diploma nursing program may enter the Masters of Nursing program after completing undergraduate pre-requisites for graduate level nursing courses.

Undergraduate Prerequisites to M.S.N. Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Fall Semester Weekend Classes</td>
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<tr>
<td>NURS 392 Dynamics of Nursing Practice Management</td>
<td>4</td>
</tr>
<tr>
<td>NURS 393 New Applications of Nursing Practice Management</td>
<td>4</td>
</tr>
<tr>
<td>January Intensive Classes</td>
<td></td>
</tr>
<tr>
<td>NURS 345 Advanced Assessment</td>
<td>2</td>
</tr>
<tr>
<td>NURS 318 Nursing in the Community</td>
<td>4</td>
</tr>
<tr>
<td>May Intensive Classes</td>
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</tr>
<tr>
<td>NURS 346 Nursing Informatics IV</td>
<td>2</td>
</tr>
<tr>
<td>NURS 320 Nursing Research</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
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</tbody>
</table>

R.N. WITH A B.S. OR B.A. DEGREE
Applicants with a B.A. or B.S. degree from an accredited college or university in a field other than nursing and who have graduated from NLNAC or AACN accredited associate degree or diploma programs may submit a portfolio detailing professional accomplishments and experiences. If the portfolio is approved, the applicant may enter the Master of Science in Nursing program directly.

R.N. WITH B.S.N. DEGREE
Applicants with a B.S.N. degree from an AACN or NLNAC accredited nursing program are admitted directly into the Master of Science in Nursing program.

ADMISSION REQUIREMENTS
- Three professional recommendations (1 clinical, 1 academic, 1 current)
- Eligible for R.N. licensure in Ohio
- Satisfactory scores on the Miller Analogies Test (MAT) or the Graduate Record Examination (GRE).
- Completion of an accredited first professional degree program in nursing.
- Within 5 years of admission and prior to registering for NURS 425, satisfactory completion of a college or university statistics course with content comparable to NURS 201.
- Applicants who do not meet the above requirements may be referred to the M.S.N. Admissions Committee for special consideration, and may be required to fulfill additional prerequisites and demonstrate clinical nursing proficiency.

PROGRAM REQUIREMENTS
Candidates for a Master of Science in Nursing with a B.S.N. degree or a Certificate in Professional Nursing must satisfactorily complete a minimum of 36 semester hours of graduate study or 18 credits if admitted in the Master’s completion option. Students seeking specialty certification as a nurse practitioner, clinical specialist, nurse midwife or nurse anesthetist must complete the specified Nursing Clinical courses. A maximum of 9 semester hours of credit in approved graduate courses, where a grade of B or above was attained, may be accepted from another accredited university. This credit will be evaluated for transfer upon receipt of the official transcript and syllabi for the courses to be reviewed. The clinical interests, learning needs and career goals of students are considered when the academic program is designed. Research experience forms an integral part of graduate study in nursing. Degree requirements must be completed within five years after initial enrollment in the School of Nursing. The ratio of clinical class-
partners, these projects are a unique component of the Bolton School’s master’s curriculum. Community agencies that participate include but are not limited to the Hospice of the Western Reserve, The Heath Museum of Cleveland, the American Red Cross Greater Cleveland Chapter, school districts in the Cleveland area, and the Cleveland Municipal School District.

PROGRESSION REQUIREMENTS

Progression in the M.S.N. program is contingent on a cumulative GPA of 3.0 and passing grades in all courses (A, B, C, P or S). If the cumulative GPA falls below 3.0 during any semester, the student will be placed on academic probation. To be removed from probation, the student must have a cumulative GPA of 3.0 or higher in the next academic semester he/she is registered. If the student fails to be removed from academic probation at this time, he/she may be separated from the School of Nursing.

The grade of incomplete (I) will be given at the discretion of the instructor for work not completed in the semester. The “Arrangement to Resolve a Grade of Incomplete” form must be completed prior to the end of the semester or the instructor may assign a grade of U or F. A grade of I must be removed by the end of the semester following the one in which the course was taken or before the student enrolls in a course for which the initial course is a prerequisite. No credit is given for an I grade. A student who receives a grade of F or U for a required course must register for the course the next semester it is offered to continue in the M.S.N. program. If the grade of U or F is in a course that is not required for the M.S.N. program, the student may register for the same course or a substitute course and achieve a passing grade to continue in the M.S.N. program. If the student receives a grade of F or unsatisfactory performance (F, U & NP) in two courses, he/she will be excluded from the Bolton School.

DEGREE REQUIREMENTS

The Master of Science in Nursing program requires a minimum of 36 semester hours of graduate credit for the student who enters with a B.S.N. degree. Other degree requirements must be fulfilled for those entering with the portfolio or R.N./M.S.N. entry options. A maximum of 9 semester hours of credit in approved graduate courses, where the student obtained a grade of B or above, may be transferred to meet program requirements. To be awarded a M.S.N. degree, the student must have a cumulative GPA of 3.0 and received satisfactory grades in all nursing courses taken for credit as a M.S.N. student. Degree requirements must be completed within 5 years of initial enrollment.

NURSE PRACTITIONER

Nurse practitioners promote optimal health, detect illness and facilitate restoration and maintenance of health. They often function independently in a variety of settings. Two specialties are available for acute care nurse practitioners and six specialties are available in primary care. These programs contain at least 500 hours of clinical experience. Graduates are eligible to sit for the national certification examinations for these specialties.

Acute Care Nurse Practitioner

There are practice requirements for these specialties. One year of experience in acute care is required for the Acute Care Nurse Practitioner. A concentration in flight nursing is available within the Acute Care Nurse Practitioner major. One year of experience in neonatal intensive care is required for the Neonatal Nurse Practitioner.

ACUTE CARE NURSE PRACTITIONER PROGRAM PLAN

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>NURS 405</td>
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<tr>
<td>Inquiry I</td>
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</tr>
<tr>
<td>NURS 438</td>
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</tr>
<tr>
<td>Theoretical Foundations of Acute Care Nursing</td>
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<tr>
<td>NURS 453</td>
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</tr>
<tr>
<td>Physiological Foundations of Advanced Practice</td>
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<tr>
<td>NURS 459</td>
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<tr>
<td>Assessment for Advanced Practice</td>
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Spring

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<td>Pharmacology and Therapeutics for the Advanced Practice Nurse</td>
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<td>NUNP 443</td>
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<tr>
<td>Acute Health Problems of the Adult</td>
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<tr>
<td>NURS 425</td>
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<tr>
<td>Inquiry II</td>
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THE FOLLOWING COURSES MAY BE TAKEN IN ADDITION TO COMPLETE A FLIGHT NURSE CONCENTRATION:

<table>
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CARDIOVASCULAR SUBSPECIALTY PROGRAM SAMPLE PLAN

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### NEONATAL NURSE PRACTITIONER PROGRAM PLAN

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| **Summer** | |
| NURS 502 | 2 |
| NUNP 413 | 3 |
| Total | 5 |

| **Fall II** | |
| NUNP 414 | 5 |
| NURS 503 | 1 |
| NUNP 444A | 1 |
| Total | 12 |

### ADULT NURSE PRACTITIONER PROGRAM PLAN

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| **Spring** | |
| NURS 425 | 3 |
| NURS 430 | 3 |
| NUNP 413 | 3 |
| NURS 443A | 1 |
| NUNP 443B | 1 |
| NUNP 443C | 1 |
| Total | 12 |

| **Summer** | |
| NURS 502 | 2 |
| NUNP 432 | 5 |
| NURS 443A | 1 |
| Total | 12 |

| **Fall II** | |
| NUNP 414 | 5 |
| NURS 503 | 1 |
| NUNP 444A | 1 |
| Total | 12 |

| **Summer** | |
| NURS 502 | 2 |
| NUNP 433 | 3 |
| Total | 12 |

*The Advanced Practice Core courses are co-requisites or prerequisites for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.*

### Primary Care Nurse Practitioners

This major is now offered in distance format with only 8 trips to Cleveland if you are a full-time student.
Adult Oncology/Palliative Care Nurse Practitioner
This option will begin fall 2009. See website for program plan.

Family Nurse Practitioner Program Plan
This major is now offered in distance format with only 8 trips to Cleveland if you are a full-time student.

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* *EPBI 490 Epidemiology* 3

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**Accumulated Total** 40

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**Total** 7

**SAMPLE PLAN FOR ADDING INFECTION CONTROL TO AN NP TRACK**

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**Accumulated Total** 40

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**Total** 12

**Accumulated Total** 40

* The Advanced Practice Core courses are co-requisites or pre-requisites for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.

**SAMPLE PLAN FOR ADDING INFECTION CONTROL TO AN NP TRACK**

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**Total** 12

**Accumulated Total** 40
## GERONTOLOGICAL NURSING PROGRAM PLAN

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### NURS 503 Inquiry Practicum 1
### NURS 443B Role & Development 1
### NURS 443C Teaching & Learning 1
### NURS 444A Ethics in Advanced Practice 1
### NURS 444B Finance in Advanced Practice 1
### Total 9 Accumulated Total 43

* The Advanced Practice Core courses are co-requisites or pre-requisites for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.

## PEDIATRIC NURSE PRACTITIONER PROGRAM PLAN

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### NURS 443A Collaboration & Consultation 1
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### NURS 443C Teaching & Learning 1
### NURS 502 Inquiry III 2
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## PSYCHIATRIC MENTAL HEALTH NURSE PRACTITIONER PROGRAM PLAN

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**Summer**

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* The Advanced Practice Core courses are co-requisites or pre-requisites for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.

### WOMEN'S HEALTH NURSE PRACTITIONER PROGRAM PLAN

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*Notes: The Advanced Practice Core courses are co-requisites or pre-requisites for the clinical nursing courses. Clinical Nursing Courses must be taken in the semester and sequence listed above. Clinical course availability is based upon enrollment.

**NURSE ANESTHESIA**

Nurse anesthesia focuses on preoperative evaluation, intra-operative management and postoperative evaluation of patient anesthesia care. Nurse anesthetists are primarily responsible for direct patient care and are prepared as expert clinicians.

Clinical courses provide students with opportunity to give direct patient care, participate in staff education programs and identify clinical topics for research. Students work one-on-one with a clinical preceptor with expertise in nurse anesthesia. The student will take part in administering general and regional anesthesia in persons of all ages. The management of emergency operations, obstetrics, pediatrics and neurosurgery are an integral part of the clinical experience. Graduates will be eligible to take the certification examination administered by the Council on Certification of Nurse Anesthetists.

All applicants must have at least one year of recent experience in one of the following acute care settings: recovery room, emergency room, or medical, surgical, neonatal or pediatric intensive care. Applicants for the Nurse Anesthesia Program will be reviewed on a rolling basis.
NURSE MIDWIFERY

Nurse-midwifery practice is the independent management of women’s health care, focusing particularly on pregnancy, childbirth, the postpartum period, care of the neonate, and the family planning and gynecological needs of women from adolescence to senescence. Certified nurse-midwives practice within a health care system that provides for consultation, collaboration or referral as indicated by the health status of the client. The CNM practices in accord with the Standards for the Practice of Nurse-Midwifery, as defined by the American College of Nurse-Midwives (ACNM).

Nurse-midwife students work individually with a clinical preceptor in a variety of out-patient, in-patient, and out of hospital settings. Graduates will be eligible to take the certification examination administered by the American Midwifery Certification Board (formerly the ACNM Certification Council, Inc.). With the addition of 3 clinical hours in NURS 559 students are eligible for dual certification in Women’s Health.

NURSE MIDWIFERY

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| Accumulated Total                           | 48    |

CLINICAL NURSE SPECIALIST

There are two specialty tracks in the Clinical Nurse Specialist program, Medical-Surgical Clinical Nurse Specialist, and Public Health Clinical Nurse Specialist. Clinical Nurse Specialists are expert clinicians in a specialized area of nursing practice. The specialty may be identified in terms of: A population, a setting, a disease or medical subspecialty, a type of care, or a type of problem. Clinical Nurse Specialists practice in a wide variety of health care settings. In addition to providing direct patient care, the CNS influences care outcomes by providing expert consultation for nursing staffs and by implementing improvements in health care delivery systems. The focus of the public health nurse specialist is on...
mobilizing and empowering the community to act on its own behalf in matters affecting health and well-being. Interventions by the public health specialist are designed in collaboration with the community and interdisciplinary personnel. Such interventions focus on the promotion, protection, and restoration of health and the prevention of disease and disability. Graduates of these tracks are eligible to sit for certification examinations as a clinical nurse specialist.

### MEDICAL-SURGICAL NURSING

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### PUBLIC HEALTH NURSING

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### INFECTION CONTROL OPTION

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NURSING INFORMATICS
The Nursing Informatics specialization emphasizes the preparation of graduates who can analyze nursing information requirements, design systems, manage information and its technological requirements, identify system implementation strategies, implement user training strategies, and evaluate system effectiveness in clinical, educational, administrative, and research venues. Students in Nursing Informatics will specialize in an area of interest within Nursing Informatics. These areas include but are not limited to: systems analysis and design, emerging technologies, database management, and organizational implementation of information systems. An internship of one semester will provide an opportunity for the student to obtain practical experience as a Nursing Informatics Specialist (NIS) in a variety of clinical, educational, research and administrative settings. The program includes 500 hours that may be credited toward the required 2000 hours for certification as a Nursing Informatics Specialist through the ANCC.

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**Spring**

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**Accumulated Total**

| Total | 37 | 52 |

M.S.N./M.A. (ANTHROPOLOGY) JOINT DEGREE

The Master of Science in Nursing/Master of Arts in Anthropology joint degree provides students with the unique combination of crosscultural expertise in medical anthropology and clinical expertise in nursing. Students must complete a minimum of 19 credits in nursing core courses, 12 to 22 credits in clinical major courses, and a minimum of 18 credits in anthropology courses, distributed as indicated below. The actual number of credits depends upon the major selected. This curriculum plan reflects clinical nursing majors other than nurse anesthesia and community health. Choice of electives should guarantee that minimum credit requirements are met. All students must pass the Masters Qualifying Examination in Anthropology.

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<tr>
<td>NURS 444C</td>
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<tr>
<td>NURS 425</td>
<td>3</td>
</tr>
<tr>
<td>NURS 502</td>
<td>2</td>
</tr>
<tr>
<td>NURS 443A</td>
<td>1</td>
</tr>
<tr>
<td>NURS 443B</td>
<td>1</td>
</tr>
<tr>
<td>NURS 443C</td>
<td>1</td>
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</table>

**Accumulated Total**

| Total | 37 |

FRANCES PAYNE BOLTON SCHOOL OF NURSING
Approved elective course in Anthropology OR Nursing 3
Total Semester Hours 55-69

M.S.N./M.A. (BIOETHICS) JOINT DEGREE
The Master of Science in Nursing/Master of Arts in Bioethics joint degree program is designed to provide nurses with the concepts essential to ethics and ethical decision-making. This program is relevant for nurses who are family advocates within health care systems. The total M.S.N./M.A. degree requirements are 53-63 credits.

<table>
<thead>
<tr>
<th>Required Nursing Courses</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Major and Pre-requisites</td>
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<tr>
<td>NURS 453 Physiological Foundations</td>
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<tr>
<td>NURS 459 Integrated Assessment</td>
<td>3</td>
</tr>
<tr>
<td>NURS 430 Pharmacology and Therapeutics</td>
<td>3</td>
</tr>
<tr>
<td>NURS 405 Inquiry I</td>
<td>3</td>
</tr>
<tr>
<td>NURS 425 Inquiry II</td>
<td>3</td>
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<tr>
<td>NURS 443 A, B, C Professionalism in Nursing</td>
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<tr>
<td>Total</td>
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<table>
<thead>
<tr>
<th>Required Bioethics Courses</th>
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<tbody>
<tr>
<td>BETH 401 Foundations in Bioethics I</td>
<td>6</td>
</tr>
<tr>
<td>BETH 402 Foundations in Bioethics II</td>
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<tr>
<td>BETH 403 Clinical Bioethics</td>
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<tr>
<td>Approved electives</td>
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<tr>
<td>NURS 502 Inquiry III</td>
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<td>Combined Total Credits</td>
<td>52-62</td>
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<td>Total</td>
<td>31-41</td>
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</table>

M.S.N./M.B.A. JOINT DEGREE
The Master of Science in Nursing/Masters in Business Administration joint degree program is designed for nurses with managerial and organizational skills needed to manage patient care environments or health programs and to participate in the strategic and operational leadership of health care agencies. This program integrates nursing and management courses taken concurrently. A three-hour practicum must be taken in one semester.

**Orientation and Statistics Preparation**

**WORKSHOPS BEGIN WEEK BEFORE FALL COURSES**

<table>
<thead>
<tr>
<th>Semester I (Fall)</th>
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<tbody>
<tr>
<td>MGMT 403 Leadership Assessment and Development 3</td>
</tr>
<tr>
<td>QUMM 414 Statistics and Decision Making 3</td>
</tr>
<tr>
<td>ACCT 401 Financial Reporting and Control 3</td>
</tr>
<tr>
<td>BAFI 402 Financial Management 3</td>
</tr>
<tr>
<td>NURS 405 Inquiry I: Theoretical Foundations 3</td>
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<table>
<thead>
<tr>
<th>Semester II (Spring)</th>
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<tbody>
<tr>
<td>MGMT 499 Strategic Issues and Application 3</td>
</tr>
<tr>
<td>MGMT 413 Human Value in Organizations 3</td>
</tr>
<tr>
<td>MIDS 409 Systems Design and Management 3</td>
</tr>
<tr>
<td>NURS 425 Inquiry II 3</td>
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<tr>
<td>NUND 483 Health Care Policy and Planning and Information Management Systems 3</td>
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<table>
<thead>
<tr>
<th>Semester III (Fall)</th>
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<tbody>
<tr>
<td>OPMT 405 Operations Management 3</td>
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<tr>
<td>MRKT 409 Marketing 3</td>
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<tr>
<td>NURS 468 Continuous Improvement in Health Care (recommended) 3</td>
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<tr>
<td>ECON 403 Economics 3</td>
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<td>NURS 502 Inquiry III 2</td>
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<tr>
<td>Total 17</td>
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</tbody>
</table>

Note: This program may be done part time. See advisor for details.

M.S.N./M.P.H. DEGREE
The focus of the M.S.N. clinical specialization is on the development of skills necessary for the comprehensive assessment and diagnosis of the health status of communities and populations. The use of program planning models for development of community or population need based programs is emphasized and thorough program evaluation techniques are stressed. The Master of Public Health Program, operated by the School of Medicine and the School of Graduate Studies, prepares students for the broad mission of public health, defined as “enhancing health in human populations through organized community effort” utilizing education, research and community service. The dual-degree program will not only prepare nurses to sit for the American Nurses Credentialing Center (ANCC) clinical specialty exam in Advanced Public Health Nursing, but also will prepare nurses to assume leadership roles in the overall planning, organizing, and delivery of care to populations and communities. See website: http://fpb.case.edu/MSN/MSNMPH.shtml

<table>
<thead>
<tr>
<th>Semester I (Fall)</th>
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<tbody>
<tr>
<td>NURS 405 Inquiry I 3</td>
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</table>

| MURS 456 Issues in Health Care Care Management (or WSOM electives) |
|-----------------------|---|
| Total 17 |

<table>
<thead>
<tr>
<th>Semester IV (Spring)</th>
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<tbody>
<tr>
<td>NURS 499 The Nurse Executive 3</td>
</tr>
<tr>
<td>MGMT 498 Action Learning Consulting Project 3</td>
</tr>
<tr>
<td>NURS 471 Organizational Dynamics (elective) 3</td>
</tr>
<tr>
<td>WSOM electives 6</td>
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<table>
<thead>
<tr>
<th>Semester V (Fall)</th>
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</thead>
<tbody>
<tr>
<td>Open elective (WSOM) 3</td>
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<tr>
<td>Open elective (WSOM) 3</td>
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<tr>
<td>NURS 577 MSN/MBA Management Practicum 9</td>
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<td>Total Semester Hours 71</td>
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</tbody>
</table>

Note: This program may be done part time. See advisor for details.
JOINT PROGRAMS WITH FRONTIER NURSING SERVICE

M.S.N./CNEP
The Community-Based Nurse-Midwifery Education Program (CNEP) is a distance education program leading to a certificate in nurse-midwifery. Students complete course and clinical work in their communities. CNEP is housed in the Frontier School of Midwifery and Family Nursing in Hyden, Kentucky. The program is administered by a Certified Nurse-Midwife with over 40 Certified Nurse-Midwifery faculty members. Through an innovative affiliation agreement, students attending CNEP receive full course credit towards a Master’s Degree in Nursing from Case Western Reserve University. Degree requirements must be completed within 5 years of completion of CNEP.

Course of Study for M.S.N./CNEP Curriculum

SCIENTIFIC INQUIRY
- NURS 405 3
- NURS 425 3
- NURS 502 2
- NURS 503 1-2
- Total 10-11

M.S.N./CFNP
The Community-Based Family Nurse Education Program (CFNP) is an innovative joint degree program with the Frances Payne Bolton School of Nursing at Case Western Reserve University. The program is designed for aspiring family nurse practitioners who complete course and clinical work in their communities. The program is designed with a 24 month full-time or a 36 month part-time option. The Master’s degree is awarded by Case Western Reserve University. Degree requirements must be completed within 5 years of completion of CFNP courses at Frontier Nursing Service. For more information, contact:

CASE WESTERN RESERVE UNIVERSITY
Frances Bolton Payne School of Nursing Student Services
and D.N.P. (Level IV) degrees and prepares students for roles in a variety of advanced practice nursing specialties with additional electives as clinical or educational leaders.

- Post Master's D.N.P. Program: The post-M.S.N. portion of the D.N.P. program prepares nurses with M.S.N. degrees to be clinical leaders. Students acquire in-depth knowledge in nursing theory, research, policy, and education or management.

Scholarly Project: All students completing the D.N.P. program prepare a scholarly project.

**Characteristics of the Graduate**

- Initiates and develops educational offerings and provides consultation with other professions/populations and communities about health, illness and health seeking behavior
- Initiates, designs, conducts, directs and reports clinical research studies or projects
- Assumes functions and role of Advanced Practice Nurse and evaluates system-wide processes and directs changes in outcomes
- Assumes leadership positions of increasing complexity at the local/state/national levels
- Analyzes ethical issues in generating policy and practice recommendations
- Develops systems to establish and promote interdisciplinary teams
- Evaluates communication systems and generates new models to effect system change
- Analyzes impact of health care policy on delivery systems and implements changes

**Progression in the D.N.P. Program**

**ACADEMIC PERFORMANCE**

Progression in the Doctor of Nursing Practice degree program is contingent upon satisfactory academic achievement in all required courses. To maintain satisfactory academic standing, students enrolled for the postlicensure component of the D.N.P. degree must attain a grade point average of 3.0 or above. C, the lowest passing grade is regarded as borderline performance. An overall GPA of 3.0 is required to progress to the post-licensure component of the Graduate Entry D.N.P. Program.

If a student’s semester grade point average is less than 3.0 or the overall GPA is less than 3.0, the student will be placed on probation and an individualized plan will be developed and documented. The student will be removed from probation when the overall GPA is 3.0 or higher. If the student is on probation for two semesters, the student’s record will be reviewed by the Executive Committee to determine whether extenuating circumstances warrant an additional semester of probation or whether the student should be separated from the program.

D.N.P. students in the postlicensure component of the Doctor of Nursing Practice program must select the letter grade option (A, B, C, F, or W) when registering for all required nursing courses (except scholarly project or practicum hours) and achieve a minimum grade point average of 3.0 for the semester.

In the event that a student’s cumulative grade point average falls below a 3.0 during any semester of matriculation, the student will be placed on academic probation. In order to remove the academic probation the student must, in the next semester for which he or she is registered, achieve grades at a level sufficient to increase the overall GPA to a 3.0. If a student on academic probation fails to be removed from that status within one academic semester following the one with academic difficulty, the student will be excluded from the program.

Students who enter the Doctor of Nursing Practice program at the prelicensure level must achieve a cumulative grade point average of 3.0 or above in all courses taken for credit as a D.N.P. student at the Frances Payne Bolton School of Nursing to be awarded the D.N.P. degree. Students who enter the Doctor of Nursing Practice program at the postlicensure level must achieve a cumulative grade point average of 3.0 or above in all courses taken for credit as a D.N.P. student at the Frances Payne Bolton School of Nursing to be awarded the D.N.P. degree. All D.N.P. students must successfully defend the scholarly project.

When a student receives a grade of F for a required course, the student must register for that course the next semester in which the course is available. Doctor of Nursing Practice degree students who receive two failing grades indicating unsatisfactory performance (F, NP, or U) in required courses will be excluded from the School of Nursing.

Progression from one semester to the next in the Prelicensure Component of the D.N.P. Program is contingent upon passing grades in all courses taken in the preceding semester.

The grade of incomplete (I) will be given at the discretion of the instructor for work not completed in the semester. A grade of I must be removed by the end of the semester following the one in which the course was taken or before the student enrolls in a course for which the initial course is a prerequisite. No credit is given for an I grade. The I will remain a permanent part of the transcript if the student fails to complete course requirements within the next semester.

**Approval of R.N. Licensure Applications**

In order to have the “Program Completion” section of the application R.N. Licensure approved by the Program Director, students must meet the following criteria:

1) Qualify for the “Certificate of Professional Nursing”/MN degree
2) Demonstrate readiness to take the NCLEX-RN Examination by achieving at least a minimum score on a NCLEX-RN predictor exam. (Refer to separate procedure on “Demonstrating Readiness to the NCLEX-RN Exam for details).

**Scholarly Project**

The D.N.P. program culminates in successful completion of a scholarly project, which may be an independent thesis or an applied research project. The scholarly project is designed by the student in collaboration with a 3-member committee approved by the Director of the D.N.P. Program. The project must be a significant contribution to existing nursing knowledge and suitable for publication in a peer reviewed journal or a book. The procedures and written product must conform to the regulations of the Bolton School of Nursing. The student must follow the appropriate approval process before applying for IRB approval (if necessary) and proceeding with the scholarly project. For a description of the independent scholarly project, see the website:

http://fpb.case.edu/DNP/program.shtml

The scholarly project could be a program needs assessment with program development and evaluation, evaluation of an existing program, development of an assessment instrument/protocol for clients, a cost/benefit analysis of program models, research or other scholarly project as approved. The scholarly project will be developed in consultation with the student’s project committee and approved by the committee in a formal proposal defense.

Students must successfully defend their completed scholarly project in an oral examination with their committee members who are responsible for certifying that it meets acceptable scholarly standards. The defense is open to faculty and students; the chair determines whether the defense is open to those outside of
the university. The committee determines the adequacy of the oral examination and written product. A student will pass if two or more of the committee members agree that the student successfully responded to questions during the defense and the written product met scholarly standards.

Degree Requirements
Candidates for the Doctor of Nursing Practice degree must complete all required courses, including the courses required in their master level clinical major. Post licensure students will be awarded a Master of Science in Nursing if they meet the degree requirements for this degree.

TIME FRAME FOR COMPLETION OF DEGREE:
• Graduate entry students (non-nurses) must complete the program within 7 years of initial enrollment.
• Post-licensure entry students must complete the D.N.P. program within 5 years.
• Post-master's entry students must complete the D.N.P. program within 4 years.
• D.N.P. students who do not complete the D.N.P. program within the above timeframe should send a letter to the Director of the Doctor of Nursing Practice program with a request for an extension and a proposed plan for completing the remaining requirements.
• Records of students who do not complete the program within the specified timeframe will be re-evaluated in terms of the curriculum in effect at the time of review. The student may be required to take additional course work to graduate.

Graduate entry D.N.P. Program
The first four semesters of the Graduate Entry Program is the prelicensure portion that includes all course work necessary to sit for the professional nursing licensing examination (NCLEX-RN) required to practice nursing. During this portion of the program, the student receives instruction in nursing theory, clinical skills, and the nursing sciences. Effective through the class entering fall 2008, students who successfully complete the prelicensure curriculum are awarded the Certificate of Professional Nursing. Beginning with the class entering fall 2009, the program will allow the approval of the Ohio Board of Regents, to award the MN (Master of Nursing) degree on successful completion of the pre-licensure curriculum. After passing the NCLEX, the student may practice as a registered nurse (R.N.) while completing the post licensure portion of the D.N.P. program.

ENTRY OPTIONS
• Post-Baccalaureate: Graduates from an accredited college or university with a baccalaureate degree in a non-nursing field.
• Senior Year in Professional Studies: Students currently enrolled in a 4-year baccalaureate program at an accredited liberal arts college after 3 years of study.

ADMISSION REQUIREMENTS
• B.A. or B.S. with acceptable GPA (3.0 cumulative; 2.5 natural science; 2.5 behavioral sciences). A grade of C (2.0) or higher is required for individual pre-requisite courses.
• English Composition: One course or integrated equivalent; at least 3 credits.
• Chemistry: One course in general or inorganic chemistry and one course in organic chemistry or biochemistry equivalent to Case Western Reserve University’s BIOL 121 within 5 years prior to enrollment (lab preferred). At least 6 credits total.
• Human Anatomy and Physiology: At least 6 credits within 5 years prior to enrollment.
• Microbiology: one course with lab within 5 years prior to enrollment. At least 4 credits.
• Sociology or Anthropology: one course, at least 3 credits. Psychology: one course, at least 3 credits.
• Human Growth and Development Across the Lifespan: one course at least 3 credits.
• Statistics: one course equivalent to Case Western Reserve University’s NUND 201 or STAT 201 (must include ANOVA) required within 5 years of enrollment in the program. At least 3 credits.
• GRE General Test: Satisfactory scores required (minimum of Verbal-500, Quantitative-500, and either Analytical-500 OR Analytic Writing 4.0)
• Miller Analogies Test (MAT): Satisfactory scores required (minimum of 45 (before 10/04) or 400 (after 10/04)

Senior Year in Professional Studies
A student in college with a formal arrangement with the Bolton School may enroll in the Senior Year in Professional Studies leading to R.N. licensure and then graduate study in nursing.

The Bolton School has existing SYPS agreements with some undergraduate institutions. Contact the Office of Student Services for more information. Applicants whose undergraduate institutions do not have an agreement with the Bolton School may arrange a Senior Year in Professional Studies on an individual basis. Information about arranging this program is available from Office of Student Services.

Students earn a B.A. or B.S. from the participating college or university upon successful completion of the first year of the D.N.P. program.

Students at Case Western Reserve University must apply through the undergraduate dean of their respective schools at the beginning of their junior year. To be awarded a B.S. or B.A. degree at the end of the successful completion of the first year of the D.N.P. program, the following must be met:
• Completion of the Case Western Reserve University Core Curriculum and two semesters of physical education, unless excused from the latter.
• Completion of three quarters of the major and minor concentration requirements
• Completed at least 90 semester hours of academic credit of which the final 60 hours being while in residence with no more than 6 semester hours earned in courses taken in another institution, either by cross-registration or by approved transfer of credit.

FRANCES PAYNE BOLTON
SCHOOL OF NURSING

GENERAL BULLETIN 2009-2011

GRADUATE ENTRY DNP
PRE-LICENSURE CURRICULUM
2008-2009

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>NUND 401 Introduction to the Discipline and Practice of Nursing (didactic 4.0, role seminar 1.0, lab 1.0, clinical 1.5)</td>
<td>7.5</td>
</tr>
<tr>
<td>NUND 402 Introduction to Pharmacology (didactic 3.0)</td>
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</tr>
<tr>
<td>NUND 403A Nursing Informatics A (didactic 1.0)</td>
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<tr>
<td>NUND 404A Inquiry for the Graduate Entry DNP A (didactic 2.0)</td>
<td>2</td>
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<tr>
<td>NUND 410 Health Assessment (didactic 1.5, lab 1.0)</td>
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<tr>
<td>NUND 413 Issues and Ethics in Healthcare (didactic 2.0)</td>
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### GRADUATE ENTRY DNP PRE-LICENSURE CURRICULUM 2009-2011

<table>
<thead>
<tr>
<th>Semester 1 (Fall, 2009)</th>
<th>Course</th>
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<tr>
<td>NUND 401</td>
<td>Introduction to the Discipline and Practice of Nursing (didactic 4.0, role seminar 1.0, lab 1.0, clinical 1.5)</td>
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<tr>
<td>NUND 402</td>
<td>Introduction to Pharmacology (didactic 3.0)</td>
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<tr>
<td>NUND 403</td>
<td>Nursing Informatics (didactic 1.0)</td>
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<td>NUND 404A</td>
<td>Inquiry for the Graduate Entry DNP A (didactic 2.0)</td>
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<tr>
<td>NUND 410</td>
<td>Health Assessment (didactic 1.5, lab 1.0)</td>
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<tr>
<td>NUND 413</td>
<td>Issues and Ethics in Healthcare (didactic 2.0)</td>
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<tr>
<td>NUND 405</td>
<td>Altered Human Functioning (didactic 3.0)</td>
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<tr>
<td>NUND 406</td>
<td>Aging in Health and Illness (didactic 2.0)</td>
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<tr>
<td>NUND 407</td>
<td>Acute Care Nursing of Adults (didactic 4.0, lab 0.5, clinical 4.0)</td>
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<td>NUND 408</td>
<td>Introduction to Genetic Concepts in Nursing (didactic 1.0)</td>
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<td>NUND 409A</td>
<td>Professional Role Seminar: Leadership (seminar 1.0)</td>
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<tr>
<td>NUND 411A</td>
<td>Public Health Nursing A (didactic 1.0, clinical 1.0)</td>
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### Semester 3 (Fall, 2010)

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<tr>
<td>NUND 404B</td>
<td>Inquiry for the Graduate Entry DNP B (didactic 2.0) (intensive)</td>
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<td>NUND 404C</td>
<td>Inquiry for the Graduate Entry DNP C (didactic 2.0)</td>
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<tr>
<td>NUND 409B</td>
<td>Professional Role Seminar: Policy (seminar 1.0) (tentative title)</td>
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<tr>
<td>NUND 341</td>
<td>Concepts of Management (didactic 2.0)</td>
</tr>
<tr>
<td>NUND 414 OR 416</td>
<td>Child/Adolescent in Health &amp; Illness OR Parents &amp; Neonates in Health &amp; Illness (Didactic 2.0, clinical 2.0, lab 0.5)</td>
</tr>
<tr>
<td>NUND 417</td>
<td>Psychiatric-Mental Health Nursing (didactic 2.0, clinical 2.0)</td>
</tr>
<tr>
<td>NUNP 410</td>
<td>Health Promotion (didactic 1.0) (web-based)</td>
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<tr>
<th>Semester 4 (Spring, 2011)</th>
<th>Course</th>
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<tr>
<td>NUND 403B</td>
<td>Nursing Informatics B (didactic 1.0)</td>
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<tr>
<td>NUND 411B</td>
<td>Public Health Nursing B (didactic 1.0, clinical 1.0)</td>
<td>2</td>
</tr>
<tr>
<td>NUND 414</td>
<td>Concepts of Management (didactic 2.0)</td>
<td>2</td>
</tr>
<tr>
<td>NUND 417</td>
<td>Psychiatric-Mental Health Nursing (didactic 2.0, clinical 2.0)</td>
<td>4</td>
</tr>
<tr>
<td>NURS 502</td>
<td>Inquiry III Evidence Based Nursing Practice (didactic 2.0) (intensive)</td>
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</tr>
<tr>
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</table>
NUND 418
Integrated Nursing Practice (didactic 2.0, clinical 3.5) 5.5

NURS 459
Integrated Assessment for Advanced Nursing Practice (Didactic 2.0, lab 1.0) 3

Total 18

Progression from one semester to the next in the Pre-licensure, M.S.N. and D.N.P. components of the D.N.P. Program is contingent upon passing grades in all courses taken in the preceding semester and an overall GPA of 3.0. (Refer to the School of Nursing Bulletin for full policy on progression.)

NOTE: Successful completion of all pre-licensure courses is necessary to sit for the Professional Nursing Licensing Examination (NCLEX-RN). The Bolton School has the right to determine a student’s readiness to sit for the examination.

MENTAL HEALTH NURSING

D.N.P. Postlicensure Program

After completing the prelicensure portion of the D.N.P. program, students select an advanced practice specialty. R.N.s with a diploma, ADN, B.S.N., or non-nursing B.A. or B.S. may enter in this portion of the D.N.P. program. For those entering with a B.S.N., course work consists of master level courses in the chosen specialty, D.N.P. core courses and a D.N.P. thesis or research project. After successful completion of the course requirements for masters clinical track, the student receives a Masters of Science in Nursing degree and is eligible to sit for national certification examinations in advanced nursing practice. The Acute Care Nurse Practitioner, Acute Care Pediatric Nurse Practitioner, Neonatal Nurse Practitioner and Nurse Anesthetist specialties have requirements for clinical experience before entering these clinical tracks (See descriptions of each specialty requirements in the Master of Science of Nursing section). The D.N.P. core requirements prepare the student in clinical or educational leadership and nursing inquiry. An independent thesis or research project is a component of the post licensure portion of the program.

ENTRY OPTIONS
- R.N. with a diploma or associate degree in nursing from an accredited school (See R.N./M.S.N. program described under the masters program)
- R.N. with a B.S. or B.A. degree in a discipline other than nursing (See portfolio option described under the masters program)
- Nurse with a B.S.N. degree
- Nurse with a M.S.N. degree

Admission Requirements

R.N. WITH DIPLOMA AND ASSOCIATE DEGREE
- See the description of the R.N.-M.S.N. program described under the masters of nursing program.
- Satisfactory completion of undergraduate pre-requisites for the masters of nursing program.
- Written statement of academic and career objectives and research interest.
- The Graduate Record Examination, including verbal, quantitative and analytical sections.

R.N. WITH B.S. OR B.A. OTHER THAN NURSING
- See the description of the portfolio option described under the master’s of nursing program.
- Written statement of academic and career objectives and research interest
- The Graduate Record Examination, including verbal, quantitative and analytical sections.

R.N. WITH A B.S.N.
- Graduated from an accredited college or university with a baccalaureate degree in nursing with an overall GPA of 3.0 (in a 4 point system) or above is required. The Graduate Record Examination, including verbal, quantitative and analytical sections.
- Transcripts from all colleges and universities where academic work was done
- Interview with faculty to discuss career plans. This can be done by phone.
- Additional evidence of academic ability may be required.
- Undergraduate records will be reviewed for comparability to the prelicensure portion of the D.N.P. program. Additional coursework may be required.
- Written statement of academic and career objectives and research interest
- Students must complete the M.S.N. level inquiry courses before beginning the upper-level D.N.P. theory and research courses.

R.N. WITH A M.S.N.
- Graduated from an accredited college or university with a masters degree in nursing with an overall GPA of 2.75 (in a 4 point system) or above is required.
- Satisfactory scores on the Graduate Record Examination (GRE) or Miller Analogies Test (MAT). This may be waived by the Post-Masters/D.N.P. Program Director.
- Transcripts from all masters coursework.
- Interview with faculty to discuss career plans. This can be done by phone, but personal interviews are preferred.
- Written statement of academic and career objectives and research interest
- Nationally certified or qualified to sit for a national certification exam in advanced practice nursing.
- Completion of a college or university statistics course with content comparable to CASE STAT 201 within 5 years of entry into the Post-Masters D.N.P. Program.

DOCTOR OF NURSING PRACTICE PROGRAM

D.N.P. III (postlicensure):
- Students who complete Level I and II of the D.N.P. program (prelicensure) move into D.N.P. III as an R.N., having already completed core courses for the M.S.N.
- Students who enter in Level III of the D.N.P. program will complete the M.S.N prior to, or concurrently with, the D.N.P. IV curriculum. NURS 503 will not be needed.
- Students entering at the D.N.P. III level follow the curriculum stated for the selected M.S.N. specialty (see curricula in the M.S.N. section of this Bulletin) while also completing the D.N.P. IV Clinical Leadership or Educational Leadership electives AND A Scholarly Project. The M.S.N. course NURS 503 is not needed for the D.N.P.

D.N.P. IV (concurrent with or post-M.S.N.):
- Students who enter in Level IV of the D.N.P. program also select one of two elective sequences in 1)Clinical Leadership or 2) Educational Leadership In spring 2009, the DNP IV program Implemented a revised curriculum. For the required sequence of courses, see the website (http://fpb.case.edu/DNP/program.shtml). Students who were admitted before fall 2008, will complete the curriculum in place at that time.

DOCTOR OF PHILOSOPHY IN NURSING

The Ph.D. program is a post baccalaureate degree program designed to prepare scientists who initiate and conduct research relevant to nursing. Expertise in clinical nursing and competence in research are required to prepare scholars to disseminate knowledge into
clinical practice and nursing education. To achieve excellence in the academic program, students engage in activities consistent with the areas of research excellence of the faculty. Moreover, the faculty is committed to the intellectual growth of the student, which is achieved through mentorship and collaboration in scholarship.

The Ph.D. student concentrates on the organization and development of knowledge requisite to nursing practice for service to a population. The population may include age group (children, adults), focus of service (individual, family, or community) and position on the continuum of health (health and wellness, acute and chronic disruptions in health). Ph.D. students are culturally diverse, and many develop and apply knowledge relevant to global health needs.

Characteristics of the Graduate

- Develops, implements, and evaluates educational offerings, individually and in collaboration with others, related to research and nursing theory.
- Synthesizes and generates knowledge for the discipline of nursing.
- Identifies health issues amenable to research; disseminates knowledge and evidence to improve health.
- Assumes leadership positions of increasing complexity at the local/state/national and international levels.
- Identifies and analyzes ethical issues and standards related to science and knowledge development.
- Develops systems to establish and promote interdisciplinary teams in the scientific community.
- Generates and disseminates knowledge relevant to health care policy.
- Uses and promotes the development of effective communication strategies that support scholarship and the dissemination of research findings.

Entry Options

- Registered nurses with a Bachelor’s of Science in Nursing degree.
- Registered nurses with a Master’s of Science in Nursing or Master’s in Nursing degree.

Admission Requirements

Applicants to the Ph.D. program in nursing apply to the School of Graduate Studies. Applications and information for admission are available from the Bolton School. Application requirements are:

1. A professional degree (B.S.N., M.N., or M.S.N.) from an accredited nursing program.
2. Three recommendations describing professional nursing competence, potential for success in the Ph.D. program and for making a significant contribution to nursing science. Two of these recommendations should be from Ph.D. prepared individuals, preferably in nursing.
3. Satisfactory performance on the Graduate Record Examination that includes quantitative, verbal and analytical sections.
4. Statement of academic and career objectives and how the applicant’s research interest is consistent with the research expertise of the faculty.
5. Official college or university transcripts for all previous graduate and undergraduate education are required.
6. Written responses to questions contained in the application packet.
7. Interview with two faculty members. This can be done by phone.
8. International applicants are required to supply official copies of TOEFL exam scores that meet these minimal scores: paper-based - 550, computer-based - 213, and internet-based - 79.

Program Requirements

COURSE REQUIREMENTS

The Ph.D. program is a post-baccalaureate program, and course requirements provide a foundation for a dissertation. Programs are individually planned so that applicants with a M.S.N. degree with a clinical nursing major with supervised practice can build on their prior masters’ education. Students entering with a B.S.N. degree will be required to take NURS 507 Clinical Knowledge and NURS 508 Context of Care. A minimum of 54 semester credits in core requirements is required, and courses are listed below. Additional course work may be required and will be determined by the faculty advisor.

<table>
<thead>
<tr>
<th>Ph.D. Research Methods/Statistics</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>NURS 530 Advanced Nursing Research I</td>
<td>3</td>
</tr>
<tr>
<td>NURS 531 Advanced Nursing Research II</td>
<td>3</td>
</tr>
<tr>
<td>NURS 532 Basic Statistics: Fundamentals for Analysis</td>
<td>3</td>
</tr>
<tr>
<td>NURS 609 Health Care Policy and Planning</td>
<td>3</td>
</tr>
<tr>
<td>NURS 615 Topical Seminar in Health Science Research</td>
<td>0-3</td>
</tr>
</tbody>
</table>

NURS 518 Qualitative Nursing Research 3
NURS 630 Advanced Statistics for Nursing Research: Linear Models 3
NURS 631 Advanced Statistics: Multivariate Analysis 3

Ph.D. related Courses 3-6
NURS 506 Nursing Epistemology 3
NURS 511 Strategies for Theory Development 3

Dissertation (NURS 701) Min. 18

NURS 703; Dissertation Fellowship

To register for NURS 701, the academic advisor and associate dean for doctoral education must provide written permission that is submitted to the dean of graduate studies. Students who have not been advanced to candidacy status (successful completion of course work and candidacy examination) may register for not more than 3 credit hours of NURS 701 per semester. They must maintain continuous limited registration for NURS 701 until advanced to candidacy status. A maximum of 6 credit hours may be taken prior to advancement to candidacy. After advancement to candidacy, students can register for up to 9 credits of NURS 701 per semester. When students complete 18 credits of NURS 701, they may subsequently register for a minimum of 1 credit hour a semester.

Students who have been advanced to candidacy and have met all coursework requirements, including 18 credit hours of NURS 701, and are within their five-year time limit for completion of the degree, but have not completed the dissertation, can register for Dissertation Fellowship (NURS 702) upon recommendation to the School of Graduate Studies. Students may take NURS 702 for a maximum of four consecutive semesters. Students are
considered to have full-time appointment (9 credit hours of 702), and tuition is charged at the rate of one credit hour. If the dissertation is not completed and defended in the fourth semester of the fellowship, the Ph.D. candidate must register for a minimum of one credit hour of NURS 701 each semester.

Research Practicum
A research practicum is required before taking the candidacy examination (described below). The research process is complex and course work provides the student with only theoretical understanding. The integration of research concepts and their application can best be learned through practical experience. The research practicum provides the hands on experience in the daily functioning of a research study. Often presentations and publications with faculty are outcomes of this experience.

The student works with a faculty mentor on that faculty’s research for 240 hours within the first two years of study. The academic advisor, student and faculty mentor who the student will be working with will develop objectives for the research practicum. It is recommended that the practicum begin during the first year of study. The practicum must be completed before the student will be advanced to candidate status.

Dissertation
The dissertation is an independent research study designed by the student in collaboration with a four member dissertation committee approved by the associate dean of doctoral education in the School of Nursing. Three of the members should be from the School of Nursing; while the fourth member must be from a department within Case Western Reserve that is outside of Nursing. The dissertation must be a significant contribution to existing nursing knowledge and suitable for publication in a peer reviewed journal or a book. Students must prepare their own dissertations, and joint dissertations are not permissible. The procedures and written dissertation must conform to the regulations of the School of Graduate Studies.

Progression in the Ph.D. Program
ACADEMIC PERFORMANCE AND PROGRESSION
Students who enter the Ph.D. in nursing program with an M.S.N. are expected to complete all coursework (36 credits) within four years of matriculation. Students entering with a B.S.N. are expected to complete all coursework (42 credits) within six years of matriculation. Students who are unable to complete the required courses within the specified time frame must submit a petition for an extension to the associate dean of graduate studies in the school of nursing and the dean of graduate studies.

A student who receives a grade of F for a required course must register for the course the next semester it is offered. If the student receives a grade of F or unsatisfactory performance (F, U & NP) in two courses, the student will be separated from the Ph.D. in Nursing program.

A grade of incomplete (I) will be assigned only for extenuating circumstances, and only when a student fails to complete a small segment of the course. The student must complete the “plan for resolution of incomplete grade” form to the associate dean for doctoral education in the school of nursing and the dean of graduate studies before the final date when grades are due in the semester during which the course was taken. All work for the Incomplete grade must be made up, and the change of grade recorded in the Office of the University Registrar, by the date specified on the form described above. Unresolved Incomplete grades will remain permanently on the student’s academic record, if the work is not made up by the designated deadline. A student who has a permanent Incomplete for a required course must retake the course in a later term. If the student cannot complete the work for the Incomplete by the specified deadline, he or she must petition for an extension which must be endorsed by the instructor, and explain the reasons why the work has not been completed, and include a new date for completion. Students are allowed only one extension of no more than one additional semester to complete the work.

A cumulative GPA of 3.0 must be maintained. If the cumulative GPA falls below 3.0, the student will be placed on academic probation. If the student does not raise the GPA to 3.0 or above in the next semester enrolled, the student will be separated from the university.

Students must maintain continuous registration throughout their degree programs unless granted a leave of absence. Students who do not register for an academic term will be automatically withdrawn from the program. They must then petition for reinstatement to continue graduate study. The associate dean for doctoral education and the dean of graduate studies must approve the petition before students may register for further coursework. In each case of readmission with full standing, the student will receive a letter stating the terms of readmission, including future time limits for the degree program and the past course work that will be credited toward the degree. If more than 24 months have elapsed since the last registration, the School of Graduate Studies may request more information.

ADVANCEMENT TO CANDIDATE STATUS
To advance to candidate status, Ph.D. students must pass an oral candidacy examination and provide a written research proposal at the time of the examination. The examination and proposal are evidence of the student’s knowledge and ability to synthesize and apply research methodologies and existing knowledge. The oral examination focuses on the nursing discipline, research methods, statistics, and substantive knowledge. The candidacy committee consists of three Bolton School faculty members who hold doctorates with a focus on research.

The student works with the candidacy committee to develop a research proposal. During this time, the student enrolls in NURS 671 “Proposal Development”. A minimum of 3 credits of NURS 671 is required, and the student may be required to take up to 12 credits of this course, if needed, to complete the proposal. Prior to scheduling the candidacy examination, the student must have completed the research practicum and all course requirements with a cumulative GPA of 3.0.

The candidacy committee determines the adequacy of responses to the oral examination and the research proposal presented at the time of the examination. A student who fails the candidacy examination may be permitted within one year of the failing the examination to retake it, provide a written response to questions from the committee or submit a revision of the proposal. The committee may also require additional course work. A student who fails the examination a second time will be separated from the Ph.D. in Nursing program.

A student who is not advanced to candidacy may not undertake further study for credit towards a Ph.D. degree and is officially separated from the university.

Proposal Defense
The purpose of the proposal defense is for
students to demonstrate their synthesis and application of substantive knowledge and research methods and statistics. Students defend their dissertation proposal to their dissertation committee comprised of three nursing faculty members who hold doctorates with a focus on research and another doctorally prepared member from another department within the university. Additional voting or non-voting members may be included. The written dissertation proposal is presented to the committee three weeks prior to the proposal defense. The dissertation committee determines the adequacy of the responses to questions and the dissertation proposal. A student not passing the proposal defense may be required to repeat the defense, revise the proposal or provide written responses to questions. The student must pass the proposal defense before pursuing human subject’s approval and before implementing the dissertation.

Dissertation Defense
Students must successfully defend their dissertation in an oral examination with the dissertation committee who are also responsible for certifying that it meets acceptable scholarly standards.

The student must provide a copy of the dissertation to committee members at least 10 days before the defense. The dissertation defense must be scheduled with the School of Graduate Studies three weeks prior to the defense. The time and place of the dissertation defense must be announced publicly within the university. The dissertation defense is open to Case Western Reserve University faculty and students, but the dissertation chair determines whether the defense is open to others outside of Case Western Reserve University.

The dissertation committee determines the adequacy of the oral examination and written dissertation. A student will pass if no more than one voting member dissents.

Degree Requirements
A student will be awarded a Ph.D. degree upon completion of all required coursework in their curriculum as detailed in their program of study. All students must complete 36 semester hours of course work at the university. A cumulative GPA of 3.0 or above in all courses taken for credit (excluding grades of S) as a Ph.D. student at the university is required for awarding the Ph.D. degree.

Graduate students are considered to be in residence when they are fully engaged in academic work. Ph.D. students must be registered for a minimum of six consecutive academic terms (fall, spring and/or summer) from matriculation to a period not exceeding five years after the first credited hour(s) of dissertation research (701). The time period in which a leave of absence is taken does not count towards the residency requirement. Within the context of continuity of registration, departments may enact other restrictions. In such instances, the departmental requirements take precedence and must formally be disclosed to the student at matriculation. Continuous registration is mandatory for all graduate students unless on an approved leave from the School of Graduate Studies.

All dissertation requirements for the Ph.D. degree must be completed within five years from the first time a student registers for dissertation credit (NURS 701), including leaves of absences. If the student fails to complete the degree requirements within this 5-year time period, including leaves, they may request a 1-year extension approved by the advisor, associate dean for doctoral education in the School of Nursing and the dean of graduate studies. If the degree requirements are still not met during this extension or an extension was never approved, the student will be separated from the School of Nursing. They may reapply to the Ph.D. program to continue to study using an abbreviated application process. After a review of the application and the student’s academic record, the Ph.D. Admissions Committee makes recommendations about re-admission and additional coursework that may be required to the associate dean for doctoral education in the School of Nursing.

OTHER STUDENT CATEGORIES

Non-degree Students
An applicant with basic preparation in nursing may apply to register as a non-degree student for up to 9 credits. The application form is available on the Nursing School Registrar’s website for M.S.N. and D.N.P. programs and the Office of Graduate Studies Admissions for the Ph.D. program. The applicant must obtain written permission from the faculty teaching the course and the associate dean for doctoral programs in the Bolton School for those taking Ph.D. courses. Clinical courses may not be taken as a non-degree student. Continuation of this status is at the discretion of the administrative officer of the Bolton School. Status as non-degree student does not imply acceptance into the Bolton School. If the non-degree student applies for admission to the Bolton School, course work completed as a non-degree student will be evaluated on an individual basis for its applicability to degree requirements within the time frame for the degree.

Special Students
Special students are those who take a specified course of study designed to meet an individual’s needs. They must meet the admission requirements for the program where the majority of class work will be done. Their status and satisfactory performance will be reviewed after one year. Students completing M.S.N. courses to obtain a certificate in any advanced practice nursing major will be admitted as special students.

If a special student decides to pursue a graduate degree, the approval of the associate dean of academic programs must be obtained. Entrance into the degree program will be considered the date when the student enrolled in the first course work as a special student. These courses must have been taken within the last five years. If more than five years have elapsed since the course work as special student was done, the student must meet the current academic requirements for the major selected.

International Students
International students may enroll in the masters, nursing doctorate and Ph.D. programs. They must meet the admission requirements for the program that they select. In addition, application should be submitted approximately one year before the desired date of enrollment. English translations of transcripts are required.

Each applicant must document the ability to speak, read and write English as evidenced by satisfactory performance on the Test of English as a Foreign Language (TOEFL). The Educational Testing Service administers the test.

Educational Testing Service (ETS)
TOEFL
www.toefl.org

Students whose native language is English are exempt. For those whose native language is not English, a score of 550 (PBT), 213 (CBT), or 80 (IBT) is desired. Students must take English courses at the English Language Services Center (ELS) at Case Western Reserve University and students must complete English courses through the Level 112. Students
who demonstrate English language proficiency may request to be exempt from these courses.

Present evidence of adequate financial resources to meet the expenses of full time study and travel expenses to and from Cleveland. Financial assistance is not available from the Bolton School. The student must arrange for a sponsor who will provide full financial support. The sponsor must document their ability to financially support the student, including costs of tuition and fees, room and meals, books, incidentals and travel expenses.

Students applying to clinical programs must be eligible for licensure as a registered nurse (R.N.) before any clinical courses are taken. To obtain R.N. licensure, the student can either 1) obtain licensure in a state other than Ohio and apply for reciprocity in Ohio, or; 2) sit for the licensure examination (NCLEX-RN) in Ohio. For information on how to become licensed in any state, you must obtain information from the specific state where you wish to become licensed. For the individual addresses of each State Board of Nursing, contact the National Council of State Boards of Nursing. National Council of State Boards of Nursing www.ncsbn.org

Once admitted to the Bolton School, an application form for a student visa will be sent to the student. Upon enrollment at the university, the student must subscribe to the Student Medical Insurance Plan or proved proof of other medical insurance coverage.

FINANCIAL ASSISTANCE
The following is a brief description of the financial aid opportunities available to students at the Bolton School of Nursing. Undergraduate students can find a more detailed description of undergraduate aid at http://finaid.case.edu from the University Financial Aid Office. Some types of aid are not available to all students, and the awarding of some grants and scholarships may make you ineligible to receive other grants or scholarships. If you have questions or would like more information, contact either The Bolton School of Nursing or Case Western Reserve University Financial Aid Offices.

Undergraduate
Undergraduate students, those enrolled in the B.S.N. and R.N.-B.S.N. programs have a variety of financial assistance available, including federal and state need-based aid, and merit-based grants and scholarships.

THE BOLTON SCHOLARSHIP
Students seeking a B.S.N. are awarded the Bolton Scholarship. Individual awards may be as much as $15,000 per year for a maximum of four years for the B.S.N. program, and three years for transfer B.S.N.. This scholarship is not need based. Additional scholarships are awarded to students demonstrating extraordinary merit and/or exceptional need.

MERIT-BASED AID
Case Western Reserve offers several full and partial-tuition merit-based scholarships. These are generally renewable for all four years of study if high academic performance is maintained. To be eligible for university scholarships, students apply by January 15 and submit SAT or ACT scores and be admitted to the university. Contact the University Financial Aid Office for more information.

NEED-BASED AID
For all need-based aid, students are encouraged to complete the Free Application for Federal Student Aid (FAFSA) by February 1 (or as soon after as possible). From this information, and the Case Western Reserve Financial Aid Application, a student’s family contribution is determined. This is calculated solely on the financial circumstances of the student’s family, and does not take cost of tuition into consideration. Once the family contribution is calculated, it is subtracted from the estimated cost of attendance (tuition, room, board, fees, books, transportation and miscellaneous expenses) to calculate the student’s financial need. The financial need is the amount that may be covered by Case Western Reserve’s financial aid programs. A student’s financial aid award or “package” may consist of up to three different components: grants, loans and employment.

Graduate
Graduate programs at the Bolton School of Nursing are the M.S.N., D.N.P., Ph.D., R.N.-M.S.N., and the joint degree programs (M.S.N./M.B.A., M.S.N./M.P.H., and M.S.N./M.A.).

Full- and Half-Time Students
Full-time enrollment is at least 9 credit hours fall and spring semesters, and at least 6 credit hours, summer sessions. Half-time enrollment is 5-8 credit hours fall and spring semesters, and 3-5 credit hours summer session. To be eligible for financial aid for summer session, the student must also be eligible for aid in the following fall and/or spring semesters.

Federal Loans
All students are encouraged to complete the Free Application for Federal Student Aid (FAFSA). Information from this form and the Case Western Reserve University Financial Aid application will be used to determine the student’s financial need, and the amount of loan for which they are eligible. The majority of students receive enough loans to cover the estimated cost of tuition and expenses.

There are two basic types of federal loans: subsidized and unsubsidized. Both types of loan repayments do not begin until a student’s enrollment falls below half-time or six months after graduating, whichever comes first. Students may begin repayments earlier if they choose.

Subsidized loans do not accrue interest until after you graduate or fall below half-time enrollment. Unsubsidized loans begin accruing interest immediately, although it does not need to be paid until repayments begin.

Federal PLUS Loan for Graduate Students
The Federal Grad PLUS Loan is designed to assist graduate and professional students in financing a portion of their educational expenses. The program enables these students borrow up to the yearly cost of education minus other financial aid received. PLUS Loans are not need-based, but the student borrower must demonstrate acceptable credit. Students must borrow the full amount of their Subsidized and Unsubsidized Federal Stafford Loans before borrowing through this program. The Grad PLUS Loan is available only to U.S. citizens or permanent residents who are enrolled at least half-time in a degree-seeking program.

PRIVATE LOANS
For those students who do not receive federal loans or wish to borrow more money than is provided by Grad PLUS loans, private lenders may be an option.

PART-TIME STUDENTS
Students enrolled in less than 5 credit hours fall and spring semesters, and less than 3 credit hours summer sessions are NOT eligible for federal aid. However, some private lending
agencies do give loans to part-time students. Contact the Bolton School of Nursing Financial Aid Office for more information.

INTENSIVE STUDENTS
Students enrolled only in intensive courses are NOT eligible for federal aid because regulations require enrollment in courses that span at least a ten-week period, but students may receive loans from some private lending agencies. Contact the Bolton School of Nursing Financial Aid Office for more information.

SCHOLARSHIPS AND GRANTS
Some of the following grants, scholarships and assistantships are given directly by the Bolton School of Nursing, while others are outside sources of assistance. Students should seek other sources of assistance on their own. Direct questions regarding the following grants and scholarships to the Bolton School of Nursing Financial Aid Office.

PROFESSIONAL NURSE TRAINEESHIP GRANT
This Department of Health and Human Services grant, awarded to the Bolton School of Nursing, is distributed to M.S.N. students and postlicensure D.N.P. students seeking the M.S.N. In most cases, students must be enrolled at least half-time, i.e. 5 credit hours for two or more semesters. No application is required.

NATIONAL HEALTH SERVICE CORPS SCHOLARSHIP
This is an excellent opportunity for full-time students in the Family Nurse Practitioner and Nurse Midwifery programs. Awarded from the Bureau of Primary Health Care (BPHC), National Health Service Corps (NHSC) Scholarship Program, the scholarship includes full tuition and a monthly stipend. There is a one-year work commitment (minimum of two years) for each year or partial year the scholarship is awarded. To fulfill the work commitment, awardees must obtain employment in an under-served public or private facility approved by the National Health Service Corps. Employment is not necessarily with the federal government. Employment opportunities can be found across the United States in urban, suburban and rural settings. This Scholarship is very competitive and seeks applicants who are dedicated to the mission of the BPHC. Applications are available from the Bolton School of Nursing Financial Aid Office, in late February. Application deadline is in late March.

THE D.N.P. STUDENT GRANT
Prelicensure D.N.P. students may receive this Bolton School of Nursing Grant. Based on financial need, $1,000 - $3,000 is an award for each year of the prelicensure component of the D.N.P. program.

OTHER GRANTS
Some advanced practice majors have additional financial assistance available. Please contact the Bolton School of Nursing Financial Aid Office.

EMPLOYMENT
Many employers of health care professionals offer tuition assistance of varying levels. While you should not expect that the assistance would cover your entire tuition, it is often a significant amount. Check with your employer for more information.

Student employment may be available at the Bolton School of Nursing or at other campus locations. Also, part-time employment may be available at local hospitals or other health care agencies.

OTHER RESOURCES
There are many private scholarships, grants and loans available to undergraduate and graduate students. Students should check local organizations (i.e. churches, parents’ employers, students’ employers and service organizations). Public libraries have books on scholarships, and the Internet is another good source of information. When searching or applying for scholarships always be alert for scams. While most scholarships are legitimate, there are some that are not.

SEARCHING ON THE WORLD WIDE WEB
FASTWEB (www.fastweb.monster.com) is a free search service. After completing a profile, this services searches through its database to identify scholarships that may meet student’s eligibility.

Since the database is continually updated, check back often. Also, complete numerous profiles that cover all of the student’s qualifications and interests because different profiles may produce different results.

FINAID (www.finaid.com) is a financial aid information page. It covers a wide variety of financial aid topics, including sources of aid, private loans and links to several free scholarship search services.

INFORMATION FROM THE UNIVERSITY

BOLTON SCHOOL OF NURSING
http://fpb.case.edu
Financial Aid Director: Dedra Hanna
Direct: 216-368-0517
Toll free: 800-825-2540 ext. 0517

UNIVERSITY FINANCIAL AID OFFICE
http://finaid.case.edu
Submit questions via the website, and a financial aid counselor will respond by e-mail in the order that questions are received.

Phone: 216-368-4530

TUITION AND FEES
Estimated Expenses for the 2009-2011 Academic Year (Fall and Spring Semesters)*

<table>
<thead>
<tr>
<th>LIABILITY INSURANCE</th>
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<tbody>
<tr>
<td>All students enrolled in the School of Nursing are required to have liability insurance that provides personal and professional coverage. Such plans are offered by Maginnis and Associates and the National Student Nurses’ Association. All arrangements are between the student and the company offering the liability program.</td>
</tr>
</tbody>
</table>

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<tr>
<th>UNIFORMS</th>
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<tbody>
<tr>
<td>Uniforms are an additional expense for the students. White uniforms are standard attire in hospital settings. There may be individual variations required, depending upon the student’s clinical rotation site.</td>
</tr>
</tbody>
</table>

General Cost 2009-2011

<table>
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<tr>
<th>TUITON</th>
<th>2009-2010</th>
<th>2010-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time (per year)*</td>
<td>$36,200</td>
<td>$38,000</td>
</tr>
<tr>
<td>Part-time (per credit hour)*</td>
<td>$ 1,509</td>
<td>$ 1,584</td>
</tr>
</tbody>
</table>

UNIVERSITY HOUSING

| Room | $5,240-8,100 |
| Board plan | $1,779-1,947 |
| Health Insurance | $1,100 |
| Hepatitis B Immunization | $200 |

*1-11 credit hours is considered part-time, 12+ hours is considered full time. D.N.P. students will be charged the per credit rate for any credits in excess of 18. M.S.N. students will be charged per credit hour.
ADDITIONAL COSTS

B.S.N.
- University Activity Fee: $263
- Clinical Practice Fee: $220
- Nursing Activity Fee: $15
- Bus Fee: $50

ENROLLMENT DEPOSIT
- (no refund) $500
- (Deposits are applied toward in the fall semester.)

D.N.P. AND M.S.N.
- Student Activity Fee: $30
- Transportation
- (Students must make arrangements for their own transportation for field experiences in selected courses)

Application fee
- (not-refundable) $75
- Place-in-class deposit
- (not-refundable) $200
- Books and Supplies

B.S.N. AND D.N.P.
- Year I: $1770
- Year II: $1225
- Year III: $1160
- Year IV: $1140
- Personal Expenses: $1,250
- FPB/NSNA (optional): $26

M.S.N. AND PH.D.
- Student Activity Fee M.S.N.: $30
- Ph.D.: $40
- Books and Supplies: $1240
- Insurance Premiums (Per Annum)
- Professional and personal liability ($1,000,000 limit): $79-158
- Personal Expenses
- Including transportation for field experiences $800

EXPENSE FOR THE SUMMER SESSION
Tuition is one-half fall/spring tuition per semester hour for undergraduate courses. Information about the cost of living (room and board) is available from the university housing office.

FINANCIAL OBLIGATIONS

All financial obligations to the university must be discharged before a student can graduate and obtain a degree. Failure to attend classes and/or failure to pay tuition does not constitute withdrawal. Checks and money orders should be made payable to Case Western Reserve University and should show the name of the student for whom payment is made.

PAYMENT OPTIONS
Checks and money orders should be in U.S. dollars, drawn on a U.S. bank, and made payable to Case Western Reserve University. Please include your student I.D. number and/or social security number on the check or money order. Payments may be mailed to:
Student Accounts Receivable
Yost Hall, Room 115
10900 Euclid Avenue
Cleveland, OH 44106

E-Checks can be made on our QuikPAY™ site at https://www.quikpayasp.com/cwru/payer.do. This is the university’s online billing and payment system that allows you to submit payment through a checking or savings account on line.

Discover® card payments can be made on our QuikPAY™ site. This transaction carries a 1.77% transaction fee that will be added to your transaction. (See above for the web locator.)

Wire transfers of funds for payment on account at Case Western Reserve may be handled through any full service bank in your area. For further information please contact the Bursar’s Office at 216-368-2226, or e-mail us at: bursar@case.edu.

TUITION MADE E-Z PAYMENT PLAN
Tuition made E-Z Payment Plan is an ACH process for automatically debiting your checking account. Your payments can be made electronically monthly without the hassle or cost of writing checks or paying postage. For more information please call 216-368-2226 or visit our website at http://www.cwru.edu/finance/manager/bursar.htm.

DEFERRED PAYMENTS
Students enrolled in fall and spring semesters for courses of semester length may arrange to pay bills for tuition and fees in two installments. At least half of the total tuition bill must be paid at registration; the remainder must be paid within 60 days. Any remainder of the date specified will be considered delinquency, with a late fee added per month.
Tuition and other fees for summer session are due and payable in full at registration.

REFUNDS
A student who withdraws during fall or spring semester must pay a percentage of the tuition charge. The amount is based on the number of weeks classes have been in session at the time of withdrawal. See university roster for specific dates. There is no tuition refund after the eighth week of classes.
A student who withdraws from the university during summer session must pay a percentage of the tuition charge. The amount, 20 percent per week, is based on the number of weeks classes have been in session at the time of withdrawal. There is no tuition refund after the fourth weeks of classes.

COURSE DESCRIPTIONS (NUAN)

NUAN 449. Chemical and Physical Properties of Anesthesia (2)
Introduction and elaboration of basic chemical and physical principles as they relate to clinical nurse anesthesia practice. An in-depth study of organic and biochemical principles, structure/activity, relationships and their significance in pharmacology. Emphasis will be on the integration and practical application of these principles to clinical nurse anesthesia practice.

NUAN 450. Pharmacological Strategies in Anesthesia Practice (2)
Application of pharmacokinetic and pharmaco-dynamic principles as they relate to specific anesthetic and adjunct drugs used in anesthesia practice. Integration of this information into clinical area regarding anesthetic uses, dosages, and side effects of these classes of drugs is emphasized. Coreq: NUAN 449.

NUAN 451. Physiological Variables and Responses I: Respiratory System (2)
A detailed study of the anatomic structures and related physiochemical mechanisms governing respiratory function in health and disease. Assess the functional integrity of this system utilizing all pertinent objective and subjective data. Consider the impact of anesthetic agents and techniques on this system and how one can plan anesthetic to facilitate health-seeking behaviors as a patient attempts to attain, maintain or regain optimal health. Implications for all types of surgery in view of effect of anesthesia on respiratory system, however, special attention on surgery involving this specific system. Coreq: NUAN 449.

NUAN 452. Physiological Variables and Responses II: Cardiovascular (3)
A detailed study of the anatomic structures and related physiochemical mechanisms governing cardiovascular function in health and disease. Assess the functional integrity of this system utilizing all pertinent objective and subjective data. Consider
the impact of anesthetic agents and techniques on this system and how one can plan anesthetic to facilitate health-seeking behaviors as patients attempt to attain, maintain, or regain optimal health. Implications for all types of surgery in view of effect of anesthesia on cardiovascular system, however, special attention on surgery involving this specific system. Coreq: NUAN 451.

NUAN 453. Physiological Variables and Responses III: Peds, OB, Endo & Geriatrics (4) Study of health-seeking behaviors and intervening variables with special consideration of the anatomy, physiology, and pathophysiology of the pediatric and obstetric, endocrine and geriatric patient. Focus will be on the integration of this information into the nurse anesthesia care to support the health-seeking behaviors of these patients. Coreq: NUAN 451 and NUAN 452.

NUAN 454. Physiological Variables and Responses IV: Renal and Neurologic Systems (3) Systematic investigation of the physiologic factors related to health-seeking behaviors with special emphasis on pathophysiologic of the renal and neurological systems. Focus will be on the integration of this knowledge into the planning, implementation, and evaluation of patients requiring nurse anesthesia intervention. Coreq: NUAN 453.

NUAN 455. Anesthesia Nursing I (2) An introduction to the art and science of nurse anesthesia including basic anesthetic principles and beginning clinical practicum to introduce the student to anesthetic equipment and operating room environment. This course is designed to give the student practical information regarding administration of safe anesthesia.

NUAN 456. Anesthesia Nursing II (1) Progressive, guided instruction on clinical and ethical management of clients undergoing all forms of anesthesia. This unit includes the history of nurse anesthesia relevant to contemporary anesthetic practice, legal and ethical aspects of anesthesia delivery, and patient/client interaction strategies. The course is designed to give the nurse exposure to career expectations in nurse anesthesia; as well as prepare him/her in administration of safe, routine anesthetic with moderate amount of instructor intervention. Coreq: NUAN 455.

NUAN 457. Anesthesia Nursing III (1) Graduated, guided instruction in clinical management of clients receiving various types of anesthesia. Focus is on the preparation and planning for anesthesia utilizing Schlofledt paradigm. Includes actual administration of anesthesia for clients exhibiting more complicated pathophysiology. More advanced technical instruction and experience. Correlation of didactic and clinical materials, as well as continuous evaluation of student progress are integral to this course. Coreq: NUAN 456.

NUAN 551A. Nurse Anesthesia: Advanced Practice I (2) Individual in-depth study of advanced clinical nurse anesthesia in such specialty areas as neurosurgical, cardiovascular, obstetric and pediatric anesthesia. The nurse learns to handle more difficult, specialized patients who are at a higher risk. Emphasis is on more complex management with advanced monitoring techniques, use of pharmacological agents and handling higher stress situations. Students develop and utilize practical clinical applications of nurse anesthesia theory. Coreq: NUAN 457.

NUAN 551B. Nurse Anesthesia: Advanced Practice I (1) (See NUAN 551A.) Coreq: NUAN 551A.

NUAN 551C. Nurse Anesthesia: Advanced Practice I (1) (See NUAN 551A.) Coreq: NUAN 551B.

NUAN 552. Nurse Anesthesia: Advanced Practice II (1) The continuation of advanced, independent clinical nurse anesthesia administration. Emphasis is on management of higher risk patients for more difficult procedures, performing total anesthetic care with minimum of anesthesiologist supervision, and readiness for transition from student to graduate status. Coreq: NUAN 551A and NUAN 551B and NUAN 551C.

Course Descriptions (NUND)

NUND 400. Guided Study (1 - 6) Selected topics in basic nursing. May include clinical experiences.

NUND 401. Introduction to the Discipline and Practice of Nursing (7.5) This course is an introduction to the discipline and practice of nursing. Factors influencing health and illness will be explored. Selected nursing strategies and interventions designed to support the maximum health potential of the adult client will be incorporated into lab sessions and practiced in a variety of settings. Small group seminars will be used to examine historical, societal, and legal influences on nursing and the role of functions of the professional nurse. Coreq: NUND 402 and NUND 410.

NUND 402. Introduction to Pharmacology (3) This course introduces basic principles of pharmacology and pharmacotherapeutics. A survey of characteristics and uses of major drug groups with an emphasis on nursing implications is presented. Coreq: NUND 401 and NUND 410.

NUND 403A. Nursing Informatics (1) This course will introduce students to the concept of health informatics and the role nurses play in the management of information in supporting all areas of nursing including clinical practice, education, research, and administration. Using case studies, lecture and class discussion. Students will develop an awareness of the importance of nursing involvement in the design, implementation, and use of information systems and other technologies. Coreq: NUND 401.

NUND 404A. Inquiry A for the Graduate Entry DNP (2) This course provides an introduction to conceptual and theoretical thinking. Students will examine knowledge development in nursing, conceptual structures, and the use of theory in nursing practice and research. Coreq: NUND 401.

NUND 404B. Inquiry B for the Graduate Entry DNP (2) This course is a continuation of NUUND 404A GE Inquiry A. It completes the introduction to conceptual and theoretical thinking and begins examination of the research process in nursing. The student will examine scientific inquiry and scientific investigation, including the research process. Coreq: NUND 404A

NUND 404C. Inquiry C for the Graduate Entry DNP (2) This course is a continuation of NUUND 404B GE Inquiry B. It expands the examination of scientific investigation in nursing and includes data management, analysis, and interpretation; critique of existing research; and applications for nursing practice. Coreq: NUND 404B.

NUND 405. Altered Human Functioning (3) Introduction to basic pathophysiologic outcomes of selected intervening variables that alter human physiologic and cognitive functioning. This course builds on the student's foundation of normal anatomy and physiology. Recommended preparation: completion of first semester of D.N.P. program.

NUND 406. Aging in Health and Illness (2) This course will explore the concept of aging in health and illness with an emphasis on the older adult as an individual with the capacity to grow and develop. Coreq: NUUND 401 and NUUND 410.

NUND 407. Acute Care Nursing of the Adult (8.5) The focus of this course is the integration of the nursing process in clinical practice. Human responses to significant health events and alterations are analyzed. Application of relevant physiology, psychosocial dimensions, and pharmacology are included. Particular emphasis is placed on nursing strategies, interventions, and the evaluation of their effectiveness in the care of the acutely ill adult. Coreq: NUUND 401, NUUND 402, NUUND 343, NUUND 403, NUUND 404A, and NUUND 410.

NUND 408. Introduction to Concepts of Genetics in Nursing (1) Introduction to the theories and concepts relevant to human genetics and genomics and their applications in health care.

NUND 409A. Professional Role Development: Leadership (1) This seminar is the second in a series designed to address professional role development. The seminar focuses specifically on leadership development in nursing. Coreq: NUUND 401.

NUND 410. Health Assessment (2.5) Comprehensive introduction to the assessment skills required for a successful nursing practice. Basic skills, such as vital signs, are taught along with a system by system approach to physical examination. Taking a health and psychosocial history is integrated into the course. The course is taught concurrently with anatomy and physiology, concepts of nursing practice, and strategies and interventions...
for alterations in functioning. Coreq: NUND 401 and NUND 402.

NUND 411A. Public Health Nursing A (2)
This is the first of a two course sequence in public health nursing - health promotion-disease prevention for groups, populations, and communities. This course will focus on enhancing the health and health-seeking behaviors of groups and populations. Coreq: NUND 405, NUND 406, NUND 407, NUND 408, NUND 409A.

NUND 411B. Public Health Nursing B (2)
This is the second of a two course sequence in public health nursing - health promotion-disease prevention for groups, populations, and communities. This course will focus on enhancing the health and health-seeking behaviors of a selected community. Coreq: NUND 411A.

NUND 413. Issues and Ethics in Health Care (2)
Designed to introduce the students to the principles underlying ethical issues and methods of rational decision making. Fundamental theories will be reviewed and opportunity provided, using case analysis, to apply the theories in addressing ethical dilemmas common to modern health care. Recommended preparation: Enrolled in 4th semester of N.D. pre-licensure program, or permission of course faculty. Coreq: NUND 401.

NUND 414. Concepts of Management (3)
Study of basic concepts relative to leadership and working with groups of people in providing nursing care. Concepts include: decision making, power, authority, roles, teaching-learning, evaluation, leader behaviors, work groups, legal aspects, change. Recommended preparation: Enrolled in 4th semester of N.D. pre-licensure program, or permission of course faculty. Coreq: NUND 413 or permission of course faculty.

NUND 415. Parents and Neonates in Health and Illness (4)
This course introduces biological, psychosocial, and developmental concepts applicable to the nursing care of women, newborns, and families during the childbearing cycle. Emphasis is placed on assessment and identification of health needs as parents and neonates respond to the changes inherent in the childbearing cycle. Strategies related to nursing care of parents and neonates are discussed. The clinical experience focuses on the direct application of these concepts and strategies in the care of patients in various perinatal settings. Prereq: NUND 401, NUND 404, NUND 405, NUND 407, NUND 408, NUND 409A, NUND 411.

NUND 416. Infants, Children, and Adolescents in Health and Illness (4)
The study of infants, children, and adolescents and their health-seeking behaviors from a developmental perspective. Emphasis is on healthy infants, children, and adolescents as well as infants, children, and adolescents with common, acute, and chronic illness within the context of their family environment. Nursing strategies focus on interventions to promote, restore, and maintain health and foster growth and development. These strategies are based on understanding advanced concepts of children's and adolescents' responses in acute health/illness states. Recommended preparation: 3-credit hour Growth and Development course. Prereq: NUND 404, NUND 405, NUND 407, NUND 408, NUND 409A, NUND 411.

NUND 417. Psychiatric Mental Health Nursing (4)
This course is designed to address psychiatric and mental health nursing concepts. The focus is on clients with acute and chronic psychiatric disorders and their mental health. Nursing strategies that are appropriate for assessment and intervention with individuals, families, and groups to facilitate optimal mental health will be discussed and practiced. Prereq: NUND 407 and NUND 408.

NUND 441. Management in Advanced Practice (3)
This course focuses on management issues and concepts related to those who will be practicing nursing as advanced practitioners. Seminars will focus on integrating legal, fiscal, quality improvement, informatic concepts and other intervening variables that affect environments of care. As an integrating part of the course, students will design and develop a nursing practice organization project that pertains to their clinical or management interests.

NUND 450. Applied Statistics (3)
This course provides an advanced overview of the assumptions and applications necessary to analyze and interpret questions and research related to clinical practice. Emphasis will be on statistical interpretation of research. During the course, data management, statistical analysis, and data interpretation, as well as univariate, bivariate, and multivariate statistics such as ANOVA and ANCOVA will be examined. The data analysis process will be examined and deconstructed throughout the course. Prereq: STAT 201 or equivalent within past 5 years.

NUND 478. Curriculum and Instruction (3)
The purpose of this course is to explore the theoretical underpinnings of education and to examine innovative approaches to critical thinking. Students are provided the opportunity to analyze philosophical and principles of education along with teaching and learning styles. The course will focus on curriculum planning and development congruent with the philosophy and objectives of a nursing program. Curriculum development includes determination of program and course objectives, along with selection and organization of appropriate learning experiences to meet these objectives. Techniques for instruction in the classroom, laboratory, and clinical settings are explored. Offered as NUND 478 and NURS 578.

NUND 479 Theoretical Foundations of Educational Testing and Evaluation (2)
In this course, an overview of educational measurement and evaluation is provided. Methods of evaluating teaching effectiveness, student learning, and student performance are explored, with particular emphasis placed on test construction and analysis. Offered as NUND 479 and NURS 619. Prereq: Coreq: NUND 478.

NUND 480. (1) Action Research and Program Evaluation
This course introduces the student to the concept of purposeful evaluation. The applicability of action research and evaluation to the change process and the potential for continuous improvement within various venues will be explored. The iterative, participative, and emergent nature of generation of new knowledge and practice innovations will be discussed. Offered as NUND 480 and NURS 620. Prereq or Coreq: NUND 479.

NUND 481. Teaching Practicum (2)
In this preceptored teaching practicum, the student may engage in classroom, laboratory, and clinical teaching assignments in nursing. The student will be expected to use current educational theory and nursing knowledge in completing the practicum experience (minimum 60 hours). Prereq or Coreq: NUND 480.

NUND 483. Health Care Planning and Policy and Information Management Systems (3)
An exploration of the nurse's role in health care policy and planning and information systems. Overview of issues in health care policy and planning, including the socio-political and economic context of health and health-seeking behaviors. Health care policy and planning at the local, state, and federal levels will be explored. Ethical dimensions of public policy formulations and implementation will be highlighted. The application of computer technology in health care and nursing will be explored. Following an introduction to hardware and software, special consideration will be given to clinical and administrative applications of information technology.

NUND 493. Population-Based Maternal-Child Nursing: Issues, Research, Policy & Inter (3)
This course focuses on broadening the knowledge base of pediatric and family nurse practitioner students to include aggregate-based health assessment and policy issues. This course is designed to build upon the students’ previously acquired knowledge of the nurse’s role in health policy analysis and planning, and the community health. Emphasis will be placed on the assessment of women’s health and children’s health at the community level, and the development of programmatic interventions to address identified needs. Students are expected to extend their expertise with policy analysis through development of a proposal to implement policy changes specific to needs identified within the population of women and children. Coreq: NUND 483

NUND 500. D.N.P. Thesis (1 - 6)
Systematic investigation of a clinically based research problem selected by the student for independent study. This includes proposal refinement and acceptance, data analysis and thesis completion under thesis committee supervision. Prereq: NURS 521.

NUND 504. Theories for Nursing Practice and Scholarship (3)
This initial course in the Doctor of Nursing Practice program examines the nature of theory, theory development in nursing, and significant conceptu-
Informatics (4)

NUND 506. Leadership in Organizations and Systems (5)
Leadership theory, organization theory and philosophy, culture, structure, processes, information management, and other factors are analyzed for their relevance to health care enterprises. Nursing is examined within the larger context of the health care system. Prereq: NUND 504.

NUND 507. Management in Advanced Nursing Practice (3)
This course is focused on management entrepreneurial concepts and issues related to advanced nursing practice. Seminars will focus on integrating legal, fiscal, quality improvement, and other intervening variables that affect environments of care. Prereq: NUND 506.

NUND 508. Health Policy Development and Implementation (3)
An exploration of the leadership role of nurses and nursing in health policy development and implementation. Overview of issues in health policy, including the socio-political and economic context of health and health-seeking behaviors. Health policy development and implementation at the local, state, national, and global levels will be explored. Ethical dimensions of public policy formulations and implementation will be highlighted. Prereq: NUND 504.

NUND 509. Curriculum and Instruction (3)
The purpose of this course is to explore the theoretical underpinnings of education and to examine innovative approaches to critical thinking. Students are provided the opportunity to analyze philosophies and principles of education along with teaching and learning styles. The focus of this course is on curriculum planning and development congruent with the philosophy and objectives of a nursing program. Curriculum development includes determination of program and course objectives, along with selection and organization of appropriate learning experiences to meet these objectives. Effective techniques for instruction in the classroom, laboratory, and clinical settings are explored. Prereq: NUND 506.

COURSE DESCRIPTIONS (NUNI)

NUNI 431. Advanced Nursing Informatics (4)
This course emphasizes the information needs of clinical users and the flow of information within the health care environment. General systems theory concepts and their applicability to health care information systems will be discussed. Diagnosis of information management problems, formulation of user-friendly solutions, implementation of those solutions, and their subsequent evaluation will be emphasized. Evolving/emerging information technologies will be discussed as well as the role of human-technology interactions in the health care setting. Prereq: NUNI 421, MIDS 409, and NURS 471.

NUNI 499. Internship in Nursing Informatics (5)
This capstone experience consists of four components: the precepted internship in an external health care setting, an outline discussion experience, a leadership seminar, and a comprehensive program examination. This internship is designed to provide the Nursing Informatics student with the opportunity to apply the knowledge and skills acquired through the program to the management of health care information activities. Recommended preparation: Completion of first year of M.S.N.

COURSE DESCRIPTIONS (NUNP)

NUNP 401. Health Promotion in Children and Adolescents (3)
This course introduces the concepts of pediatric primary health care from a developmental perspective. Concepts and theories from nursing and other related disciplines associated with the assessment and care of well children and their families are explored. Clinical application of theories and nursing strategies to optimize health-seeking behaviors in clients and to foster therapeutic relationships are examined. Prereq or Coreq: NUNP 416.

NUNP 410. Health Promotion Across the Life Span (2)
This course introduces health promotion fundamental to advanced practice nursing. Epidemiological principles and international, national and local health promotion goals are examined with emphasis on cultural and environmental principles, individual assessment and evidence-based practice. Diagnostic reasoning and intervention strategies to optimize health-seeking behaviors in clients and to foster therapeutic relationships are examined.

NUNP 412. Neonatal Nurse Practitioner II (4)
This course focuses on the health problems of the high-risk neonate in the context of family, culture, and community. Nursing strategies that enhance, maintain, and restore health in ill neonates and their families. Principles identified for advanced diagnostic and therapeutic approaches specific to the neonate, including pharmacology, are emphasized. Prereq: NUNP 405.

NUNP 413. Neonatal Nurse Practitioner III (3)
Pathophysiology, assessment, and diagnostic approaches specific to neonates with acute problems will be examined. Concepts related to discharge planning collaboration and long-term follow-up will be introduced. Prereq: NUNP 412.

NUNP 414. Neonatal Nurse Practitioner IV (5)
This course focuses on the acute and ongoing health problems specific to the management of neonates with complex health problems. Pathophysiology, assessment, and diagnostic approaches specific to complex health problems of preterm infants, infants with chromosomal aberrations, and infants with multidimensional health problems will be emphasized within the context of their family and community environments. Community-based service learning will be stressed along with follow-up of the infant and family during the first year of life. Emphasis will be placed on consultation and referral processes within multidisciplinary teams. Prereq: NUNP 405, NUNP 412 and NUNP 413.

NUNP 416. Integrated Assessment of the Neonate (2.5)
This course introduces principles fundamental to the integrated assessment of the neonate. It stresses perinatal history taking, gestational age assessment, physical assessment skills, and assessment of genetic
NURS 430. Community Engagement Seminar I (1)

This course is a one credit seminar focused on the delivery of culturally appropriate community based health care and on selected issues contributing to the growing disparities in health care outcomes. Students will engage in a 12 hour field experience in a Cleveland community health facility or school system. The seminar will include two sessions devoted to the reflection and evaluation of the field experience. In addition, each semester will include required attendance at the Rozella Schlotfeldt Public Lectures related to issues contributing to disparities in health care. Prereq: NURS 110 or permission of instructor.

NURS 201. Applied Nutrition in Health and Disease (2)

This course builds upon the student's knowledge of human physiology and metabolism. Nutrient requirements are highlighted as well as changes related to different stages in the lifespan. Contemporary nutritional issues will be addressed. Prereq: BIOL 114 and BIOL 116 or permission of instructor. Coreq: BIOL 117 and BIOL 119.

NURS 210. Community Engagement Seminar II (1)

This course is a one credit seminar focused on the delivery of culturally appropriate community based health care and on the issues of aging and poverty as they contribute to the growing disparities in health care outcomes. Students will engage in a 12 hour field experience in a Cleveland community health facility or school system. The seminar will include two sessions devoted to the reflection and evaluation of the field experience. In addition, each semester will include required attendance at the Rozella Schlotfeldt Public Lectures related to issues contributing to disparities in health care. Prereq: NURS 160 or permission of instructor.

NURS 432. Common and Acute Health Problems of the Adult I (5)

This course introduces the common and acute health problems occurring across the adult life span. A body system approach is used with emphasis on the biological, psychological, social and cultural aspects of care. Pathophysiology, assessment and diagnostic strategies specific to the acute and common problems of adults and adolescents will be stressed. Nursing strategies used to enhance, maintain and restore health will be emphasized. Prereq: NURS 453, NURS 459 and NURS 410. Prereq or Coreq: NURS 430.

NURS 433. Common and Acute Health Problems of the Adult II (3)

This course is a continuation of NURS 432. Emphasis is on the pathophysiology, assessment and diagnostic approaches specific to the adolescent and adult client. Health-seeking behaviors will be stressed within the context of the family and community.

NURS 434. Advanced Management in Adult Primary Care (5)

This course focuses on the health care concepts specific to the management of complex, multidimensional health problems experienced by adolescents and adults within the context of their family and community environments. Pathophysiology, assessment and diagnostic strategies specific to complex health problems in adults are emphasized. The selection of clinical interventions, clinical decision making, and evaluation of strategies used to enhance the health outcomes of adults will be stressed. Prereq: NURS 433.

NURS 439. Family Health Nursing: Health of Children and Adolescents (4)

This course introduces the influence of family dynamics and the information necessary for the practice of primary health care of children and adolescents. The course includes application of the principles of growth and development, disease prevention, and management of common acute and chronic health problems. The impact of the family on child and adolescent development and health is explored. Clinical application of nursing strategies to optimize health-seeking behaviors is emphasized. Prereq: NURS 432.

NURS 443. Acute Health Problems of the Adult (1 - 6)

Emphasis is on the pathophysiology, assessment, and diagnostic approaches specific to acute health problems of adults. The clinical laboratory focuses on development of advanced therapeutics and case management skills. Prereq: NURS 438.

NURS 444. Advanced Management of Acutely Ill Adults (1 - 4)

This course focuses on concepts specific to complex, multidimensional health problems of hospitalized adults. Pathophysiology, assessment, and diagnostic strategies specific to complex health problems are emphasized. Clinical practice focuses on case management of acutely ill hospitalized adults with complex health problems. Prereq: NURS 443.

NURS 449. Primary Care of Older Adults (3)

This course will focus on the assessment of the older adults. These factors are analyzed in various environments. Epidemiological and health behavior models are used to assess health risks, assist with problem identification, primary, secondary, and tertiary prevention strategies. Cultural, ethnic, and developmental issues are addressed. Concepts, assessment strategies, interventions and evaluation approaches specific for older adults are identified. Prereq: NURS 419.

NURS 454. Advanced Management of Complex Problems in the Older Adult (4)

This course focuses on the management of complex multidimensional health problems experienced by older adults and their families in multiple environments of care. Pathophysiology, assessment, and diagnostic strategies specific to complex health problems in older adults are emphasized. Evidence-based management strategies used to enhance the outcomes in older adults to promote health and prevent disability will be stressed. The role of the GNP on care giving teams will be included. Prereq: NURS 449. Coreq: NURS 442.

Course Descriptions (NURS)

NURS 110. Foundations of the Discipline (1)

This course is designed to introduce the student to the practice, profession and discipline of nursing. A futuristic perspective will provide a framework for discussion of the foundation of contemporary nursing practice within a variety of health care settings.
NURS 211. Introduction to Pharmacology (2)  
Introduction to basic principles of pharmacology and pharmacotherapeutics. Review of characteristics and use of major drug groups with emphasis on nursing implications. Prereq: NURS 122 and BIOL 116.

NURS 230. Nursing Care of the Adult I (5)  
This course is the first in a two part series of courses focusing on the application of the nursing process in various settings to the adult experiencing common acute and chronic health alterations. Special emphasis is placed on assessment, diagnostic testing, and nursing interventions as part of the nursing process. Prereq: NURS 122, BIOL 114, and BIOL 117. Coreq: BIOL 121.

NURS 240. Nursing Care of the Adult II (5)  
This course builds upon the knowledge and skills mastered in NURS 230 and NURS 250. Course content and learning opportunities provide students with the information necessary to collaborate with other members of the health care team in providing comprehensive care to adults and older adults. Students will use the nursing process in selecting appropriate nursing interventions for the care of adults experiencing multiple acute and chronic health problems in the acute care setting. Special emphasis is placed on evaluating patient responses and revising the plan of nursing care to optimize expected outcomes. Prereq: NURS 211, NURS 230, NURS 250, and BIOL 121.

NURS 250. Aging in Health and Illness (2)  
This course will explore the concept of aging as a healthy developmental process with a particular focus on the elderly as active, independent, and contributing members of the community. Content will include the physiology of aging, health problems common to the elderly, the psychological, emotional, and sociological aspects of the aging process and policy issues. Prereq: NURS 122, BIOL 114, BIOL 117, and BIOL 119.

NURS 260. Community Engagement Seminar III (1)  
This course is a one credit seminar focused on the delivery of culturally appropriate community based health care and on the issues of culture, ethnicity and socio-economic background as they contribute to the growing disparities in health care outcomes. Students will engage in a 12 hour field experience in a Cleveland health care facility or school system where they will provide health screening and health education services to children and families. The seminar will include two sessions devoted to reflection and evaluation of the field experience. In addition, each semester will include required attendance at the Rozella Schlotfeldt Public Lectures related to issues contributing to disparities in health care. Prereq: NURS 260.

NURS 315. Parents and Neonates in Health and Illness (4)  
This course focuses on the study of childbearing families and their health-seeking behaviors from a developmental perspective. Content includes nursing knowledge and skills related to assessment of health status of parents and neonates. Nursing strategies focusing on interventions to promote, restore, and maintain health are discussed. Prereq: NURS 240, NURS 317, and NURS 342.

NURS 316. Infants, Children, and Adolescents in Health and Illness (4)  
The study of infants, children, and adolescents, and the health-seeking behaviors from a developmental perspective. Emphasis is on healthy infants, children, and adolescents as well as infants, children, and adolescents with common, acute, and chronic illness within the context of their family environment. Nursing strategies focus on interventions to promote, restore, and maintain health and foster growth and development. Prereq: NURS 240, NURS 317, NURS 342.

NURS 317. Psychiatric-Mental Health Nursing (4)  
The course is designed to address health-seeking behavior patterns within the context of psychiatric and mental health nursing concepts. The focus is on clients with psychiatric disorders and their mental health. Nursing strategies that are appropriate for assessment and intervention with individuals, families, and groups to facilitate optimal mental health will be discussed and practiced. Prereq: NURS 230 and NURS 211, or permission of instructor.

NURS 318. Nursing in the Community (4)  
The study of the promotion of health and the primary, secondary, and tertiary prevention of health problems of a population. Focuses on the community as client with nursing care of individuals, families, and groups. The clinical component focuses upon developing and evaluating health promotion programs, family assessment, community assessment, and community-based home care within the context of the community. Recommended preparation: RN license.

NURS 320. Theoretical and Evidence Bases for Best Practice in Nursing (3)  
This course explores the theoretical and evidence bases for best practices in nursing. The course begins with an overview of the theoretical and philosophical underpinnings of nursing practice and nursing science. The course includes an intensive focus on the concept of evidence based practice and the process of evaluation supporting practice. Additionally, the course introduces evaluation models used to determine the effectiveness and quality of existing practice and to recommend improvements. Prereq: STAT 201 and completion of five semesters of B.S.N. program. SAGES Dept Seminar

NURS 341. Concepts of Management (3)  
This course focuses on the study of basic concepts related to leadership, management and working with groups in the provision of nursing care. Concepts include: decision making, power, authority, roles, teaching-learning, evaluation, leader behaviors, work groups, change, legal aspects and quality. Students will apply the key concepts from marketing, law, finance, quality management, and other intervening variables that affect environments of care.

NURS 342. Medical Microbiology, Immunity, and Infectious Disease (4)  

NURS 343. Issues and Ethics in Health Care (2)  
This course is designed to introduce the student to the principles underlying ethical issues and methods of rational decision making. Fundamental theories will be reviewed and opportunity provided, using case analysis, to apply the theories in addressing ethical dilemmas common to modern health care.

NURS 345. Nursing Informatics III: Clinical NIS (2)  
The focus of this course is directed toward the understanding and use of information technologies and systems that support decision making in nursing practice, administration, research and education. Tools such as list servers, the World Wide Web, e-mail and databases may be used to augment the knowledge base in the course. Recommended preparation: RN license. Prereq: NURS 240 or RN license.

NURS 346. Nursing Informatics IV: Applications (2)  
The focus of this course is directed toward the advanced informatics concepts and the implementation of selected applications within the health care setting. Systems analyzed and implemented may range from those used for patient care within the inpatient environment to those used in community or outpatient environments. Affected users of the systems may be clients, families, nursing or other health care professionals. Prereq: NURS 345 or permission.

NURS 350. Concepts and Management in Geriatric Nursing (9)  
This course will introduce concepts of rehabilitation, family nursing, geriatric nursing, and geriatric mental health and assist students in applying these concepts in a long-term care setting. Content will focus on assessment and intervention strategies for health problems common in the older adult. This will include a focus on developmental issues in the elderly, the assessment and management of depression. The course will also include content on assess-
ment and intervention to improve the physical and functional capacities of the elderly, exercise interventions to improve cardiovascular and muscular capacity required for daily activities. Prereq: NURS 351 and NURS 353.

NURS 351. Acute Care II: Management of Care (4)
Application of management concepts in providing nursing care to individuals and groups of patients. Learning opportunities include experiences with members of the multidisciplinary health care team in planning, implementing, and evaluating patient outcomes. Prereq: NURS 240 and NURS 317. Coreq: NURS 353.

NURS 352. Acute Care III (9)
This course focuses on the knowledge and skills necessary to provide nursing care for patients with complex problems. Emphasis is on nursing strategies designed to provide comprehensive care to patients and their families affected by acute illness. Clinical practice is directed toward the care of acutely ill adults. Prereq: NURS 370, NURS 371, NURS 372, NURS 373.

NURS 353. Principles of Critical Care I (4)
This course provides the knowledge and technical skills foundational to the care of critically ill patients. Clinical practice is directed toward the care of the critically ill patient with a focus on patient assessment, use of biotechnical technology, development of psychomotor skills, and planning basic care. Prereq: NURS 240 and NURS 317. Coreq: NURS 351.

NURS 354. Nursing Care of Critically Ill Adults (9)
This course focuses on the integration of knowledge and skills to provide effective and efficient nursing care to critically ill adults. Emphasis is on nursing strategies designed to provide comprehensive care to patients and their families affected by acute illness. Clinical practice is directed toward the care of acutely ill adults. Prereq: NURS 370, NURS 371, NURS 372, NURS 373.

NURS 356. Nursing Care of Critically Ill Neonates, Infants, and Children (9)
This course focuses on the knowledge and skills necessary for beginning practice in the nursing care of critically ill neonates, infants and children. Emphasis is on nursing strategies directed toward the application of basic principles of critical care nursing with attention to special needs of critically ill neonates, infants and children and their families. Prereq: NURS 370, NURS 371, NURS 372, NURS 373.

NURS 360. Community Engagement Seminar V (1)
This course is a one credit seminar focused on the delivery of culturally appropriate community based health care and on the issues of culture, ethnicity and socio-economic background as they contribute to the growing disparities in health care outcomes. Students will engage in a 12 hour field experience in a Cleveland health care facility or school system where they will provide health screening and health education services to children and families. The seminar will include two sessions devoted to reflection and evaluation of the field experience. In addition, each semester will include required attendance at the Rosella Schlofeldt Public Lectures related to issues contributing to disparities in health care. Prereq: NURS 310. Coreq: NURS 351 and NURS 353.

NURS 370. Information Technologies in Health (1)
The focus of this course is the application of advanced information and communication technologies in the health care of communities and populations. Building on a base of consumer informatics, the course will explore Geographic Information Systems (GIS), data mining techniques, telemedicine technology, and advanced communication technologies in the context of global health. Prereq: NURS 315, NURS 316, NURS 345, NURS 351 and NURS 353. Coreq: NURS 371, NURS 372 and NURS 373.

NURS 371. Public Health Nursing (3)
In this course, students will utilize a problem-based approach to develop knowledge and specific competencies in applying key concepts of public health, public health nursing and epidemiology. Through guided observation and classroom experiences, students will discover strategies to assess, plan, implement and evaluate population-focused programs for health promotion and disease prevention. Prereq: NURS 315, NURS 316, NURS 345, NURS 351 and NURS 353. Coreq: NURS 370, NURS 372 and NURS 373.

NURS 372. Health in the Global Community (3)
This course focuses on an analysis of the forces shaping community and global health patterns. Drawing on multidisciplinary sources, this course explores the impact of these global processes as they manifest in the health of our own and other societies. Emphasis is placed on analysis of the broad cultural, environmental, social-economic, and political systems that contribute to health status and outcomes, health policies, and health care delivery around the world. Prereq: NURS 315, NURS 316, NURS 345, NURS 351 and NURS 353. Coreq: NURS 370, NURS 371, and NURS 373. Global & Cultural Diversity

NURS 373. Global Health Practicum (5)
The purpose of this practicum is to provide students with the opportunity to analyze the concepts of health and health care, health policy and finance, culture and ethics through a preceptorized, 10-week community-based immersion experience in local, national, or international settings. Students will apply epidemiological techniques, the skills of negotiation, partnership building, community assessment and nursing science in the identification and analysis of a health problem leading to the development of an intervention. Prereq: NURS 315, NURS 316, NURS 345, NURS 351 and NURS 353. Coreq: NURS 370, NURS 371 and NURS 372. SAGES Senior Cap

NURS 391. Home Health Care Nursing (5)
This course focuses on the knowledge and skills necessary to provide nursing care in home health settings for clients with complex problems. Emphasis is on nursing strategies designed to provide comprehensive nursing care to clients and their families. Clinical practice is directed toward the care of client/family in the home. Recommended preparation: RN license.

NURS 392. Dynamics of Nursing Practice and Management (4)
The focus of this course is management and leadership concepts and their application to nursing practice. Topics such as strategic planning, resource management, organizational structure, legal issues, and delegation will be explored. Recommended preparation: RN license.

NURS 393. New Applications in Nursing Practice Management (4)
The focus of this course is the application of management and leadership concepts in a seminar format and clinical practicum for registered nurses. Students will apply concepts of strategic planning, resource management, organizational structure, and delegation in a health care setting. Recommended preparation: RN license.

NURS 399. Independent Study (1 - 12)
Independent guided study for undergraduate students with special needs or interests.

NURS 400. Guided Study in Nursing (1 - 18)
Independent study for students with special needs and interests.

NURS 401. Statistics for Health Sciences (3)
This course examines statistical methods of analyses of variance and multiple linear regression. Content includes ANOVA, repeated measures analysis of variances, correlation analysis, and multiple linear regression. Learning statistical theories is coupled with practice of data analysis using statistical software. This course is for graduate students in nursing and health sciences. It is not for credit toward any undergraduate or graduate degrees in Statistics. Recommended preparation: completion of basic statistics within five years of admission to program. Prereq: STAT 201.

NURS 404. Emergent Care of the Child (2)
This course incorporates biological, developmental, psychological, emotional, social, and cultural aspects of care. The emphasis is on pathophysiology, assessment, diagnostic approaches, and interventions specific to emergent care of infants, children, and adolescents. Advanced therapeutics are introduced. Recommended preparation: Certification in PALS and neonatal resuscitation or concurrent enrollment in NUNP 444. Prereq or Coreq: NUNP 444.

NURS 405. Inquiry I - Theoretical Foundations (3)
This course provides an introduction to conceptual and theoretical thinking. Students will examine knowledge development in nursing, conceptual structures, and their uses as a basis for nursing practice and research.

NURS 406. Flight Nursing Seminar I (1)
This seminar course provides a forum for preparing students to care for patients requiring air transfer to specialty care facilities. Special emphasis is placed on advanced procedures, flight physiology, and environmental influences on the clinical approach in order to apply acute care competencies to flight nursing practice. Prereq or Coreq: NUNP 443.

NURS 407. Flight Nursing Seminar II (1)
This seminar continues to prepare students to care for patients requiring air transfer to specialty care facilities. Special emphasis is placed on clinical approaches to patient management across the lifespan. Recommended preparation: ACLS, PALS, and neonatal resuscitation certification. Recommended preparation or concurrent enrollment in NUNP 444, NURS 406, NURS 404.

NURS 408 Health Care of the Young Child with a Disability (3)
The focus is on the study of young children with disabilities and chronic conditions. Related issues of development, diagnosis, treatment, and family concerns are included. Continuum of care from hospital to home is considered. Involvement of the family as a member of the health care team is emphasized. Various technologies and feeding strategies for management of children's disabilities are highlighted. Context of care is considered from a multidisciplinary team approach.

NURS 409. Specialty Assessment and Diagnostics in Cardiovascular Nursing (2)
This course provides the basis for the selection and interpretation of assessment and testing strategies during the process of differential diagnosis of cardiovascular problems. Lecture is supplemented with specific clinical lab experiences.

NURS 410. Cardiovascular Nursing Seminar I (1)
This seminar course focuses on cardiac rhythm abnormalities and their management. Prereq or Coreq: NURS 430. Coreq: NURS 409.

NURS 411. Cardiovascular Nursing Seminar II (1)
This seminar course focuses on the management of complex cardiovascular disease. Prereq: NURS 410.

NURS 416. Integrated Assessment of the Neonate for Midwives (1)
This course introduces principles fundamental to the integrated assessment of the neonate. Gestational age assessment, assessment of genetic risks, and physical assessment skills are developed.

NURS 424. Theoretical Basis of Medical/Surgical Nursing II (5)
This course provides the opportunity to explore complex health problems of patients requiring a variety of health care services and support systems. Nursing strategies requiring independent, interdependent, and collaborative activities are evaluated for their efficacy in supporting and assisting the patient’s progress toward health. Clinical experiences are individualized to promote implementation of the Clinical Nurse Specialist role and build upon the student's expertise.

NURS 425. Inquiry II - Research Process (3)
This course emphasizes scholarly inquiry, scientific integrity and scientific investigation. It includes study of the research process, particularly design, sampling, data collection and analysis, and interpretation and reporting of findings. Recommended preparation: NUND 201 or STAT 201. Prereq: NURS 405.

NURS 430. Pharmacology and Therapeutics (3)
Examination of the major categories of pharmacologic agents and application of pharmacologic concepts in the clinical setting. Emphasis is placed on understanding the physiologic action of the drugs, expected patient responses, and major side effects. Major-specific seminars integrate knowledge of pharmacology into clinical practice. Recommended preparation: NURS 453, RN license or consent of instructor.

NURS 438. Theoretical Foundations of Acute Care Nursing (2 - 4)
This course focuses on advanced practice by examining common health and illness phenomena in the acute care setting. Concepts, theories, and phenomena will be analyzed for their relevance in planning and evaluating nursing care strategies and modalities. Individualized clinical experience in the acute care setting with a selected patient population is part of the advanced practicum. Prereq or Coreq: NURS 453 and NURS 459.

NURS 441. Mental Health of Older Adults (1)
This course focuses on discussion of the consultative, investigative, and planning skills to meet the special mental health needs of the elderly. Concepts of mental health promotion, mental illness prevention, knowledge development, implementation, and evaluation of psychotherapeutic nursing strategies are examined. The examination of diverse mental health disorders in the aged mental health service delivery are included.

NURS 442. Mental Health Interventions with Older Adults (1)
This course focuses on the theoretical basis of psychosocial assessment and intervention with older adults and their families, with an emphasis on individual, group, and family interventions. Concepts from individual, family, and group modalities and the process of consultation and education are examined. Students will also learn the components of individual and family assessment in “well elders” and the identification of mental disorders, including problems with memory and cognition. This knowledge base serves as the foundation for developing and applying interventions in practice to meet the mental health needs of older adults. Prereq or Coreq: NURS 441.

NURS 443A. Collaboration, Consultation, & Credentialing in Advanced Practice Nurs (1)
The focus of this course is the process of consultation and collaboration in advanced practice nursing. The organizations that are involved in promoting and assisting advanced practice nurses (APNs) will be addressed. The similarities and differences in the roles of the APN will be explored. The process of credentialing APNs will also be examined.

NURS 443B. Role Development in Advanced Practice (1)
The focus of this course is the study of the multiple roles integrated into advanced practice nursing including principles of management and leadership. Strategies to market the value of the advanced practice nurse (APN) role and the individual APN are addressed.

NURS 443C. Teaching and Learning in Advanced Practice (1)
The focus of this course is the examination of the process of teaching, learning, and evaluation. A variety of teaching modalities applicable across the lifespan will be explored.

NURS 444A. Ethical Issues in Advanced Practice (1)
The focus of this course is ethical decision-making for advanced practice nurses. The interaction between the health care delivery system and ethical decision making is explored.

NURS 444B. Health Care Delivery and Finance in Advanced Practice (1)
The focus of this course is the study of the financial and business factors related to the health care delivery system and advanced practice nursing. Students will discuss strategies related to reimbursement, business practices, billing, and coding.

NURS 444C. Health Policy Legislation and Legal Issues in Advanced Practice (1)
The focus of this course is the critical analysis of health policy and legal issues. Strategies for influencing the regulatory process will be explored.

NURS 445. Infection Control I (3)
Examination of the principles of pathogenicity, transmission, diagnosis, immunization, and therapy of select infectious disease agents and methods of prevention and control of these agents in the community and health care settings. Introduction to application of infection control policies and procedures in a variety of community and clinical settings.

NURS 446. Collaboration and Administration in the Health Care Delivery System (3)
Examination of the influence of the health care delivery environment on the delivery of care and the role of the Advanced Practice Nurse as collaborator within the health care structure. Clinical practice and seminars will focus on the role of the manager in planning, organizing, staffing, directing, and controlling the health care environment for the purpose of improving patient care, facilitating collaborative activities with other health care professionals, and identifying mechanisms to effect change within the health care system. Clinical practice 8 hours per week.

NURS 448. Mental Health Pracitcum with Older Adults (3)
This course focuses on the application and development of psychosocial assessment and intervention with older adults and their families, with an emphasis on individual, group, and family interventions. Concepts from individual, family, and group modalities and the process of consultation will be
applied. The components of individual and family assessment will be applied in “well elder” as well as those with identified mental disorders. Prereq: NURS 441 and NURS 442.

NURS 450. Infection Control II (3)
Examination and application of an infection control program in a community or clinical setting. Content related to bioterrorism or natural disaster situations will be included. Prereq: NURS 495, NURS 496, EPBI 494 and NURS 445.

NURS 453. Physiologic Foundations for Advanced Practice Nursing (4)
This course is designed to build upon the student’s pre-existing knowledge of basic human anatomy, physiology, and nursing science. Selected body systems are examined in order to provide in-depth integration of normal physiologic functions with specific intervening variables and pathologic mechanisms associated with life span development and dysfunction. Recommended preparation: RN license or consent of instructor.

NURS 454. Well Woman Health Care (3)
Study of selected theoretical formulations and models applied by professional nurses in the promotion of growth and wellness in adolescent and adult women. Emphasis on conception, decision making, sexuality and health teaching. Acquisition of knowledge and skill related to physical and psychosocial health assessment of pregnant and nonpregnant clients. Individually planned experiences with nurse faculty who are serving as primary care givers in maternity, family planning and gynecologic care settings. Prereq or Coreq: NURS 453 and NURS 459.

NURS 455. The Childbearing Family (4)
This course will focus on analysis and applications of the nursing strategies to enhance health-seeking behaviors of the pregnant family during the maternity cycle and on the education of parents about the childbearing year. The normal aspects of the pregnant woman and the identification of any deviations from the normal are central to the content. The course will also emphasize the enhancement of the pregnant family’s childbirth experience through utilization of the teaching-learning process. The student will learn to evaluate and apply techniques relative to childbirth education. Clinical experiences will be planned in ante partum, neonatal, childbirth education and home settings. Prereq: NURS 454. Coreq: NURS 430.

NURS 457. Labor and Birth (5)
The focus of this course is the application of nursing theory, practice and research by advanced practice nurses in the promotion of health and wellness of women, newborns and their families during intrapartum and the immediate postpartum period. Emphasis is placed on the health-seeking behaviors of the mother and her family using a holistic approach emphasizing cultural, ethnic and racial diversity in the provision and evaluation of care. Supervised clinical experience includes anticipating and identifying complications and participating in consultations, referrals and collaborative management. Prereq: NURS 455.

NURS 459. Integrated Assessment for Advanced Nursing Practice (3)
This course introduces concepts fundamental to the role of the Advanced Practice Nurse. It stresses health assessment, history taking, interviewing, and physical assessment skills, and provides the basis for decision making, advanced therapeutics and case management. Recommended preparation: RN license or consent of instructor.

NURS 460A. Theoretical Basis for Individual Counseling (1)
This course emphasizes the ongoing development of the counseling relationship across the life span. The professional encounter between the individual and advanced practice nurse will be formulated based on the Helping Model for problem management. Students will differentiate counseling and therapy. Students will also develop and apply crisis intervention skills, interviewing skills and alternative adjunct therapies.

NURS 460B. Theoretical Basis for Individual Psychotherapy (1)
This course will build therapeutic skills for the advanced practice nurse specializing in mental health. Students will master Helping Skills in their interventions with individuals with psychopathology. Prereq: NURS 460A. Prereq or Coreq: SSBT 548 and PSCL 524.

NURS 461. Practicum and Supervision of Individual Therapy (1 - 2)
Direct care experience. Focus on therapeutic process with persons experiencing psychosocial disturbances. Use of nursing strategies to enhance health-seeking behaviors. Examination of genesis of psychopathology: emphasis on methods of assessment, goal setting, intervention, and evaluation. Group and individual supervision. Prereq: NURS 460A.

NURS 462. Practicum and Supervision of Group and Family Therapy (2 - 3)
Direct care experience, formal group and family experience focusing on process, content and leader behavior. The nurse-therapist employs nursing strategies to enhance health-seeking behaviors of family and group. Use of concepts from psychiatry and behavioral and social sciences related to the promotion of mental health and treatment of psychosocial distress in groups and families. Group and individual supervision. Prereq: NURS 460A.

NURS 463. Theoretical Basis of Practice & Supervision in Consultation & Mental Health (1 - 3)
Indirect care experience. Theories of consultation. Adult education. Exploration of issues related to the role of the clinician in the enhancement of health-seeking behaviors of individuals and communities as they strive to achieve optimal levels of health. Examination of the consultative, administrative and educational processes in the practice of consultation and community education. Seminars, group, and individual supervision. Prereq: NURS 460A, NURS 462.

NURS 466. Practicum and Supervision in Role of Clinician (3)
The professional encounter between the psychiatric mental health clinical nurse specialist, staff and agency personnel providing mental health services, and clients receiving services in the context of an environment of care is emphasized. Intrapersonal, interpersonal and extrapersonal variables that influence the health-seeking behaviors of individuals, families and groups as they seek to attain, maintain or regain optimal levels of mental health are employed.

NURS 467. Theory of Family and Group Modalities (2 - 3)
The professional encounter between nurse therapist and the group or group members and the family or family members occurs within the context of an environment of care. The nurse therapist enhances health-seeking behaviors of individuals, families and groups. The nurse therapist employs nursing strategies cognizant of interviewing variables, to facilitate health-seeking behaviors of family and group members. Concepts from family and group theory, family and group literature, and research in family and small group dynamics are selected to provide an eclectic approach to treatment.

NURS 468. The Continual Improvement of Healthcare: An Interdisciplinary Course (3)
The focus of this course is on collaborative work for the benefit of patients and community. Seminar classwork is combined with a field project, in which interdisciplinary student teams apply what they have learned to the improvement activities of a local health care organization. Successful completion of the course depends on participation in seminar sessions and completion of the interdisciplinary student team project. Offered as EPBI 468, NURS 468, and MPH 468.

NURS 471. Organizational Theories (3)
Examination of intervening variables which affect health care organizations including structure, dynamics and processes of change.

NURS 479. Public Policy and Aging (3)
Overview of aging and the aged. Concepts in the study of public policy. Policies on aging and conditions that they address. The politics of policies on aging. Emergent trends and issues. Offered as ANTH 498, BETH 496, EPBI 408, GER 496, HSTY 480, MPH 408, NURS 479, NURS 579, POSC 480, and SOCI 496.

NURS 480. Public Health and Epidemiology (3)
Study of health care problems within the larger social/environmental context. Epidemiology as a method of reasoning leading to the making of causal inferences. Principles underlying epidemiology as a method of study and the scope, potentialities and limitations of this approach. Recommended preparation or concurrent enrollment: Statistics or consent of instructor.

NURS 491. Community Health Nursing I (4)
This is the first course in the Community Health Nursing major. It is designed to introduce students to the specialist practice of community health nursing and emphasizes the importance of population.
based practice. A population or a geopolitical community focus will be identified by the student, and a comprehensive appraisal of its health status conducted. Priority health concerns and strategies to enhance health-seeking behaviors and mechanisms will be identified. Recommended preparation: Undergraduate Community Health Nursing courses; graduate standing in nursing.

NURS 495. Community Health Nursing II (4)
In this course students will design a feasible plan to address the identified priority concern for a selected population or geopolitical community. Program planning models will be examined, and a model useful to address the priority concern selected. Evaluation techniques will be identified and included in the program design. Interventions to enhance health-seeking behaviors based on primary, secondary, and tertiary prevention strategies will be implemented in the clinical component of the course. Prereq: NURS 491.

NURS 496. Community Health Nursing III (4)
This course completes the Community Health Nursing major. Based on work successfully completed during the previous two courses the student will conclude program implementation and conduct a summative evaluation of overall program effectiveness. As part of the leadership experience, the student, in partnership with the community or population, will explore external funding for program continuation. Issues influencing health care delivery and community health nursing practice will be examined. Prereq: NURS 491 and NURS 495.

NURS 499. The Nurse Executive-Personal & Professional Challenges in Health Care (3)
Offered toward end of the M.S.N./M.B.A. program and prepares the graduate for entry into a nurse management role. The focus will be on contemporary role demands in nursing management, ranging from head nurses to vice presidents of nursing to heads of community health and mental health agencies, and taking account of all regions of the U.S. Emphasis will be placed on exploring knowledge and skill requirements of nursing management, current developments (such as nursing values, goals, and tasks), and the strategic and operational configuration of hospitals and other health care agencies.

NURS 500. Master's Thesis (1 - 4)
Systematic investigation of a research problem selected by the student for independent study. Prereq: NURS 415.

NURS 502. Inquiry III - Evidence-Based Nursing Practice (2)
This course focuses on linking research evidence to nursing practice. Processes for implementation and evaluation of evidence-based nursing practice will be included. Prereq: NURS 425.

NURS 503. Inquiry Practicum (1 - 2)
This course focuses on the development of competencies in scientific inquiry. Such competencies are achieved through experiences in participation in a research study or evidence-based project related to nursing science. A written report of the experience is required. Prereq: NURS 415 or NURS 425.

NURS 506. Nursing Epistemology (3)
This course involves the study of knowledge shared among members of the discipline, the patterns of knowing and knowledge development, criteria for evaluating knowledge claims and philosophy of science. The course is a search and discussion experience aimed at enabling graduate students to become knowledgeable about approaches to the study of disciplines and scientific knowledge development. Forces affecting the development of knowledge, the origins of key terms and concepts, and identification of major themes in nursing will be explored.

NURS 507. Clinical Knowledge (3)
This course is structured to allow students to develop clinical knowledge about their area of interest and to begin the process of identifying clinical research questions. Supervision for this experience will be twofold. Students will be placed with an expert clinician with a minimum of a master's degree (in nursing) to identify and arrange relevant clinical experiences. The student and the clinician will work with the course faculty to create opportunities for the student to experience the clinical phenomena of interest, which may include actual "hands-on" experience. Students will also meet regularly with the other students in the course and the course faculty for group supervision that focuses on linking clinical practice issues to research questions. Course requirements would include eight hours of practicum experiences per week.

NURS 508. Context of Care (3)
This course is designed to allow students to explore the social, political, economic, and health care issues that form the context for their clinical phenomena of interest. The intent of this course is for the student to become knowledgeable about the broader forces that affect their clinical problem. Topics might include current research in their field, as well as health policy related to their phenomena, political entities that affect funding, and the regulation of practice in their area of interest. The student will need a content expert to help them plan and coordinate practicum experiences, which should be multiple and varied, and include exposure to both local and state level entities. Prereq: NURS 507 or equivalent.

NURS 510. Health Disparities (3)
This course aims to provide theoretical and application tools for students from many disciplinary backgrounds to conduct research and develop interventions to reduce health disparities. The course will be situated contextually within the historical record of the United States, reviewing social, political, economic, cultural, legal, and ethical theories related to disparities in general, with a central focus on health disparities. Several frameworks regarding health disparities will be used for investigating and discussing the empirical evidence on disparities among subgroups (e.g., the poor, women, uninsured, disabled, and non-English speaking populations) will also be included and discussed. Students will be expected to develop a research proposal (observational, clinical, and/or intervention) rooted in their disciplinary background that will incorporate materials from the various perspectives presented throughout the course, with the objective of developing and reinforcing a more comprehensive approach to current practices within their fields. Offered as CRSP 510, EPBI 510, MPH 510, NURS 510, and SASS 510.

NURS 511. Strategies for Theory Development (3)
This course examines the nature of theory and strategies for theory development in nursing. Students will explore a variety of strategies and select an approach for beginning theory development that addresses nursing phenomena in their area of interest.

NURS 518. Qualitative Research (3)
This course is a study of qualitative research approaches directed toward the development of nursing knowledge. This course will include methods and issues in data collection, analysis, and critique of research findings. It will focus on the philosophico-cultural and epistemological foundations of qualitative research, present an overview of various methodological approaches, examine in depth the criteria for rigor, and analyze ethical issues in qualitative methodologies.

NURS 520. Advanced Nursing Research I (3)
The development of research questions within a nursing framework and related research designs will be studied. The focus of the course will be problem formulation, selected research designs and sampling. Prereq: NURS 504 or consent of instructor.

NURS 521. Advanced Nursing Research II (3)
The discussion of research designs and their rationale for use will be continued. Principles of measurement, study implementation and data analysis will be discussed. The development of a research proposal will be the expected outcome of this two-semester sequence. Prereq: NURS 401 or STAT 401 and NURS 520.

NURS 522. Advanced Internship in Cardiovascular Nursing (1 - 5)
This 600-hour internship is designated to provide the master's prepared ACNP-Cardiovascular Nursing Graduate with the experience needed to enter practice as an APN caring for patients with complex cardiac disorders. Recommended preparation: completion of appropriate NP program. Prereq: NURS 411.

NURS 523. Advanced Internship in Flight Nursing (1 - 5)
This internship is designed to provide the Master’s prepared ACNP-flight nurse concentration graduate with experience needed to qualify for the Certification Examination in Flight Nursing. This experience consists of a 600 hour precepted internship in a flight nursing setting. Recommended preparation: Completion of M.S.N. program focus in Flight Nursing and ACNP certification, certification in ACLS, PALS, and neonatal resuscitation.

NURS 524. Advanced Practicum in Infection Control (1 - 5)
This practicum experience consists of up to 600 hours of a precepted experience in an infection control program setting. This practicum is designed to provide the student with experience needed to qualify for the Certification Examination in infection control.
Control administered by the Certification Board of Infection Control and Epidemiology to receive CIC certification. The student may choose among a public health, acute care, long-term care, or international setting. Prereq: NURS 450.

NURS 530. Advanced Nursing Research Methods I (3)
This course focuses on conceptualization of a research problem within a nursing perspective, threats to validity, sampling, measurement, and survey, quasi-experimental, and experimental designs. The emphasis is on the application on these strategies while encouraging flexibility in conceptualizing a study using different research methods. Students will develop a research study using methods consistent with theoretical and empirical knowledge and the nursing perspective. Coreq: NURS 532.

NURS 531. Advanced Nursing Research II (3)
This course is the second in a two-course sequence of research methods. It focuses on power analysis, data management, experimental and epidemiological designs and designs to assess change. Included is a discussion of ethics and concerns regarding human subjects. The emphasis is on the application of research strategies while encouraging flexibility in conceptualizing a study using different methods. The development of a research proposal is the outcome of this two-semester sequence. Prereq: NURS 530 and NURS 401 or STAT 401 or equivalent.

NURS 532. Basic Statistics: Fundamentals for Analysis (3)
The purpose of this course is to provide the student with the fundamentals needed for analysis of research problems. It will review theoretical foundations of statistical analysis and inference, probability theory, and hypothesis testing. Use of measures of central tendency, basic parametric and non-parametric tests will be discussed, with specific application to health problems. Use of SPSS will be included. Prereq: Graduate standing or permission of instructor.

NURS 557. Advanced Midwifery (6)
In consultation with faculty, students select a nurse-midwifery service where they assume the responsibilities of beginning practitioner for a minimum of 10 weeks of intensive, supervised clinical practice. Synthesis of the nurse-midwifery management process while providing continuity of care integrating all core competency areas is emphasized. Students explore the professional aspects of nurse-midwifery practice. Historical development of the profession is used as a framework for understanding current issues related to nurse-midwifery education and practice in the United States. Prereq: NURS 457.

NURS 559. Advanced Practice in Nursing Care of Women (2 - 4)
Integration of concepts, theories, conceptual, and theoretical models, focused on supporting the health-seeking of women and their families as they contend with intervening factors. Emphasis on psychosomatic, acute and long-term illnesses and their interplay with psychosocial problems encountered by women. Clinical practice and seminars will include providing nursing care to women and their families in all stages of life cycle. Prereq: NURS 455.

NURS 577. M.S.N./M.B.A. Management Practionum (3)
The student will enter the M.S.N./M.B.A. program with a minimum of two years of recent clinical nursing experience, and may or may not have had any management experience. This practicum is designed to provide a guided experience in a management context. NURS 577 will be offered in the spring semester of the second year of the M.S.N./M.B.A. program, after the student has completed nearly all basic courses in both schools. The management practicum will provide onsite experience in management activities. Most practicum sites will be area health care agencies. In some cases, students may alternate opportunities addressing health-related policies in area businesses or corporations. Typical practicum experiences will engage students in management projects, special assignments and/or research. Students are expected to use current management and nursing knowledge and will often use the research process in completing the practicum experience. They will work closely with nurse executives and managers within their organizations. Prereq: NURS 468 and NURS 471.

NURS 578. Curriculum and Instruction (3)
The purpose of this course is to explore the theoretical underpinnings of education and to examine innovative approaches to critical thinking. Students are provided the opportunity to analyze philosophies and principles of education along with teaching and learning styles. The course will focus on curriculum planning and development congruent with the philosophy and objectives of a nursing program. Curriculum development includes determination of program and course objectives, along with selection and organization of appropriate learning experiences to meet these objectives. Techniques for instruction in the classroom, laboratory, and clinical settings are explored. Offered as NUND 478 and NURS 578.

NURS 579. Public Policy and Aging (3)
Overview of aging and the aged. Concepts in the study of public policy. Policies on aging and conditions that they address. The politics of policies on aging. Emergent trends and issues. Offered as ANTH 498, BETH 496, EPBI 408, GERO 496, HSTY 480, MPH 408, NURS 479, NURS 579, POSC 480, and SOCI 496.

NURS 601. Special Problems (1 - 12)
This course is offered, with permission, to Ph.D. students in Nursing undertaking reading in a field of special interest.

NURS 609. Health Care Policy and Planning (3)
Special emphasis will be placed on selected national and international health policy issues that form the socio-political context of nursing care and practice. Health care policy and planning will also be explored. Ethical dimensions of public policy formulations and implementation will be highlighted. The course will also include an exploration of the nurse's role in research in the formation of health care policy and planning. Students will participate in sessions designed to illuminate the policy components and implications of clinical research.

NURS 615. Topical Seminar in Health Science Research (3)
This Ph.D. course is designed to provide in-depth knowledge of research in a given area. Opportunities are provided to apply knowledge for further development of the student's research interests and ideas. An in-depth examination of selected theoretical and methodological approaches to the development of research related to human science will be emphasized. Interrelationships among theory, research, and knowledge from nursing and related disciplines will be explored.

NURS 619. Theoretical Foundations of Educational Testing and Evaluation (2)
In this course, an overview of educational measurement and evaluation is provided. Methods of evaluating teaching effectiveness, student learning, and student performance are explored, with particular emphasis placed on test construction and analysis. Offered as NUND 479 and NURS 619. Prereq: NURS 578.

NURS 620. Action Research and Program Evaluation (1)
This course introduces the student to the concept of purposeful evaluation. The applicability of action research and evaluation to the change process and to continuous improvement within various venues will be explored. The iterative, participative, and emergent nature of generation of new knowledge and practice innovations will be discussed. Offered as NUND 480 and NURS 620. Prereq: NURS 619.

NURS 621. Teaching Practicum (3 - 6)
In this preceptored teaching practicum, the student may engage in classroom, laboratory, and clinical teaching assignments in nursing. The student will be expected to use current educational theory and nursing knowledge in completing the practicum experience (minimum 60 hours). Prereq: NURS 620.

NURS 630. Advanced Statistics: Linear Models (3)
This course is focused on advanced procedures for data analysis and statistical inference in health research. The course is devoted to discussion of linear models, including simple and multiple regression, logistic regression and application to study design. The role of assumptions and theory in guiding the analysis plan is emphasized through lecture, readings, and critical evaluation of published research in the student's area of interest. Prereq: NURS 532.

NURS 631. Advanced Statistics: Multivariate Analysis (3)
This course focuses on selected advanced multivariate topics and procedures in health research. Topics will be covered through lecture, readings, computer analysis as well as critical analysis of published research in the health sciences fields. Topics to be covered in this course include: survival analysis, factor analysis, path analysis, repeated measures ANOVA and advanced regression techniques (logistic, loglinear, mixed models). Prereq: NURS 530 and NURS 531 and NURS 532 and NURS 630.
NURS 671. Proposal Development (1 - 6)
Provides an opportunity for guided development of a candidacy proposal through planned contact with a designated committee of faculty members. The aim is to assist the student in the development of a refined proposal with strong scientific merit. The course should be utilized only by those with a candidacy proposal statement. Minimum 3 hours required for progression in program.

NURS 701. Dissertation Ph.D. (1 - 18)
Prereq: Predoctoral research consent or advanced to Ph.D. candidacy milestone.
**GUIDE TO ABBREVIATIONS**

### COURSE IDENTIFICATION CODES
The following four-letter course identification codes are used at Case Western Reserve University. They must be used when entering courses during registration (e.g., English 150 would be listed as ENGL 150).

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<thead>
<tr>
<th>Code</th>
<th>Course</th>
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<td>MUDE</td>
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<td>MUTH</td>
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<tr>
<td>MVIR</td>
<td>Molecular Virology Training Prg</td>
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</table>
GUIDE TO ABBREVIATIONS

NEUR, Neurosciences
NTRN, Nutrition
NUAN, Nurse Anesthesia
NUND, Doctor of Nursing
NUNI, Nursing Informatics
NUNP, Nurse Practitioner
NURS, Nursing
OPMT, Operations Management
OPRE, Operations Research
ORBH, Organizational Behavior
PATH, Pathology
PHED, Physical Education
PHIL, Philosophy
PHOL, Physiology and Biophysics
PHRM, Pharmacology
PHYS, Physics
PLCY, Management Policy
POSC, Political Science
PRAC, Practicum
PSCL, Psychology
QUMM, Quantitative Methods in Management
REHE, Restoration of Health
REMA, Restoration & Maintenance of Health
RLGN, Religious Studies
RUSN, Russian
SASS, School of Applied Social Science
SOCI, Sociology
SPAN, Spanish
SPPP, Problem, Policy, Program (MSASS)
SRCH, Research (MSASS)
SSBT, Socio-Behavioral Theory (MSASS)
SSWM, Social Work Practice Methods (MSASS)
STAT, Statistics
THTR, Theater Arts
UNIV, University Studies
USNA, Think About The Natural World
USSO, Think About The Social World
USSY, Think About The Symbolic World
WASH, Washington Semester
WGST, Women's & Gender Studies
WLIT, World Literature

PLAN CODES (SIS)
This is a list of all coding used for academic plans of study at the University. It does not imply that the program is currently available as a major. Some of these codes are for concentrations, certificates, minors or for majors no longer offered. It is necessary to maintain this list in its entirety for purposes of maintaining historical records.

ACC-BS, Accounting (BS)
ACC-MACC, Accountancy
ACC-MACC-A, Accountancy (Accel BS)
ACC-MACC-J, Accountancy (Joint BS)
ACC-MIN, Accounting (Min)
ACL-MBA, Accelerated MBA
ACL-MBA-P, Accelerated MBA - PT
ACS-MBA, Accelerated Saturday MBA
AIN-MIN, Artificial Intelligence (Min)
AMS-BA, American Studies (BA-2nd Maj)
AMS-MIN, American Studies (Min)
ANA-PHD, Anatomy (PhD)
ANE-MS-B, Anesthesiology (MS-B)
ANP-MS-A, Applied Anatomy (MS-A)
ANP-MS-B, Applied Anatomy (MS-B)
ANT-BA, Anthropology (BA)
ANT-MA-A, Anthropology (MA-A)
ANT-MIN, Anthropology (Min)
ANT-PHD, Anthropology (PhD)
APM-BS, Applied Mathematics (BS)
APM-MS-A, Applied Mathematics (MS-A)
APM-MS-B, Applied Mathematics (MS-B)
APM-PHD, Applied Mathematics (PhD)
ARE-BS, Art Education (BS)
ARE-MA-A, Art Education (MA-A)
ARH-BA, Art History (BA)
ARH-MA-B, Art History (MA-B)
ARH-MIN, Art History (Min)
ARH-PHD, Art History (PhD)
ARM-MA-B, Art Hstry & Museum Studies (MA-B)
ARM-PHD, Art Hstry & Museum Studies (PhD)
ARS-MIN, Art Studio (Min)
ASI-BA, Asian Studies (BA)
ASI-MIN, Asian Studies (Min)
ASL2-BA, Asian Studies (BA-2nd Maj)
AST-BA, Astronomy (BA)
AST-BS, Astronomy (BS)
AST-MIN, Astronomy (Min)
AST-MS-A, Astronomy (MS-A)
AST-MS-B, Astronomy (MS-B)
AST-PHD, Astronomy (PhD)
BAF-MIN, Banking and Finance (Min)
BCH-BA, Biochemistry (BA)
BCH-BS, Biochemistry (BS)
BCH-MIN, Biochemistry (Min)
BCH-MS-A, Biochemistry (MS-A)
BCH-MS-B, Biochemistry (MS-B)
BCH-PHD, Biochemistry (PhD)
BET-MA-B, Bioethics (MA-B)
BET-PHD, Bioethics (PhD)
BIO-BA, Biology (BA)
BIO-BS, Biology (BS)
BIO-MIN, Biology (Min)
BIO-MS-A, Biology (MS-A)
BIO-MS-B, Biology (MS-B)
BIO-PHD, Biology (PhD)
BRS-MS-A, Biochemical Research (MS-A)
CBI-PHD, Cell Biology (PhD)
CCM-MD, Medicine
CGL-MA-A, Cognitive Linguistics (MA-A)
CHE-BA, Chemistry (BA)
CHE-BS, Chemistry (BS)
CHE-MIN, Chemistry (Min)
CHE-MS-A, Chemistry (MS-A)
CHE-MS-B, Chemistry (MS-B)
CHE-PHD, Chemistry (PhD)
CHI-MIN, Chinese (Min)
CHN-CT, Community Health Nursing
CHN-MSN, Community Health Nursing
CHS-MIN, Childhood Studies (Min)
CIS-MS-A, Computing & Info Sci (MS-A)
CIS-MS-B, Computing & Info Sci (MS-B)
CIS-PHD, Computing & Info Science (PhD)
CLS-BA, Classics (BA)
CLS-MIN, Classics (Min)
CMP-BA, Computer Science (BA)
CMP-BS, Computer Science (BS)
CMP-MIN, Computer Science (Min)
CNM-CT, Certificate in Nonprofit Mgmt
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<tr>
<th>Abbreviation</th>
<th>Course Title</th>
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GUIDE TO ABBREVIATIONS

STA-BA, Statistics (BA)
STA-BS, Statistics (BS)
STA-MIN, Statistics (Min)
STA-MS-A, Statistics (MS-A)
STA-MS-B, Statistics (MS-B)
STA-PHD, Statistics (PhD)
STN-MBA, Standard MBA
STN-MBA-P, Standard MBA - PT
STN-MNO, Master of Nonprofit Org
STND-MNO, Master of Nonprofit Org
SWS-PHD, Social Welfare
SYW-BS, Systems Biology (BS)
SYP-PHD, Systems Physiology
THR-BA, Theater Arts (BA)
THR-MFA-A, Theater Arts (MFA-A)
THR-MIN, Theater Arts (Min)
UND-DNP, Undecided
WHP-CT, Women's Health Nurse Pract
WHP-MSN, Women's Health Nurse Pract
WLT-BA, World Literature (BA)
WLT-MA-A, World Literature (MA-A)
WLT-MA-B, World Literature (MA-B)
WLT-MIN, World Literature (Min)
WMN-BA, Women's & Gender Studies (BA)
WMN-MIN, Women's & Gender Studies (Min)

HISTORICAL PROGRAM CODES

This is a list of all historical coding used for academic programs of study at the University.

ACC, Accounting
AFR, Auditing & Financial Reporting
AIN, Artificial Intelligence
AMN, Amer Stud & Museum Stud
AMS, American Studies
ANA, Anatomy
ANE, Anesthesiology
ANP, Applied Anatomy
ANT, Anthropology
APM, Applied Mathematics
APX, Applied Physics
ARC, Architecture
ARE, Art Education
ARH, Art History
ARK, Arts in Technical Age
ARM, Art History & Museum Studies
ARS, Art Studio
ASC, Asian Civilization
ASI, Asian Studies
AST, Astronomy
ATT, Comp/Info Sci (MS-Columbus)
BAF, Banking And Finance
BAS, Applied Social Science
BCH, Biochemistry
BET, Bioethics
BJM, Biometry
BIO, Biology
BIS, Biomedical Sciences
BRS, Biochemical Research
CAP, Adult Clinical Psychology
CBL, Cell Biology
CCN, Critical Care Nursing
CCP, Child Clinical Psychology
CHE, Chemistry
CHI, Chinese
CHL, Community Health Nursing
CHS, Childhood Studies
CIS, Computing and Info Science
CLS, Classics
CLT, Comparative Literature
CMP, Computer Science
CMS, Ceramic and Materials Science
CNM, Certificate in Nonprofit Mgmt
COS, Communication Sciences
CPH, Cell Physiology
CRS, Clinical Research
DAM, Dean's Approved Major
DGA, Develop Genetics And Anatomy
DNC, Contemporary Dance
DNT, Dentistry
DTG, Dental Graduate
EAP, Elec Engr & Applied Physics
EAR, Aerospace Engineering
EBA, Executive MBA
EBI, Biomedical Engineering
ECE, Chemical Engineering
ECI, Civil Engineering

ECL, Clinical Engineering
ECM, Computer Engineering
ECO, Economics
EDM, Executive Doctorate in Mgmt
EDU, Education
EFT, Fluid & Thermal Science
EGL, English
EGM, Engineering Mechanics
EGR, Engineering
EIN, Industrial Engineering
EMA, Macromolecular Science
EMC, Mechanical Engineering
EMM, Metallurgy & Materials Science
EMS, Materials Science & Engr
ENT, Entrepreneurship
ENV, Environmental Engr (Adm. Only)
EPB, Epidemiology & Biostatistics
EPI, Environmental Epidemiology
EPO, Engr Pract Oriented Mast Prog
ERT, Earth Sciences
ESC, Systems Ctrl & Industrial Engr
EST, Environmental Studies
ESY, Systems & Control Engineering
EVH, Environmental Health Sciences
EXP, Exercise Physiology
FAM, Family Medicine
FMG, Financial Management
FRA, Financial Reporting & Attestation
FRC, French
FRS, French Studies
GEM, German
GEN, Genetics
GEO, Geological Sciences
GER, Gerontological Studies
GES, German Studies
GMH, Geriatric Mental Health Nurs
GMS, General Medical Sciences
GNC, Genetics Counseling
GNV, Environmental Geology
GPN, Ger Ment Hlth/Psyc Ment Hlth
GRT, Gerontological Nursing
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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>HDE</td>
<td>Human Development</td>
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<tr>
<td>HEA</td>
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<tr>
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<td>HSP</td>
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<td>HSS</td>
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<td>LLIS</td>
<td>LLM - US Legal Studies</td>
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<td>NAA</td>
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<td>NAD</td>
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<td>ORD</td>
<td>Organ Devel &amp; Analysis</td>
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<td>PAD</td>
<td>Psy Ment Hlth/Nurs Admin</td>
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<td>PEX</td>
<td>Experimental Psychology</td>
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<td>PFP</td>
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<tr>
<td>PHB</td>
<td>Biophysics and Bioengineering</td>
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<td>PHN</td>
<td>Public Health Nutrition</td>
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<td>PHO</td>
<td>Physiology And Biophysics</td>
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<td>PMC</td>
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<td>PMD</td>
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<td>PMR</td>
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<td>PNP</td>
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<td>POL</td>
<td>Polymer Science &amp; Engineering</td>
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<td>POS</td>
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<td>Public Policy</td>
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<td>PSY</td>
<td>Psychology</td>
</tr>
<tr>
<td>PVT</td>
<td>Preveterinary (Adm Only)</td>
</tr>
</tbody>
</table>
HOW TO GET TO CASE WESTERN RESERVE UNIVERSITY

The university is about five miles east of downtown Cleveland on Euclid Avenue (U.S. Routes 6, 20, and 322). Most road maps of Ohio have the University clearly indicated.

By Car
Coming from the east via Interstate 90, exit at Martin Luther King Jr. Boulevard. Proceed south for about a mile to the East 105th traffic light; cross over East 105th and keep to the right over the traffic circle, continuing along Martin Luther King Jr. Boulevard to Euclid Avenue. Turn left onto Euclid and watch for the Information Booth at the right.

If coming from the east via Interstate 80 (Ohio Turnpike), exit at Interchange 13 and proceed north on Interstate 480, which merges with Interstate 271. Exit I-271 at Cedar Road and follow it westbound towards Cleveland. Where Cedar starts down a steep hill and lane-switching lights are hanging overhead, look for a sign identifying Case Western Reserve University at the corner of Murray Hill Road (the first light at the bottom of the hill). Continue down Cedar road, staying in the far right-hand lane. You will go under a railroad bridge. Bear right onto Stearns Road at the light. Stay in the right lane and turn right onto Euclid Avenue. Stay in the right lane for one block, then turn right at the light at Adelbert Road. Allen Medical Library is on one corner, and Adelbert Main on the other. Look for the Information booth on the right-hand side of Adelbert.

If coming from the west via the Ohio Turnpike, exit at Interchange 8A and follow Interstate 90 east. In the downtown area, exit on Chester Avenue and proceed east to Euclid Avenue. Turn left onto Euclid and look to the right for the Information Booth. If you are coming from the south via Interstate 71 (or Interstate 77), proceed north until I-71 (or I-77) merges with Interstate 90, take I-90 east, then exit onto Chester eastbound as above.

By Air
Arrive at the Cleveland Hopkins International Airport. The fastest, most economical means of reaching the University from Hopkins is the RTA (Regional Transit Authority) Rapid Transit train eastbound to the University Circle station, which is just south of campus. A free University Circle shuttle bus connects the station with all areas of the campus.

By Train
Arrive at the AMTRAK station in downtown Cleveland. Take the new RTA Waterfront rail line to Tower City and transfer to a train eastbound for University Circle. A free University Circle shuttle bus connects the station with all areas of the campus. Taxis are also available at the AMTRAK station.

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GUIDE TO ABBREVIATIONS

RBI, Reproductive Biology
RLG, Religion
RNB, Reg Nurs Baccalaureate
RNM, Reg Nurs Masters
RUS, Russian
SAF, Social Work - 4yr
SAL, Social Work - Is
SAJ, Social Work - MSSA/Jewish Comm
SAL, Social Work/Law Joint Degree
SAM, Social Work - MSSA/Ph.D.
SAO, Social Work - Is
SAS, Social Work
SAT, Social Work - 3yr
SIA, Social Work - Sr Yr Ab
SMG, Social Work - MSSA/MBA
SMN, Social Welfare Ph.D. Program
SOC, Sociology
SPA, Spanish
SPC, Speech
SPH, Social Policy History
SPM, Sports Medicine
SSC, Social Sciences (Adm Only)
STA, Statistics
SWC, Advanced Clinical Social Work
SWF, Social Welfare
SWS, Social Welfare Ph.D. Program
SYP, Systems Physiology
TAX, Tax
TCM, Technology Management
TEC, Technology (Medical, Lab, Dental)
THR, Theater Arts
UGS, Undergraduate Scholars Program
UNK, Non-Declared Major
URB, Urban Studies
WHP, Womens Hlth Nurse Practitioner
WMN, Women's Studies
800, Non-Degree Student

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