# General Bulletin 2006-2009

## Undergraduate Programs
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**UNIVERSITY MISSION**

Case Western Reserve University’s mission is to serve society as a leading center for undergraduates, graduate, and professional education; for research that adds to society’s store of knowledge and addresses its priorities; and for active, responsible world and community citizenship. The students, faculty, staff, volunteers, alumni, and others who constitute the university community pursue and represent this mission through their teaching, research, professional activities, and public service, all marked by a commitment to continuous learning.

**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.

**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
Web: www.ncahigherlearningcommission.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.
- Computing Accreditation Commission of ABET, Inc.
- Accreditation Council for Cooperative Education (cooperative education programs)
- American Association of Nurse Anesthetists (nurse anesthesia)
- 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 Social Work Education (applied social sciences)
- National Association of Schools of Music (music)
- National Board 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**

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 merger 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 twenty-six 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 citizen of Cleveland. 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 to offer programs leading to joint degrees.

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 in a full range of disciplines in the humanities, arts, social sciences, and natural sciences. Departmental faculty conduct research and offer instruction leading to master's and doctoral degrees in these fields. The college is also the academic home for some undergraduates pursuing major fields of concentration in disciplines included in the faculties of management and medicine.

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 also offers a practice-oriented degree, the Master of Engineering, tailored for employed engineers seeking to advance their knowledge. The Institute for the Integration of Management and Engineering, a joint venture of the Case School of Engineering and the Weatherhead School of Management, offers the Master of Engineering and Management degree.

The School of Graduate Studies (est. 1892) confers M.A., M.S., M.F.A., M.P.H., and Ph.D. degrees upon students who have completed advanced study in the arts and sciences and 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 School of Dental Medicine (est. 1892) offers curricula leading to the M.S.S.A. (Master of Science in Social Administration) degree in social work, and to the Ph.D. degree in social welfare. In collaboration with the schools of law and management, the school administers the Mandel Center for Nonprofit Organizations. The Mandel School also operates a continuing education program for social-work practitioners in the community. Through the Mandel Center, the Mandel School and the School of Management offer a joint program leading to the degree of Master of Nonprofit Organizations (M.N.O.).

The School of Dental Medicine (est. 1892) offers a curriculum leading to the D.M.D. degree and postdoctoral training in several dental specialties leading to the M.S.D. degree. The school also collaborates with the School of Medicine (beginning 2007) to offer a joint degree program, the D.M.D., M.D. Program. In conjunction with its curriculum, the school operates a dental clinic on campus where students provide faculty-supervised dental service to area residents.

The School of Law (est. 1892) offers a broad range of courses leading to the J.D. degree. The school also offers graduate instruction leading to the J.L.M. in U.S. legal studies. As part of its curriculum, the school operates a legal clinic in which law students, under faculty supervision, provide services to clients from the community. The school administers 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 and participates in the Mandel Center for Nonprofit Organizations.

The Weatherhead School of Management (est. 1967) offers curricula leading to the B.S., M.S., M.Acc., M.B.A., M.S.M. (Master of Science in Management), M.P.O.D. (Masters in Organizational Change and Development), E.D.M. (Executive Doctor of Management), and Ph.D. degrees in management, organizational behavior, and operations research. Members of the school's faculty also provide instruction in economics for undergraduate students enrolled in 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 the Integration of Management and Engineering.

The School of Medicine (est. 1843) offers a curriculum leading to the M.D. degree. This curriculum, developed at the school and emulated widely throughout the world, features an interdisciplinary approach to organ systems. The school's pre-clinical 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, with an emphasis on acute care, and the Doctor of Nursing Practice (D.N.P.) degree, a professional degree for students who already have baccalaureates in the liberal arts or sciences. The school also offers instruction leading to the 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.

CLEVELAND

From a settlement that began nearly two centuries ago on the banks of the Cuyahoga River, Cleveland has grown into a metropolis of more than 2 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
a number of the nation’s major corporations. The city is also a major banking center; the Fourth District Federal Reserve Bank, one of twelve 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 of Cleveland, the Cleveland Clinic, the MetroHealth Medical Center, and others are internationally recognized for outstanding patient care and contributions to medical research.

Greater Cleveland is dotted with, parks, theaters, museums, shopping malls and sports arenas and stadiums. Parklands include beaches along Lake Erie and the 17,000-acre Cleveland Metropark system. Cleveland has professional baseball, football, basketball, soccer, and hockey teams and facilities for softball, skiing, skating, hiking, and cycling. More than sixty ethnic groups are represented in Cleveland; summer 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 forty cultural, medical, educational, religious, and social service institutions located at the eastern edge of the city. In addition to Case, 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 of Cleveland; 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 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.

The purpose of UCITE is to support and encourage change and innovation in teaching. It does this through a combination of informal seminars and workshops on topics in education and learning (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 learning to use the web, class videotaping, class visitation, mentoring, 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. Glennan fellows are nominated by their peers. Awards are made on the basis of proposals, which they submit following nominations. 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.

Other grants programs are not endowed but instead are supported by annual donations. 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 secretary.

INFORMATION TECHNOLOGY SERVICES

www.case.edu/its

Information Technology Services (ITS) offers a wide variety of state-of-the-art technology applications, tools, and services to enrich Case’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
- Telephone services, including Voice over IP and unified messaging
- Audio/video/videoconferencing/streaming services
- Internal administrative systems
- University archives and records

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

ITAC supports current technologies that enhance teaching and learning at Case. 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-streaming media, videoconferencing and IP television
- MediaVision Courseware
- Emerging instructional technologies
- 3D and virtual experiences
- Innovative multimedia
- Student technology consultants
- Blackboard

MediaVision
http://www.case.edu/its/itac/mediavision

MediaVision, part of ITAC, is responsible for providing state of the art audio-visual services; technology enhanced classrooms as well as a set of "video-centric" technologies that are designed to take advantage of the university’s world-class, gigabit-to-the-desktop network.

- Technology-Enhanced Classrooms
- Video production
- Streaming video and web casting
- Videoconferencing
- MediaVision Courseware
Software Services
www.case.edu/softwarecenter
Case faculty, staff, and students are eligible to download software packages over the university network. Packages and tools include:

- Microsoft Office Suite
- Calendar
- Virus protection
- Desktop publishing
- Drawing and painting systems
- CAD
- Mathematical and statistical packages and tools, and
- Programming languages

Personal productivity and general purpose software packages, including:

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

UNIVERSITY LIBRARIES
All Case Western Reserve University's libraries support the university’s undergraduate, graduate and professional programs. Combined, their collections contain nearly 2.5 million volumes. The libraries maintain individual web sites 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. The libraries are an integrated system that comprises the Kelvin Smith Library, the Cleveland Health Sciences Library, the School of Law Library and the Harris Library at the Mandel School of Applied Social Sciences.

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 approximately 1.7 million volumes. The Astronomy and Music Libraries are branches of KSL and are housed within their respective departments. KSL currently subscribes to more than 12,000 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. Over 7,000 serials are in electronic formats and may be accessed via the campus network and authorized remote access. 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, and the Freedman Digital Library, Language Learning and Multimedia Services Center.

The Mandel School of Applied Social Sciences (MSASS) 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 39,000 volumes and subscriptions to over 400 periodicals and about 900 video and audio items to support MSASS 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 web site provides information resources for social work students, faculty, practitioners, and other human service workers in the greater Cleveland area.

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 web site provides core links to legal information resources, government agencies and legislative history resources.

PerceptIS-Help Desk
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 administrative offices and residence halls. It also manages Case’s Unified Messaging voicemail system, which delivers voicemail messages to a Case email account.

UNIVERSITY 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 24 million pages) and over forty gigabytes that document the university’s life from 1826 to 2006, offers the following services:

- Digitization of select, high-demand materials for ease of access and use
The Case 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 Case 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 Case Catalog also provides quick links to the libraries’ web sites, 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-authorized remote access.

Case Western Reserve University is a founding member of the OhioLINK consortium, which provides a shared, unified catalog for eighty-five colleges and universities, as well as the State Library of Ohio. The OhioLINK Central Catalog, at 45.3 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 CLEV-NET 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

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

Harris Library – MSASS
http://msass.cwru.edu/library/

OhioLINK
http://www.ohiolink.edu

ARL
http://www.arl.org

DENTAL CLINIC
Phone: 368-3200
Fax: 368-6463
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 life-long learners to provide the best possible patient care. Students covered by the Case medical plan receive some 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 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.

AUXILIARY SERVICES
University Bookstore
Thwing Center
Phone 216-368-2650
Fax 216-368-5205
Loraine Felan, Manager
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, the latest in computer software and accessories, 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.

The University Bookstore offers a complete medical department. 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 5:00 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.
http://www.case.bkstore.com

The bookstore accepts cash, checks, major credit cards, CaseCash, Case charge, and department requisitions.

PRINTING SERVICES
Thwing Center, Basement level
Business Office, Bindery
Phone 216-368-2550
Fax 216-368-1250
Kelvin Smith Library Rm. LL11c
8:30 a.m. to 5:00 p.m.
Peter B. Lewis Building Rm. 23
8:30 a.m. to 5:00 p.m.

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, we can service any of your photocopying, printing or finished document needs. Specific amenities include: black and white photocopying, color copying, standard university items – business cards, letterhead, 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.

We offer free pick-up and delivery from all campus locations and can also set you up so that you can print directly from your desktop to our black and white and color copiers. Please check our website for a full range of products and services. Order items online at:
http://www.case.edu/finadin/auxserv/print-srv/print.html

TRANSPORTATION
A free shuttle bus system that runs on a continual schedule throughout the week serves the 550-acre University Circle area. In the evenings, a loop bus runs every twenty minutes over a specific campus route. Bus schedules are available in the Access Services Office, Thwing, and several other buildings. In addition, Regional Transit Authority bus routes run through the heart of University Circle, linking the campus with the greater commu-
nity. Rapid Transit trains run directly from the campus to Cleveland Hopkins International Airport. Complete information on the shuttle system, including bus tracking, can be found at http://shuttle.case.edu

CAMPUS PARKING
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 students 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. Current proof of part-time registration is required when a request for a part-time parking permit is made. Summer session permits are also available.

Information for renewal of permits for the next academic year is available during the spring semester. Questions about the cost of permits may be directed on or after May 1 to Access Services, Crawford Hall, 10900 Euclid Avenue, Cleveland, Ohio 44106-7084 (216-368-2273).

Maps detailing the complete parking inventory of Case will be issued with each permit or online at http://parking.case.edu

All students registered at the university must abide by the parking rules of the Joint Parking Systems, which includes Case, University Hospitals, and University Circle Inc. Complete copies of the rules are available at the Standard Parking Office 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 for a first written appeal to Standard Parking. In the event of an unsuccessful first written appeal, the alleged violator 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.

UNDERGRADUATE ADMISSION
Admission to Case Western Reserve University is competitive. Primary consideration is given to measures of academic performance such as grades, level of courses completed, and class rank. SAT or ACT scores and extracurricular 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 admission 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 admission status should indicate their preference for Early Action and meet the November 1 application deadline. They will be notified of the Admission Committee's decision by January 1. 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 applications by December 1. By March 1 they will be notified about admission to the University, and by the same date a select number of applicants 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 application 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 admit first year students for the spring or summer 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 Undergraduate Studies.

Secondary School Preparation
All entering first year students are expected to have completed 16 units of full-credit academic work in secondary school, including four years of English, three years of mathematics, and two years of laboratory science. A fourth year of mathematics is expected of students planning to concentrate in mathematics, science, or engineering. Students planning to pursue pre-medical studies or concentrations in mathematics, science, or engineering should have three years of laboratory science, including biology, chemistry, and physics. All students are encouraged to have completed two to four years of a foreign language.

TESTS
Applicants must submit scores from either the ACT or the SAT. 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 US 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 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 every weekday. The Admission Office is open on select weekends 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
103 Tomlinson Hall
Cleveland, Ohio 44106-7055
216-368-4450
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. The application is available on website for the Office of Undergraduate Admission.

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. Scores may be reported either through the testing agency
or on the official high school transcript.
4. Written recommendations from a high school counselor (required) and a teacher (optional).

Applicants should also submit grades for the first semester of the senior year.

Notification of Admission
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 $300.00 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 Admission. 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 and 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 form, including required the personal written statement. The application is available on website for the Office Undergraduate Admission.
2. An official high school transcript.
3. Official transcripts from each college or university attended.
4. The Statement of Good Standing completed and signed by a college or university official.
5. A letter of recommendation from a college or university professor.
6. 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 $300 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 Admission 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 BA 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. 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 BA or BS degree from Case Western Reserve University and a BM 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 art 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, consult the appropriate section of this bulletin.

REGISTRATION
(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. Each student must have an ID number on record in the student information system. The social security number is used as the student ID number. Students from other countries who do not have social security numbers are issued student ID numbers.

The “Schedule of Classes” is published once per semester, and an electronic version is updated routinely to indicate changes and is available through the University Registrar’s website at: http://www.case.edu/provost/registrar/registrar.html. The University Registrar’s website includes the academic calendar, the dates for late registration and drop/add, and a complete listing of courses offered. Students are encouraged to use the on-line registration system (SOLAR) if available through their school. Alternatively, students may obtain course selection forms and instructions in their deans’ or registrars’ offices. If not using SOLAR, completed schedule forms are to be signed by the student’s advisor and/or dean, before the student goes to the registrar’s office. No zero-credit-only registrations (e.g., zero-credit physical education courses) are allowed, unless approved as part of ongoing degree programs. During any semester, students may not register in more than one school or college of the university.

**COURSES OF INSTRUCTION**

All courses at the university, except courses in the Medical School, Law School, School of Dentistry, 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 multi-course 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>Letter Grade</th>
<th>Meaning</th>
<th>Quality Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Excellent</td>
<td>4</td>
</tr>
<tr>
<td>B</td>
<td>Good</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>Fair</td>
<td>2</td>
</tr>
<tr>
<td>D</td>
<td>Passing</td>
<td>1</td>
</tr>
<tr>
<td>F</td>
<td>Failure</td>
<td>0</td>
</tr>
<tr>
<td>I</td>
<td>Incomplete</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>Withdrawal from a class</td>
<td></td>
</tr>
<tr>
<td>WD</td>
<td>Withdrawal from all classes for a particular semester</td>
<td></td>
</tr>
<tr>
<td>WF</td>
<td>Withdrawn under Academic Regs. 5 &amp; 6 (law school)</td>
<td></td>
</tr>
<tr>
<td>AD</td>
<td>Successful audit</td>
<td></td>
</tr>
<tr>
<td>NG</td>
<td>Unsuccessful audit</td>
<td></td>
</tr>
<tr>
<td>p</td>
<td>Passing in a pass/no pass course</td>
<td></td>
</tr>
<tr>
<td>NP</td>
<td>Not passing in a pass/no pass course</td>
<td></td>
</tr>
<tr>
<td>COM</td>
<td>Commendable (School of Medicine only)</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>Honors in a pass/no pass course (law, medical school only)</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>For courses that extend for more than one semester</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>Satisfactory (for master’s or doctoral thesis, E.M.B.A. seminar courses, and medicine only)</td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>Unsatisfactory (for master’s or doctoral thesis, E.M.B.A. seminar courses, law school and medical school only)</td>
<td></td>
</tr>
<tr>
<td>RPT</td>
<td>Repeated Course (through Summer 2006)</td>
<td></td>
</tr>
</tbody>
</table>

**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 mid-term 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.

1. **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, P, 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 reenroll 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 for this grade.

**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 towards degree programs in the dental school 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. This procedure necessitates completion of a form that must be signed by the dean and/or faculty advisor and submitted to the University Registrar. 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 forms 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 number of grade points earned at the university during a given semester by the sum of the credit hours for all courses in which the student received letter grades of A, B, C, D, or F taken at the university during that same semester. (Not all of these grades are given by all schools.) For the purpose of semester grade calculations, grade points earned when a grade of Incomplete is replaced by the appropriate course grade are credited to the semester in which the incomplete grade was received, but status action (separation, probation, or restoration to good standing) taken at the end of that semester is not affected unless the grade change occurs by the first day of classes of the following semester. Qualification for honors is based on the same terms.

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 on-line at http://www.case.edu/staff/shpp/harasspolicy.html, in the Office of Equal Opportunity and Diversity, the Office of Student Affairs, the Provost’s Office, and at many of the university offices throughout the campus. Consultation and advice are available in the offices of Equal Opportunity & 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/or information on the following subjects: 1) retention and graduation rates; 2) financial assistance available to students and requirements and restrictions imposed on Title IV aid; 3) crime statistics on campus; 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 Adelbert Hall (216-368-4389) and is posted on the Registrar’s website at: http://www.case.edu/provost/registrar/righttoknow.html. Information on financial assistance, including descriptions of application procedures and forms, may be obtained from the Office of University Financial Aid, 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 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 Case Western Reserve University Police and Security Services at 216-368-2908 or on the web at: http://www.case.edu/finadmin/security/secmain.htm.

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

(October 1, 2006)

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Provost and University Vice President

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Vice President for Commercial Development

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Vice President, General Counsel and Secretary of the Corporation

J. Jeffrey Robison
Vice President for Development

[to be named]
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Chief Investment Officer

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Vice President for Cleveland and Regional Affairs

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Dean of the School of Dental Medicine

Mohan Reddy
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(October 1, 2006)

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Karl H. Rudolph
James A. Rutherford
Albrecht Saalfield
Bill R. Sanford
David Satcher, M.D., Ph.D.
Kenneth Felix Seminatore
Craig R. Smith
Kathleen Flynn Smith
Elizabeth Spahr, Ph.D.
Walter O. Spencer
Thomas Steinbinder
Robert D. Storey
William W. Taft
Nelson S. Talbott
Joseph H. Thomas
Robert M. Ward
Russell J. Warren
Richard T. Watson
Albert J. Weatherhead III
Kerr I. White, M.D.
Alton W. Whitehouse, Jr.
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 social security 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 2006-2007:

- 1 to 11 credit hours (credit or audit)
- $1,171.00 per semester hour
- 12 or more credit hours (credit or audit)
- $15,120.00 per semester.
- Students registered in the School of Graduate Studies and MSASS will be charged according to the following schedule for 2006-2007:
  - 1-11 credit hours (credit or audit)
  - $1,171 per semester hour
  - 12-17 credit hours (credit or audit) in Graduate Studies
  - $14,050 per semester
  - Above 17 hours in Graduate Studies, a surcharge of $1,171 per semester hour will be assessed.

Students enrolled in undergraduate courses for the summer semester 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 entering the School of Dental Medicine in fall 2006 will be charged $42,500 for each of the four years of the academic program. Students who entered the Dental program in fall 2005 will pay $42,180 per academic year. Students entering in fall 2004 will pay $37,650 for the 2006-07 academic year. Students entering prior to fall 2004 will pay $34,860. Dental Medicine students pay additional tuition for each summer clinic. For summer 2006, this amount is $2015.

MEDICINE

The tuition rate for students entering in fall 2006 is $39,272. Students who entered in fall 2005 will be charged $37,944 in tuition. Students who entered in fall 2004 will be charged $37,720 in tuition. Students who entered in Fall 2003 will be charged $36,500 in tuition.

MANAGEMENT

Full-time students registered in the various masters programs of the Weatherhead School of Management will be charged $32,990 for the 2006-2007 academic year with a part-time rate of $1375 per credit hour and $15,250 for selected summer 2006 programs. Full-time students enrolled for credit hours in excess of 20 during a semester will be assessed an additional $1,375 per credit hour. Parttime MBA students enrolling for more than 12 credit hours will pay $16,066 plus $1,339 for each credit hour over 12. First-year students in the Executive Master of Business Administration program are charged $37,500 for the academic year 2006-2007. Second-year students will pay $35,700 for the academic year and $8,600 for summer 2006. Students in the Executive Doctor of Management program will be charged $32,900 for the 2006-2007 academic year.

LAW

In the School of Law, first- and second-year students pursuing a J.D. degree, taking 10 credit hours or more will be charged $33,300 for the 2006-2007 academic year with a part-time rate of $1,288 per credit hour. Third-year students are charged $33,900.

MANDEL SCHOOL

In the Mandel School of Applied Social Sciences, a student in the master's program will be charged $14,050 per semester for the 2006-2007 academic year for enrollment between 12 and 16 credits in a semester. The part-time rate of $937 applies to students taking 1-11 credits in a semester. Full-time students enrolled for credit hours in excess of 16 will be assessed an additional $937 per credit hour. Doctoral candidates will be charged $1,171.00 per credit hour to a maximum of $14,050.00 per semester for registrations of 12-17 credit hours. Students enrolled in the Mandel Center for Nonprofit Organizations will be charged $1,171.00 per credit hour to a maximum of $1,4050 per semester for 12-20 credit hours. Students taking more than 20 credits during a semester will be assessed a $1,171 surcharge per credit.

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: $30
- Dentistry: $45
- Graduate Studies: $50 (not required for non-degree students)
- Law: $40
- Management: $50
- Medicine: $85
- Nursing: $75 (N.D. & M.S.N.)
- Health Service and Medical Insurance Fee: $550/semester

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 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: $121 per semester for continuing students $124 per semester for new students
- Dentistry: $100 per semester
- Graduate: $5 per semester
- Law: $42 per semester
- Nursing: $15 per semester (N.D. & M.S.N); $7.50 per semester (Ph.D.)
- Medicine: $15 per semester
FINANCIAL INFORMATION

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 2006-2007 academic year, the clinical practice fee is $200.

Laboratory Fee
Dentistry: $195.00 per semester

Graduation Fee
Doctor of Philosophy: $187

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)
Dentistry: $1,000 (non-refundable)
Nursing (NS, ND, NG): $200 (non-refundable)
Law: $150 spring deposit and $250 summer deposit (both non-refundable)
Management: $500 (non-refundable)
Undergraduate: $300 enrollment deposit (non-refundable)

Special Nursing Fees
Professional and personal liability insurance ($1,000,000 limit): $79-$158
FPB/NSNA insurance, N.D. students: $59 per year
Malpractice insurance – B.S.N. $29 per year

Other Expenses (estimated)
Books, Supplies, and Equipment
Nursing—Level I: $1670  Level II: $1220; Levels III and IV: $1160
Medicine—$4000 year (students must also supply their own microscopes; contact School of Medicine for requirements)
Dentistry—first year: $12,339; second year: $6,381; third year: $3,350; fourth year: $1,240
Law: $1240 per year
Management: $2940 for first year students; $1240 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 15 for the fall semester, March 15 for the spring semester, and July 15 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 Office of Student Accounts Receivable at (216) 368-2226 or the Contoller’s Office Website at www.case.edu/finadmin/controller/conthome.htm.

There is no tuition refund after the tenth week of classes.
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>
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<tr>
<td>1</td>
<td>0%</td>
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<tr>
<td>2-3</td>
<td>12%</td>
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<tr>
<td>4-5</td>
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<td>6-7</td>
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<tr>
<td>8-10</td>
<td>50%</td>
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<tr>
<td>10+</td>
<td>100%</td>
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There is no tuition refund after the sixth week of classes.
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 AID FUNDS

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

1) The term “Federal Student Aid Funds” refers to the Federal financial aid programs authorized under the Higher Education Act of 1965 (as amended) and includes the following programs: unsubsidized FFEL Loans, subsidized FFEL Loans, unsubsidized Federal Direct Loans, subsidized Federal Direct Loans, Federal Perkins Loans, FFEL PLUS Loans, Federal Direct PLUS Loans, Federal Pell Grants, Federal Supplemental Educational Opportunity Grant.

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 University Registrar. 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 upon the University calendar up to the 60% point 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% point in the semester. Federal and all other aid is viewed as 100% earned after that date.

5) In accordance with Federal regulations, when financial aid is involved, refunds are allocated in the following order: Unsubsidized FFEL Loans, Subsidized FFEL Loans, Federal Perkins Loans, FFEL PLUS Loans, Federal Pell Grants, Federal Supplemental Educational Opportunity Grants, other Title IV Federal assistance, other Federal sources of aid, other state, private, institutional aid, and the student.

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 home address 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 able 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 outstanding 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 on-line at http://fin.aid.cwru.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 home page has direct links to other financial aid Web pages 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 University Office of Financial Aid using the “Ask the Financial Aid Counselor” link. One of the counselors will respond via the Internet.

A secure link on the Financial Aid website, briefCase, provides students and applicants twenty-four 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 University Office of 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 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 reapplication 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 at age 18; or
3. A veteran; or
4. Married; or
5. A graduate or professional student; or
6. Not married but with legal dependents.

Even though a student is classified as independent, the Office of Financial Aid may make an objective determination of the total resources available to the student from all sources, including parents.

APPLICATION PROCEDURES
Undergraduate Students
The Free Application For Federal Student Aid (all students) available at the applicant’s secondary school or from the Office of University Financial Aid, should be submitted to the Federal Processor. Return address envelopes are included in each application packet. Applications may be completed on-line at www.fafsa.ed.gov for the Free Application For Federal Student Aid. Submission of these forms by February 1 is strongly recommended because it takes approximately four weeks to analyze and forward the information to the University. The Federal code for the FAFSA is 003137 for all undergraduates. Case Western Reserve University also requires as part of the application for financial aid a signed photocopy of the parents’ Internal Revenue Service Form 1040, including all schedules and W-2 forms, for the latest calendar year. The student’s name, Social Security number, and the college in which the student will be enrolled should be printed clearly at the top of the form. The IRS form should be sent directly to:

University Office of Financial Aid
Case Western Reserve University
Yost Hall, Room 417A
10900 Euclid Avenue
Cleveland, Ohio 44106-7049
Fax (216) 368-5054

If the student filed a federal tax return for the previous year, a signed copy, along with all W-2 forms from employers, must be submitted to the University Office of Financial Aid. If the student did not file a tax return, a Student Affidavit of Income must be completed and submitted to the University Office of Financial Aid. This form is available from the University Office of 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://finaid.case.edu under “Forms and Publications.”

Transfer students are evaluated for all sources of financial aid. Transfer students must submit the Free Application For Federal Student Aid, and IRS forms as noted above. 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 Bach-
el 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.

Students selected for Verification by the Federal Processor or the Office of Financial Aid will be sent a Verification Form by the University. Applicants should respond promptly to the request for completion of the Verification Form because Federal regulations prevent the disbursement of any Federal funds until the verification process has been completed. For more information about application procedures, request the booklet "Undergraduate Financial Aid and Scholarships" from:

University Office of Financial Aid
Case Western Reserve University
Yost Hall, Room 417A
10900 Euclid Avenue
Cleveland, Ohio 44106-7049

Graduate and Professional Students

Following is a summary of procedures for applying for need-based assistance by school. For more detailed and specific information, request the booklet "Financing Graduate and Professional Education at Case Western Reserve University" from:

University Office of Financial Aid
Case Western Reserve University
Yost Hall, Room 417A
10900 Euclid Avenue
Cleveland, Ohio 44106-7049

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 University Office of Financial Aid to meet the first $18,500 of need with a Stafford Loan. All financial aid application forms are available from the admission offices of the various schools or the University Office of 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 University Office of 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 University Office of Financial Aid:
   a. A Case Form.
   b. If selected for verification, 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.

Continuing students must submit:
1. A Free Application for Federal Student Aid (FAFSA) Federal Code E00084
2. To the University Office of Financial Aid:
   a. A Case 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:
2. To the University Office of Financial Aid:
   a. A Case 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 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.
   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 Free Application for Federal Student Aid (FAFSA) Federal Codes E00680-Engineering Students; E00681-Arts & Science Students.

All applicants for financial aid, other than that awarded by the department, must submit to the Office of Financial Aid:

a. A Case Form.

b. If selected for Verification, 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.

School of Law

All applicants for financial aid must submit:
2. To the University Office of Financial Aid:
   a. If selected for Verification, 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 School of Law
2. Some new students may be required to submit a Free Application for Federal Student Aid (FAFSA) Federal Code E00080

2. To the Office of University Financial Aid:
   a. A Case 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 Student/Spouse Affidavit of Income is necessary.
   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.

Weatherhead School of Management
All financial aid applicants must submit the following documents:
1. New and continuing students: A Free Application for Federal Student Aid (FAFSA) Federal Code E00080
2. To the Office of University Financial Aid:
   a. A Case 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 Student/Spouse Affidavit of Income is necessary.
   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.

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.
Other required documentation should be sent directly to the School of Medicine.
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 University Office of Financial Aid at Case Western Reserve University.
3. All new and continuing students must submit to the University Office of Financial Aid:
   a. A Case Form;
   b. If selected for Verification, 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;
4. For all students the School of Nursing must submit to the University Office of Financial Aid a Memo of Assistance indicating the number of credits the student will be taking during each period of enrollment during the academic year, and the amount and kind of assistance awarded for each term.

Mandel Center for Nonprofit Organizations

All financial aid applicants must submit the following documents:
1. New and continuing students: A Free Application for Federal Student Aid (FAFSA) Federal Code E00080
2. To the University Office of Financial Aid:
   a. A Case Form.
   b. If selected for Verification, a signed or certified copy of the student's (and, where applicable) prior year federal income tax return and W-2 forms.
   c. A memorandum from the Mandel Center for Nonprofit Organizations specifying the amount and types of aid, if any, the student will receive from the school.

FINANCIAL INFORMATION

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.
Up to five $3,500 Materials Science and Engineering Scholarships for entering freshmen who are interested in majoring in materials science and engineering.

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

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

One $18,000 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 accountancy.

One $18,000 Elizabeth Walker Scholarship every four years for a first-year student accepted in the arts, humanities, natural sciences, social and behavioral sciences, management, or accountancy.

A Trustee's Scholarship for freshmen entering the College of Arts and Sciences or the Case School of Engineering who rank in the top 10 percent of their high school graduating class and have composite SAT scores of at least 1500, or a composite ACT score of at least 35. (Value for freshmen entering in 2006 is $25,700.) The university may establish annual limits on the number of Trustee's Scholarships to be offered.

A President's Scholarship for first-year student entering the College of Arts and Sciences or the Case School of Engineering who rank in
the top 10 percent of their high school graduating class and have composite SAT scores of at least 1400, or a composite ACT score of at least 33. (Value for freshmen entering in 2006 is $20,800.) The university may establish annual limits on the number of resident’s Scholarships to be offered.

A Provost’s Scholarship for first-year students entering the College of Arts and Sciences or the Case School of Engineering who rank in the top 15 percent of their high school graduating class and have composite SAT scores of at least 1300, or a composite ACT score of at least 31. (Value for freshmen entering in 2006 is $15,700.) The university may establish annual limits on the number of Provost’s Scholarships to be offered.

Up to sixteen Provost’s Special Scholarships for first-year students entering the College of Arts and Sciences or the Case School of Engineering who demonstrate superior academic performance (rank in the top 15 percent of high school graduating class and have composite SAT scores of at least 1,200 or composite ACT scores of at least 28), 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 2006 is $18,600.)

The dollar value of the Trustee’s, President’s, and Provost’s Scholarships each year will be the prevailing dollar value of the scholarship at year of entry at the university, minus the value of any gift assistance from a state entity designated to offset the tuition difference between private and publicly assisted colleges in that state. The Ohio Student Choice Grant is an example of such a grant.

Renewal of Trustee’s, President’s, and Provost’s 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 (8) 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)

b) A cumulative scholarship grade point average of 1.75 at the end of the first year, and a cumulative scholarship grade point average of 3.00 thereafter.**

**Scholarship Grade Point Average: No courses are eliminated from a student’s record for the purpose of calculating the “Scholarship G.P.A.” The “Scholarship G.P.A.” is the student’s cumulative G.P.A.; unless the student has used the Repeat Option or has earned any F grades in the 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, or the student does not enroll at Case Western Reserve University in a semester for which the scholarship recipient would receive the scholarship, the scholarship is terminated.

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

Ohio Leadership Awards Program

Minimum of twelve awards of up to $5,000 to first-year students admitted to the undergraduate colleges. Academic and leadership qualities required. Selection is on basis of nomination by high school teacher and interview.

Cleveland Plain Dealer Scholarship Program

The Cleveland Plain Dealer Scholarship Program provides two, $1,000 scholarships to incoming first-year students who intend to concentrate in business management or print journalism, and are residents of Northeast Ohio. They must have demonstrated high academic achievement in their high school record and be determined by the Office of Financial Aid to have financial need. Scholarship availability is contingent upon annual funding levels. Interested students should contact the Office of University Financial Aid.

Creative Achievement Awards Program

Three scholarships for entering first-year students who demonstrate outstanding creative ability and achievement in the arts. Each applicant is required to submit a portfolio of original work. An on-campus interview is required. The scholarship is valued at $15,700 for students entering in 2006.

Music and Theater Arts Scholarship

Case offers scholarships to prospective first-year students who plan to major in Music or Theater Arts. A total of fifteen (15) scholarships through the Music Department and six (6) through the Theater Arts Department are available each year. Individual scholarships range from $2,000 to $16,000 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 specific 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 Upperclassmen
The President has authorized the awarding of a limited number of scholarships to upper-class students beginning in the fall 2002. 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 grade point average 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 beginning in the 2002-2003 academic year:

- One Trustee’s Scholarship
- Two President’s Scholarships
- Four Provost’s Scholarships

Students may obtain an application after February 15th 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 15th 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 grade point average, full time undergraduate status, and earn at least thirty additional credit hours during each subsequent year to retain the scholarship.

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 vary 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 $4,050 (for 2006-2007). The student must apply for the Federal Pell Grant by completing the Free Application for Federal Student Aid (FAFSA). Within four to six weeks of filing, the student will receive a 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.

Ohio Instructional Grant (OIG)
Ohio residents who will be enrolled as undergraduate students at an eligible Ohio or Pennsylvania college or university may apply for an Ohio Instructional Grant. Application is made through completion of the Free Application for Federal Student Aid (FAFSA). The student will receive an Award Certificate or letter of denial by return mail, and the Office of University Financial Aid will receive a roster of eligible students.

OHIO COLLEGE OPPORTUNITY GRANT
The Ohio College Opportunity Grant replaces the Ohio Instructional Grant for students who begin as first-year undergraduates in the 2006-2007 academic year. A grant will be awarded to students from Ohio with an expected family contribution of $2,190 or less. Grants will range from $600 to 4,992.

Ohio Student Choice Grant
All full-time undergraduate students who are residents of Ohio and were not full-time students at a college or university on or prior to July 1, 1984, are eligible to receive this grant. For 2006-2007 the amount is $900.

Ohio Academic Scholarship Program
The State of Ohio has established the Ohio Academic Scholarship Program, through which 1,000 scholarships of $2,205 each are offered each year. Each high school in the State of Ohio is guaranteed at least one Ohio Scholarship each year. The scholarships are renewable for each of four consecutive years of undergraduate or graduate study, beginning with the freshman year, provided that satisfactory academic progress toward a degree is maintained. Individual applications to the State of Ohio are submitted through the student’s high school. The high school record and composite score on the American College Test (ACT) will be used to select the winners of the scholarships. Students should see their high school guidance counselors for additional information.

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 notify the University Office of 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 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. Scholarships

Alumni Scholarships in varying amounts are awarded to one or more second-year students based on outstanding performance and financial need. Two Full-time Full Tuition Scholarships are awarded annually. Two Intensive Semester Half Tuition Scholarships are awarded annually. Three International Student Scholarships are awarded annually.

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 grade point average of 3.0 on a 4.0 scale. Applications are available through the School of Dental Medicine. The application deadline is June 15.

American Dental Association (ADA) Endowment Fund Minority Dental Student Scholarship Program
The ADA offers scholarships for second year minority Dental Medicine students. Selection criteria include demonstration of financial need and cumulative grade point average of 2.5 on a 4.0 scale. Applications and information are available through 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.

Other Financial Assistance
The University has contracted with Sallie Mae to provide private loan funds to supplement Federal and university loans. Among the programs currently available for Dentistry is the Sallie Mae Custom Signature Loan. Further information and application forms are available from the Office of University Financial Aid or the Financial Aid Advisor in 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, ASSISTANTSHPs, 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
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 grade point average. 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 M.B.A. 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 M.B.A. 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 in the award decision. Special fellowships and scholarships are awarded to full-time M.B.A. candidates who add to the diversity of the student body. The Weatherhead Alumni Association awards an annual full-tuition scholarship to an outstanding full-time M.B.A. candidate, with a minimum of two years' work experience. The student must demonstrate outstanding academic achievement and GMAT test results. Internships, extracurricular activities, community service, and the application essay will also be considered in determining management and leadership potential.

School of Medicine
Scholarship Funds
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 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 officer of the medical school.

Frances Payne Bolton School of Nursing Doctorate of Nursing Practice (D.N.P.)
Grants-in-Aid are awarded to full-time students in the D.N.P. program who demonstrate financial need and maintain satisfactory academic progress. Some of these are from endowments but the majority are 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 full-time graduate students preparing for teaching, administration, or specialization in a particular field of nursing practice. Students must be enrolled full-time both fall and spring semesters to qualify. Students entering in the spring will qualify if they commit to full-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 full-time students who are Registered Nurses based on academic merit and prior relevant academic and/or work experience. A fellowship/assistantship carries a remission of tuition for 9 hours each semester plus a monthly stipend competitive with those at other major private universities in exchange for 17-1/2 hours of work a week by the student. To apply for a fellowship/assistantship, 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 nursing 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 a full-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 University Office of 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 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 University Office of 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 M.B.A. 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 current students. The Frances Payne Bolton School of Nursing has several loan funds available to assist students with exceptional financial need as determined by the Office of Financial Aid. Loans Awarded by Agencies Outside the University

The following loans are available to all undergraduate, graduate, and professional students who are enrolled on at least a half-time basis, hold U.S. citizenship or permanent resident status, and are admitted to or enrolled in a degree-seeking program.

Subsidized Loans
Case Western Reserve University participates in the Federal Stafford Loan program. The Federal Stafford Loan program lends money through private lenders, including Case Western Reserve University, to students in certain graduate and professional schools.

Students must be enrolled half-time (6 credit hours per semester) and demonstrate financial need. The interest rate is 6.8 percent. The interest is subsidized (paid) by the U.S. Federal Government as long as the student remains enrolled at least half time (6 credit hours per semester). A student making satisfactory academic progress may borrow up to $2,625 for the first year of undergraduate study, up to $3,500 for the second year, $5,500 for each year of subsequent undergraduate study, and $500 for each year of graduate study, with an aggregate maximum of $23,000 undergraduate and $65,000 undergraduate and graduate.

Beginning July 1, 2007, first-year undergraduates may borrow up to $3,500, and second-year students may receive up to $4,500. Repayment begins six months after the student ceases to be enrolled on at least a half-time basis. No principal or interest must be paid while the student is enrolled half-time or more. All students must demonstrate financial need as determined by the University Office of Financial Aid in accordance with criteria established 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 University Office of Financial Aid. The appropriate forms must then be submitted to the University Office of 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. 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 (where appropriate, the student’s spouse’s), or, if a tax return was not filed, a completed Student/Spouse Statement of Income. This pertains to all undergraduate students and graduate students selected for Verification.
   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 N.D., 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 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 at the SallieMae website 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 and feature the same interest rates as their subsidized counterparts. 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. The maximum allowable loan amounts for dependent students are $2,625 per year for freshmen, $3,500 per year for sophomores, $5,500 per year for juniors and seniors, and $8,500 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 $10,000 per year for graduate students. Beginning July 1, 2007, this amount will rise to $12,000. 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 SallieMae 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 on-line at the SallieMae website and select from several lenders. The student should allow at least 8 to 10 weeks between submission of the forms to the Office of 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 will 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 will be 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 University Office of Financial Aid.

**Outside Loan Programs**

Case Western Reserve University, in partnership with the Student Loan Marketing Association (Sallie Mae), offers 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 Prime Rate. Interest payments may be paid during the in-school period or capitalized upon repayment. 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 pursuing the B.S.N. and N.D. 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 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 University Office of 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. 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 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 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 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 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.

**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 grade point average 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 grade-point average in the table below:

<table>
<thead>
<tr>
<th>Year at Semester</th>
<th>Cumulative the Hours</th>
<th>Grade-point University Completed Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>1211.75</td>
<td>2432.00</td>
<td>3672.00</td>
</tr>
<tr>
<td>4912.00</td>
<td>51152.00</td>
<td>61392.00</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 university’s Office 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 university Office of 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.
(Ashbury Theological Seminary)
Vice President for Student Affairs
Clay Barnard, M.S. (Miami University)
Assistant Vice President for Student Affairs
Donald J. Kamalsky, M.S.
(State University of New York, Albany)
Assistant Vice President for Student Affairs and Director of Housing and Residence Life
Sue Nickel-Schindewolf, M.A.
(University of Akron)
Assistant Vice President for Student Affairs and Director of Residence Life
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

Edith Berger
Director of International Student Services
Mayo Bulloch, M.A.
(Case Western Reserve University)
Director of Educational Enhancement
Programs and Director of the Center for Civic Engagement
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
Ana Locci, Ph.D.
(Case Western Reserve University)
Director of University Farm
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 Support Services
Dennis Rupert, M.A.
(Edinboro University of Pennsylvania)
Director of Finance and Administration
Jes Sellers, Ph.D. (University of Florida)
Director of University Counseling Services and Center for Behavioral Health
Deborah Richardson-Bouie, Ph.D.
(University of Delaware)
Director of Multicultural Affairs

CAREER CENTER

206 Sears Library Building
Phone 216-368-4446
Fax 216-368-4759
www.careercenter.case.edu

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.
- www.cwru.edu/stuaff/careersComprehensive website of career/employment resources
- Dun & Bradstreet’s Million Dollar Directory
- Career Network—mentoring, shadowing and networking program for students to connect with alumni
- Videotaped mock interviews
- On-campus interviewing opportunities, resume referrals, and annual job fairs
- Practicum and internship programs
- Credential files service for graduate/professional school or employment

THE CENTER FOR CIVIC ENGAGEMENT AND LEARNING

Thwing Center
Phone 216-368-6960
Email commservice@case.edu
http://studentaffairs.case.edu/civicengage ment

The Center for Civic Engagement and Learning connects students and community through service. The center coordinates both curricular and co-curricular 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 Literary Corps., and weekly service opportunities. The Center for Civic Engagement also offers regular, weekly, 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

T05 Kelvin Smith Library  
Phone 216-368-5230; Fax 216-368-8826  
http://ess.case.edu

Educational Services for Students (ESS) helps students in all phases of their academic development. Through advising, tutoring, group programs, and individual consultation, the ESS staff provides opportunities for academic assessment and self-improvement. ESS also coordinates programs addressing the academic and adjustment needs of specific student populations, first-year students, participants in the university’s Minority Scholars Program (MSP), commuting students, and students with special needs. ESS utilizes a large team of trained student paraprofessionals. Learning Assistants (LAs) who serve as ESS representatives in the residence halls, working with Residence Life staff to provide special support and outreach to residential students. Technical Assistance Center (TAC) assistants lead programs and help residence hall students with computer-related questions. Commuter Assistants (CAs) address the needs of first-year commuting students through individual contacts, programs, and newsletters. Peer Assistants (PAs) work together to plan and coordinate activities for their assigned PA families, groups of first-year Minority Scholars Program students. In addition, ESS employs a large corps of carefully selected and trained student tutors who function as individual tutors, walk-in tutors, and supplemental instruction leaders.

The Center for Civic Engagement and Learning co-ordinates community service projects that promote student volunteerism and student-service learning.

The ESS Plain Dealer Electronic Learning Center (PDELC), a center in Kelvin Smith Library that houses fully networked computers and printers, is staffed by trained student assistants. The PDELC is open to all university students, providing access as well as assistance. The PDELC student assistants are trained to be able to provide information and assistance on a range of software applications. Two student groups, students participating in MSP and students who commute to campus, are eligible to reserve PDELC computing systems and to receive free academic printing. The Office of Commuter Services serves undergraduate commuting students offering programs, activities, regular email correspondence, and a Commuter Lounge in Thwing Center. Peer tutoring is offered, without charge, in all undergraduate course work. Tutors are undergraduate and graduate students. These student-tutors must demonstrate excellence in their academic subject area, have a faculty recommendation, and attend training sessions in basic study skill techniques, test-taking tips, and time-management ideas. Individual tutoring is available in undergraduate courses. In many subjects, tutoring appointments can be scheduled online at http://ess.case.edu/tutor. Walk-in tutoring clinics, staffed by experienced tutors able to assist with selected core courses, operate evenings in the residence halls. In addition, ESS provides Supplemental Instruction (SI) sessions for designated courses. SI leaders are carefully selected student tutors who attend the assigned course and lead interactive review sessions. Disability resources are available through ESS, which serves as the resource center and ombudsman for university students with disabilities.

At Case, the ESS oversees a Prometric Testing Center that 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 Building, room 440. Candidates seeking information and the registration process for the internet-based Test of English as a Foreign Language (TOEFL) should visit www.toefl.org. This website will provide the test dates available at Case in Sears 464.

ACES, the Academic and Computing Excellence Seminar, is a noncredit program developed by ESS. The course is offered in the summer and at the beginning of each semester to help students develop effective study strategies and confidence using the university’s high-speed network. The course includes assessment, class room instruction, and use of the PDELC. Summer ACES is a residential program, designed for in-coming first year students. University Studies (UNIV) 400 is the non-credit course required for all graduate students who assume (or will assume) instructional responsibilities for any undergraduate course at the university.

Educational Services for Students coordinates UNIV 400. Course descriptions for UNIV 400A, B, and C go here.

COMMUTER LIFE

Commuter services for undergraduate commuting students are provided through the office of Educational Support Services (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. The CA team also publishes the annual Commuter Guide, plans special commuter orientation activities, and organizes the Annual Commuter Appreciation Day. The Rock Bottom Lounge is open Monday through Friday, 8 a.m. to 12 midnight, Saturday from 10 a.m. to 12 midnight, and Sunday from 12 noon to 12 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

Sears 470  
Phone: 216-368-4000  
Web: <ess.case.edu/disability

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

Documentation will be reviewed in order to make a determination of a student's eligibility for service and the type of service needed. Accepted students will have the opportunity to complete an online disclosure form at the ESS web site (ess.case.edu) and submit verifying documentation to Disability Resources. Students (and their parents) 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 at Case should be made eligible 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.

Undergraduate Housing
Case 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 has a two-year residency requirement. Students who live within forty miles of Case 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 operations 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 growth. The staff members know the university community resources and are committed to helping each student benefit to the fullest extent from their college experience.

The First Year Experience at Case
The first year at the university is the beginning of an exciting time of learning about the many opportunities and resources available on campus, 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 two to three residence halls, each housing approximately 100 students. Residential Colleges are staffed by full-time, live-in Coordinator 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 at Case is often 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

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. 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 commu-
nity resources. Ten of the twelve residence halls are found within the Residential Colleges. Cedar Residential College includes Cutler House and Storrs House. Juniper Residential College comprises Norton House, Raymond House, and Sherman House. Magnolia Residential College includes Smith House, Taft House, and Tyler House. Mistletoe Residential College comprises Pierce House and Hitchcock House. These Residential Colleges feature double rooms with community bathrooms and floor lounges. The remaining two residence halls in the North Residential Village are 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, our new, apartment-style option for upperclass students, 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 residence halls.

South Residential Village
A mix of second year and upperclass students live in the seven, suite-style residence halls, and nine fraternity and three sororities 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 Fribley Commons, which houses Fribley 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:
<ess.case.edu/disability>

Room Rates
For the most up-to-date rate information, please visit our website at: http://housing.case.edu/docs. The following accommodations are currently available for Case 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, please visit our website at: http://housing.case.edu

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

Standard
19 meals, plus 75 Dining Points
17 meals, plus 150 Dining Points

Gold
19 meals, plus 75 CaseCash
17 meals, plus 150 CaseCash

Halal/Kosher
14 meals, plus 200 Dining Points/CaseCash
10 meals, plus 200 Dining Points/CaseCash

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 on the Housing, Residence Life & Greek Life web site at http://housing.case.edu/offcampus. 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
Email:ISSNews@case.edu
Web: <http://studentaffairs.case.edu/international/about

Edith Berger, director

The Office of International Student Services (ISS) supports and enhances the international student experience at Case. 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 the Fulbright-Hays grant office. The ISS staff serve as advocates for international students, with the goal of ensuring that each student has the best possible educational, cultural, and personal experience at Case Western Reserve University.

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, an annual international dinner, cross-cultural workshops, a student lounge and study room, and several 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 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 education. For the 2006-2007 academic year, sponsors of undergraduate student must demonstrate an ability to contribute $46,383. (The cost of undergraduate and professional school programs vary from $34,078 to $63,541. Please contact the Office of International Student Services to get the appropriate amount for your intended program of study.) Case 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.

Funds
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 may take as long as one month to redeem (cash) at this university. It is advisable to draw a draft on a bank located in the United States. Traveler’s cheques 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 www.toefl.org for more information about the TOEFL test.) Completion of the ELS Language Center’s Level 112 with at least a 3.0 average is also acceptable. To learn more about the ELS Language Centers, please go to 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 at 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.

Medical Insurance
All students must carry medical insurance. No exceptions are allowed. Refer to “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 obtaining 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 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:
Office of Undergraduate Admission
103 Tomlinson Hall
Case Western Reserve University
10900 Euclid Avenue
Cleveland, OH 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.

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 generally faces problems of living in a different cultural environment under an unfamiliar academic system. It is anticipated that the student can solve these 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 additional steps.
Financial Resources  
In addition to regular application materials, international students must submit a letter from their sponsor and a bank statement verifying the sponsor’s willingness and ability to fund a Case education. For the 2004-2005 school year, sponsors must demonstrate an ability to contribute at least $36,000. Case provides no financial assistance or need-based scholarships to international undergraduate students. At the present time, the only financial aid available to graduate students from other countries is a limited number of tuition grants and assistantships provided by certain departments of the university. These grants are made available only to unusually well-qualified students. A decision on these awards is made only after a decision on acceptance to the university. Case Western Reserve does not grant any financial assistance to undergraduate international students. An international student may want to arrange for a sponsor who will provide full financial assistance. Such a sponsor must document fully his or her ability to support the student, including the cost of tuition and fees, room and meals, books, incidentals, and travel expenses. The university cannot predict what individual expenses will be. Refer to the “Financial Information” section of this Bulletin. Costs for tuition and room and board are subject to change and do not reflect travel costs.

Transfer of Funds  
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 (U.S.) 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 draw a draft on a bank located in the United States. Traveler’s cheques are recommended in place of currency.

Employment  
International students on F-1 or J-1 visas may work on campus provided 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 holidays and vacation periods provided they are eligible and intend to register for the next school term.

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 completion of ELS Language Center, Level 109, at Case Western Reserve University is a mandatory requirement for admission and must be on file before registration will be permitted. Students may be retested on arrival at the university. The TOEFL test was introduced as a computer-based test in July 1998 in many parts of the world. Sylvan Learning Systems, Inc. administers the computer-based test year-round at permanent testing centers throughout the world. In addition, testing is offered at supplemental centers on specific dates or during specific time periods. For testing at supplemental centers, students must obtain the “Information Bulletin for Supplemental TOEFL Administrations” from TOEFL Services:

TOEFL Services  
P. O. Box 6151  
Princeton, New Jersey 08541-6151  
U.S.A.  
http://www.toefl.org  
Information bulletins are also available overseas at the Institute of International Education overseas branch offices; at the American-Korean Foundation in Seoul, Korea; at many U.S. embassies, binational centers and USIS centers; and at many universities. 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 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. Applicants who are required to submit TOEFL scores may be tested again for English placement before they are permitted to register.

Medical Insurance  
All students must carry medical insurance. No exceptions are allowed. Refer to “University Health Service” for details.

Passports and Visas  
When accepted by the university, the student will be sent a letter of admission and the appropriate form by 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 on receipt of a statement indicating sufficient financial support (for example, a letter of award 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 will be contacted by the Office of International Student Services as to the procedures to be followed. To meet U. S. government regulations, a graduate student on an F-1 or J-1 visa must take at least nine semester hours of university work for credit. An undergraduate must register for at least 12 credit hours.

Application  
An application should be submitted by January 15 for fall admittance and by October 15 for spring admittance. Certified translations of academic credentials into English should be submitted with the official copies of all credentials. Initial undergraduate inquiries should be submitted to:

Office of Undergraduate Admissions  
Case Western Reserve University  
10900 Euclid Ave.  
Cleveland, Ohio 44106-7055  
U.S.A.

Management  
Only those applicants from other countries who have an undergraduate educational equivalent to that required for a bachelor’s degree from an accredited institution in the United States will be considered for admission to the Weatherhead School of Management. Candidates with a three-year bachelor’s degree will not be considered for admission unless they have also completed further education for which they have received a degree or diploma, or have completed significant professional work experience (minimum five years). The school does not accept applications from candidates who have already completed a Master of Business Administration (MBA) from another college or university.

The school requires the results of performance on the Graduate Management Admission Test (GMAT) and the Test of English as a Foreign Language (TOEFL). The TOEFL requirement is waived if a student has completed his/her
undergraduate education at a college/university where the language of instruction was English. The GMAT and the TOEFL are administered daily at testing centers throughout the world. Application forms and information bulletins can be obtained by writing to:

Graduate Management Admission Test or Test of English as a Foreign Language Educational Testing Service Box 966 Princeton, New Jersey 08540 or visiting their website at: http://www.gmat.org

All applicants from other countries are required to pay the $50 application fee. Requests for application materials and all correspondence, transcripts, and documents supportive of an application should be forwarded to:

Admission Office
50 Peter B. Lewis Building
Weatherhead School of Management
Case Western Reserve University
10900 Euclid Ave.
Cleveland, Ohio 44106-7233
(216) 368-2030

Applicants to the J.D./M.B.A. program must meet all of the admission requirements of both the School of Law and the School of Management. These applicants should write the admission offices of both schools for bulletins and application forms and should indicate on both applications that they are applying for the joint J.D./M.B.A. program. Separate application fees of $50 (by the School of Management) and $40 (by the School of Law) are charged. Candidates must take the Law School Admission Test (LSAT) as well as the GMAT. The results of the LSAT are sent to the School of Law and the results of the GMAT are sent to the School of Management. Information about the LSAT may be obtained from:

Law School Admission Council
Box 2000
Newtown, Pennsylvania 18940
or check their website at http://www.lsac.org or from the School of Law.

MULTICULTURAL AFFAIRS
The Office of Multicultural Affairs (OMA)
450 Sears Building
Phone 216-368-2904

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 insure 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.

PHYSICAL EDUCATION AND ATHLETICS

Case sponsors nineteen 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 Aikido, archery, cheerleading, crew, cycling, fencing, ice hockey, kung fu, table tennis, tai kwan do, ultimate frisbee, and volleyball. Sport clubs are available to all students, faculty, and staff. Intramural competition is available in more than forty activities, and more than one-half of undergraduates participate for relaxation, physical fitness, and a chance to improve skills.

SQUIRE VALLEEVUE FARM

Squire Valleeveue Farm
Farm Office: 368-0275
http://www.case.edu/farm/

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. It is a beautiful, university-owned, 39-acre property that includes within its boundaries a forest, ravines, waterfalls, meadows, ponds, and brooks. Several historic facilities are designed for education, research, and recreation. The buildings accommodate research and instructional laboratories, classrooms, and a large greenhouse. The Sheep Barn, Pink Pig (a 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, staff, and alumni. Utilization of the buildings and large picnic shelters must be in accordance with University Farm policies and be secured by reservation through the farm office by calling 216-368-0275.

THWING CENTER

Thwing Center
11111 Euclid Avenue
Phone 216-368-2660
Fax: 368-2642
studentaffairs.case.edu/thwing
Director: Casey Medley

Thwing Center is located in the heart of Case Western Reserve University’s campus. It has seen many years of proud service to students, faculty, alumni, and staff; it is the community center of the university. Named for Charles Franklin Thwing, President of Western Reserve University from 1890 to 1921, the facility houses food services, the campus bookstore, a ballroom, meeting rooms, a postal substation, a cyber café, ATMs, food services, student and administrative offices, and lounges for study and relaxation. 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 memo-
rable. Thwing is the “home” of several student organizations. Meeting rooms in Thwing can be reserved on-line at: studentaffairs.case.edu/Thwing/

MEDIA BOARD
The Media Board supervises and reviews the operations of all undergraduate student publications and broadcast media. The Media Board, made up of students and faculty advisors, is coordinated by the Thwing Center Administrative Office. 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)
Web http://films.case.edu

An unusually large number of films are shown at Case. 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
WRUW-FM 91.1
112200 Bellflower Road
Cleveland, OH 44106
Studio phone: 216-368-2208
Office phone: 216-368-2207
Web: 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.

STUDENT ACTIVITIES AND LEADERSHIP

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 120 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 Family Weekend, Halloween at the Farm, Homecoming, Springfest, and the Hudson Relays.

The Undergraduate Student Government holds elections each spring for student class representatives of academic colleges, commuters, and class officers, 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. The Development Committee works to improve the quality of co-curricular life on campus and maintains a grievance process whereby students may express their opinions. 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. The Entertainment Committee selects and sponsors singers, bands, and comedians at the Spot, Rough Rider Room, and Thwing Center. The Fine Arts Committee presents jazz, dance, visual arts, and other performing arts programs.

The Lecture Committee plans and sponsors lectures by national speakers on topics of significance. The Diversity Programs Committee presents social and educational programs to increase cross-cultural understanding as well as cultural and educational programs concerning racial, sexual, and disabled minority interests. Traditional annual events such as Homecoming are planned by the Special Events Committee. All-campus parties and major concerts are planned by the Concert Committee. The Recreation and Development Committee cosponsors educational programs as well as tickets to major sporting attractions and our annual Hudson Relays weekend.

The Interfraternity Congress/Panhellenic

Council oversees the activities of the Greek social organizations on campus. In the spring, they plan Greek Week activities and an all-campus party. 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.

TRIO PROGRAMS

(Upward Bound and Talent Search)
131 Yost Hall
216-368-3750
216-368-6640

Upward Bound is the oldest of the Pre-college 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.

The Talent Search Program is an educational program at Case Western Reserve University designed to (1) identify qualified youths with potential for education at the postsecondary level and encourage them to complete secondary school and undertake a program of postsecondary education and (2) to publicize the availability of student financial assistance for persons who seek to pursue postsecondary education. Talent Search is the newest of the
pre-college programs at the university, having been first funded September, 1998.

UNIVERSITY COUNSELING SERVICES AND COLLEGIATE BEHAVIORAL HEALTH

Center for Collegiate Behavioral Health
University Health Service
Call 216-368-2510
email: mindbody@case.edu

University Counseling Services
Sears Library Building, 2nd floor
Call 216-368-5872
email: wecounsel@case.edu

University Counseling Services (UCS) and Collegiate Behavioral Health (CBH) provides 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 CBH understands the need to maintain confidentiality; therefore, the UCS/CBH 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 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 the website at www.case.edu/staff/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, 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.

UNIVERSITY HEALTH SERVICE

Eleanor W Davidson M.D., Director
Lois Wells, R.N.-C., Director of Nursing
Mary Beth Kattius, M.P.A., Business Manager
2145 Adelbert Road
Phone 216-368-2450

Hours:
M,J,W, F ..................... 8:30 am - 4:30 pm
Thurs .......................... 9:30 am - 4:30 pm
Closed weekends and holidays
Appointments 216-368-4539
On-Call/Emergency Phone 216-368-2450

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 subspecialized 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. A parent may not access information in this record without the same 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. See web site for further information: 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 on the Student Medical Plan website at http://studentaffairs.case.edu/medicalplan. A waiver must be completed each semester by the deadline stated (check the 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 us at 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 Collegium Musicum, the Glee Club, and the University Circle Chamber Orchestra. The Department of Music has information on auditions.

**Honorary 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.

**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. Stu-
dent 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 the 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**

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 also should be 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, or 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), 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 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 or 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;
2. the faculty member feels that the seriousness of the first offense warrants presentation to the academic integrity board; or
3. the faculty member, after consultation with the dean, prefers to have 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 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 Assistant Vice President for Student 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 Assistant Vice President for Student Affairs (or his or her designee) 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 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 Assistant 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 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 preempt investigation or adjudication of a suspected violation when those processes are feasible. If a student is found responsible for a violation, sanctions can be imposed.

**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:

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 and are specifically restricted in some university areas including Squire Valleyme 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. The quantity of alcohol will be determined by using the following formula (number of servings equals number of legal drinkers in attendance multiplied by the hours of event). This formula also applies to BYOB events.

5. 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.

6. 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.

7. No one should be coerced, even subtly, to drink or overindulge, and the rights of those who choose to abstain must be respected.
8. When alcohol is served, food must be provided by the sponsor of the event in adequate amounts to last through the event.
9. The kind 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.
10. 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.
11. 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.
12. The serving of alcohol must cease at least one-half hour before the scheduled end of an event.
13. When entertainment is included in the event, the type of entertainment and the duration must be listed on the Alcohol Use Permit.
14. The gift of alcohol as a reward for any student activity or contest is prohibited.
15. 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.

**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 in the Student Services Guide.

**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 in the Student Services Guide, published annually by the University Office of Student Affairs.

**SMOKING POLICY**
As a matter of public policy, the university is dedicated to providing a safe and healthful environment. In addition, the university has substantial commitments to health-related research and teaching. Thus, the Case Western Reserve University community has a particular obligation to be sensitive to health-protection issues. Case Western Reserve University permits no smoking in its facilities with the exception of residence hall rooms. Smoking is permitted in residence hall rooms only if it is acceptable to all of the assigned occupants. It is permissible to smoke on campus grounds; smokers are asked to use urns provided for ash and butt disposal and to respect the rights of non-smokers at public gatherings on the grounds.
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<th>Field of Study</th>
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<th>Professional/Graduate</th>
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a. Joint program with Cleveland Institute of Art.
b. Available only as a second major.
c. Joint program with Cleveland Institute of Music.
d. Includes dietetics.
e. See clinical (child) psychology, clinical (adult) psychology, developmental psychology, experimental psychology, and mental retardation research psychology.
g. The Medical Scientist Training Program.
h. Combined degree by special arrangement for selected students who hold acceptances in the School of Medicine.
i. 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.

j. Available as the undergraduate portion of the Bachelor of Science in Engineering/Master of Science program.
k. Available as the graduate portion of the Bachelor of Science in Engineering/Master of Science program.
l. Joint 5-year Doctor of Medicine/Master of Science

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- k. Available as the graduate portion of the Bachelor of Science in Engineering/Master of Science program.
- l. Joint 5-year Doctor of Medicine/Master of Science
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a. Joint program with Cleveland Institute of Art.
b. Available only as a second major.
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d. Includes dietetics.
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h. Combined degree by special arrangement for selected students who hold acceptances in the School of Medicine.
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.

Available as the undergraduate portion of the Bachelor of Science in Engineering/Master of Science program.

Available as the graduate portion of the Bachelor of Science in Engineering/Master of Science program.

Joint 5-year Doctor of Medicine/Master of Science Program

<table>
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<th>Field of Study</th>
<th>Undergraduate</th>
<th>Professional/Graduate</th>
<th>Combined</th>
</tr>
</thead>
</table>
| Nonprofit Organizations            | Bachelor of Science in Nursing        | Master of Nonprofit Organizations i | Doctor of Philosophy  
|                                    |                                      |                        | Doctor of Nursing Practice (D.N.P.)  
|                                    |                                      |                        | Master of Science in Nursing (M.S.N.)  
|                                    |                                      |                        | Nurse Practitioner  
|                                    |                                      |                        | --Acute Care Options: Flight Nursing  
|                                    |                                      |                        | Cardiovascular Nursing  
|                                    |                                      |                        | --Adult Option: Infection Control  
|                                    |                                      |                        | --Family  
|                                    |                                      |                        | --Gerontological  
|                                    |                                      |                        | --Neonatal  
|                                    |                                      |                        | --Pediatric  
|                                    |                                      |                        | --Psychiatric Mental Health  
|                                    |                                      |                        | --Women's Health  
|                                    |                                      |                        | ^Clinical Nurse Specialist  
|                                    |                                      |                        | --Community Health Option: Infection Control  
|                                    |                                      |                        | --Medical Surgical Options: Oncology, Critical Care  
|                                    |                                      |                        | ^Nurse Anesthesia  
|                                    |                                      |                        | ^Nurse Midwifery  
|                                    |                                      |                        | ^Nursing Informatics  
| Nursing                            | Bachelor of Science in Nursing        | Master of Science in Nursing/Master of Business Administration  
|                                    |                                      |                        | Master of Science in Nursing/Master of Arts (Anthropology)  
|                                    |                                      |                        | Master of Science in Nursing/Master of Arts (Bioethics)  
|                                    |                                      |                        | Master of Science in Nursing/Master of Public Health  
| Nutrition                          | Bachelor of Arts d                    | Master of Science d  
|                                    | Bachelor of Science in Nutrition d    | Doctor of Philosophy   | Bachelor of Science in Nutrition/ 
|                                    |                                      |                        | Master of Science  
|                                    |                                      |                        | Doctor of Philosophy/  
|                                    |                                      |                        | Doctor of Medicine  
|                                    |                                      |                        | Master of Science/Doctor of Medicine  
| Nutritional Biochemistry and Metabolism | Bachelor of Arts  
|                                    | Bachelor of Science in Nutritional Biochemistry and Metabolism | Master of Business Administration  
| Operations Management              |                                      |                        | Master of Business Administration/  
|                                    |                                      |                        | Master of Science in Management--Operations Research  
| Operations Research                |                                      | Master of Business Administration  
|                                    |                                      |                        | Master of Science in Management  
|                                    |                                      |                        | Doctor of Philosophy  
| Organizational Behavior            |                                      | Master of Business Administration  
|                                    |                                      |                        | Master of Science in Positive Organizational Development and Change  
|                                    |                                      |                        | Doctor of Philosophy  
| Organization Development and Analysis |                                      | Master of Science in  
|                                    |                                      |                        | positive Organizational Development and Change  

GENERAL BULLETIN 2007-2008
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</thead>
<tbody>
<tr>
<td>Pathology</td>
<td>Doctor of Philosophy</td>
<td>Doctor of Medicine/Doctor of Philosophy G</td>
<td>Master of Science/Doctor of Medicine</td>
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<tr>
<td>Pharmacology</td>
<td>Bachelor of Science in Physics</td>
<td>Doctor of Philosophy</td>
<td>Doctor of Medicine/Doctor of Philosophy G</td>
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<tr>
<td>Philosophy</td>
<td>Bachelor of Arts</td>
<td>Master of Science/Doctor of Philosophy</td>
<td>Bachelor of Science in Physics/Doctor of Science</td>
</tr>
<tr>
<td>Physiological and Pharmacological Sciences</td>
<td>Bachelor of Science in Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science/Doctor of Science J</td>
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<tr>
<td>Political Science</td>
<td>Bachelor of Arts</td>
<td>Bachelor of Arts/Doctor of Medicine/Doctor of Arts/Doctor of Juris Doctor</td>
<td>Bachelor of Science in Engineering/Doctor of Science J</td>
</tr>
<tr>
<td>Polymer Science and Engineering</td>
<td>Bachelor of Science/Doctor of Philosophy</td>
<td>Master of Arts/Doctor of Arts/Doctor of Philosophy (Anthropology)</td>
<td>Bachelor of Science/Doctor of Philosophy (Anthropology)</td>
</tr>
<tr>
<td>Pre-Architecture b</td>
<td>Bachelor of Arts</td>
<td>Master of Public Health/Doctor of Business Administration</td>
<td>Bachelor of Science/Doctor of Public Health/Doctor of Business Administration</td>
</tr>
<tr>
<td>Psychology</td>
<td>Bachelor of Arts</td>
<td>Bachelor of Arts/Doctor of Arts/Doctor of Juris Doctor</td>
<td>Bachelor of Science/Doctor of Public Health/Doctor of Juris Doctor</td>
</tr>
<tr>
<td>Public Health</td>
<td>Bachelor of Arts</td>
<td>Master of Public Health</td>
<td>Master of Public Health/Doctor of Business Administration</td>
</tr>
<tr>
<td>Public Health Nutrition</td>
<td>Bachelor of Arts</td>
<td>Master of Science</td>
<td>Master of Science/Doctor of Public Health/Doctor of Business Administration</td>
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<tr>
<td>Religious Studies</td>
<td>Bachelor of Arts</td>
<td>Doctor of Philosophy</td>
<td>Master of Science/Doctor of Public Health/Doctor of Business Administration</td>
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<tr>
<td>Social Welfare</td>
<td>Bachelor of Arts</td>
<td>Master of Science in Social Administration</td>
<td>Master of Science in Social Administration/Doctor of Public Health/Doctor of Business Administration</td>
</tr>
<tr>
<td>Social Work</td>
<td>Bachelor of Arts</td>
<td>Master of Science in Social Administration</td>
<td>Master of Science in Social Administration/Doctor of Public Health/Doctor of Business Administration</td>
</tr>
<tr>
<td>Sociology</td>
<td>Bachelor of Arts</td>
<td>Bachelor of Arts/Doctor of Arts</td>
<td>Bachelor of Arts/Doctor of Arts (Anthropology)</td>
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<tbody>
<tr>
<td>Spanish</td>
<td>Bachelor of Arts</td>
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<tr>
<td>Statistics</td>
<td>Bachelor of Arts</td>
<td>Master of Science</td>
<td>Bachelor of Arts/Master of Science</td>
</tr>
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<td>Bachelor of Science in Statistics</td>
<td>Doctor of Philosophy</td>
<td>Bachelor of Science in Statistics/Master of Science</td>
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<tr>
<td>Supply Chain Management</td>
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<td>Master of Science in Management</td>
<td>Master of Business Administration/Master of Science in Management--Supply Chain</td>
</tr>
<tr>
<td>Systems and Control Engineering</td>
<td>Bachelor of Science in Engineering</td>
<td>Master of Science</td>
<td>Bachelor of Science in Engineering/Master of Science</td>
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<tr>
<td></td>
<td></td>
<td>Doctor of Philosophy</td>
<td>Doctor of Philosophy/Master of Science</td>
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<tr>
<td>Systems Integrated Physiology</td>
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<tr>
<td>Teacher Education B</td>
<td>Bachelor of Arts</td>
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<tr>
<td>Theater Arts</td>
<td>Bachelor of Arts</td>
<td>Master of Fine Arts</td>
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<tr>
<td>Women's Studies B</td>
<td>Bachelor of Arts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>World Literature</td>
<td>Bachelor of Arts</td>
<td>Master of Arts</td>
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Please add in correct alphabetical order:
Cognitive Science Bachelor of Arts
Molecular Medicine
Doctor of Philosophy
UNDERGRADUATE STUDIES

PROGRAMS, REQUIREMENTS, AND REGULATIONS

Office of Undergraduate Studies
357 Sears Building
Phone 216-368-2928; Fax 216-368-4718
E-mail: UGStudies@case.edu
Web page: http://www.case.edu/provost/ugstudies/undstud.htm

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(Kent State University)
Assistant Dean for First Year Students
Claudia C. Anderson, B.A.
(Youngstown State University)
Assistant Dean of Undergraduate Studies
Lynmarie Hamel, M.Ed.
(Cleveland State University), J.D.
(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
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 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 for the Bachelor of Arts 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. Junior Year Abroad, the Fisk University Semester 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.

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
**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 2.00 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;

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 or 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:

A. 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.

B. 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.

C. Writing Portfolio, comprising writing assignments selected from the First Seminar and University Seminars as well as from other courses. 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.

D. A Department Seminar, generally taken in the junior year, that focuses on methods and modes of inquiry and communication that.

E. A 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. Students who matriculated prior to fall 2006 may complete degree programs as prescribed in the 2006 - 2007 Handbook for Undergraduate Students, or may complete degree programs as prescribed by the Handbook published for the academic year in which they matriculated. Transfer Students and Core Requirements Transfer students will be required to complete the General Education Requirements (GERs) found in the 2006 - 2007 Handbook for Undergraduate Students or the SAGES curriculum in the 2006 - 2007 Handbook for Undergraduate Students, based upon the number of credit hours accepted and transferred to the university:
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 2.00. 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.A.

- 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
- Religion
- Sociology
- Spanish
- Statistics
- Teacher Education*
- Theater Arts

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 Deans’ 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 2.00. 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 College of Arts and Sciences are offered in the following fields:
- Applied Mathematics
- Art Education
- Astronomy
- Biochemistry
- Biology
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)
- 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 FSCCT 100 (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 (USSS 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 comprising 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
(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 (JPN), Latin (LATN), Music - General (MUGN), Music - History (MUIH), Music - Theory (MUTH), Philosophy (PHIL), Religion (RLGN), Russian (RUSN), Spanish (SPAN), Theater (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), 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, PSCL 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:
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 Capstone Experience 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.
Bachelor of Science in Engineering degrees conferred by the Case School of Engineering are offered in the following 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).

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, 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 (FSSO 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 comprising 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.

Mathematics, Sciences, and Engineering Requirements
Mathematics (14 semester hours)
MATH 121 or 123
MATH 122 or 124
MATH 223 or 227
MATH 224 or 228 or MATH 234

Chemistry
(4 semester hours)
CHEM 111*

Physics
(8 semester hours)
PHYS 121 or 123
PHYS 122 or 124

Engineering
(18 semester hours)
ENGR 131
ENGR 145*
ENGR 200
ENGR 210
ENGR 225

Natural Sciences, Mathematics, or Statistics Requirement
(3 semester hours)
Course designated by major department

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 four-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 (GREK), Hebrew (HBRW), History (HSTY), Italian (ITAL), Japanese (JAPN), Latin (LATN), Music - General (MUGN), Music - History (MUIH), Music - Theory (MUTH), Philosophy (PHIL), Religion (RLGN), Russian (RUSN), Spanish (SPAN), Theater (THTHR), World Literature (WLIT) and/or Social Sciences: Anthropology (ANTH), 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 Capstone Experience 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
(13 semester hours)
(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)
First Seminar: Natural World (FSNA 1xx)
First Seminar: Social World (FSWO 1xx)
First Seminar: Symbolic World (FSBY 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 comprising 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 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 (CLSO), Dance (DANCO), 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), 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 PSCL 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)
Any 3-semester hour Social Science courses Select from:
Anthropology (ANTH), Communication Sciences (COSI), Economics (ECON), Political Science (POSC), Psychology (PSCL), Sociology (SOCI), SOCI 203 or approved course in human growth and development

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 Capstone Experience 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 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 2.00. 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 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) or First Seminar: Natural World (FSNA 1xx) or First Seminar: Social World (FSSO 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 comprising 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 (MUHI), Music - Theory (MUTH), Philosophy (PHIL), 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-semester hour Social Science courses except ECON 102*, ECON 103*, or ECON 326**.

Select from:
Anthropology (ANTH), 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), Communication Sciences (COSI), Economics (ECON), Political Science (POSC), Psychology (PSCL), Sociology (SOCI)

*S 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 Capstone Experience 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.

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 majors within the 120 hour minimum requirement for the B.A. 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 de-
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.

Minors for Students Majoring in Fields other than Engineering

1. A minor program shall consist of no fewer than 15 and no more than 18 semester hours of specified course work in a discipline other than the student’s major.
2. The responsibility for designating the requirements for a minor shall lie with the department offering the minor.
3. For all courses taken to satisfy minor requirements and for which grades are averaged, students pursuing degrees based on the SAGES General Education Requirements of the College of Arts and Sciences, the Weatherhead SAGES General Education Requirements or the School of Nursing SAGES General Education Requirements, must earn a minimum cumulative average of 2.00. Transfer students who wish to complete a minor must complete at Case Western Reserve University at least half the requirements for the minor.

MINORS FOR ENGINEERING MAJORS

An engineering student’s academic work in a discipline other than the student’s major may be recognized as a minor. A student will be entitled to have the minor designation recorded on his/her transcript upon successful completion of a basic academic program in a discipline not within the student’s major. The completion of a minor academic program does not relieve the student of any requirements for his/her major degree. The following rules govern the minor program for an engineering student:

1. A minor program shall consist of no fewer than 15 and no more than 18 semester hours of course work.
2. The responsibility for designating the requirements for a minor shall lie with the department offering the minor.
3. For minors in areas other than humanities and social sciences, no more than two courses taken for the minor may be used simultaneously to satisfy the requirements of the student’s major field, including department requirements, technical electives and the SAGES Engineering Core.
4. An engineering student who chooses to do so may, by taking work that goes beyond the requirement for four courses in the humanities and/or social sciences, complete a minor in either of these areas, and count towards the minor up to 12 hours of humanities/social science courses that are also being used to fulfill the breadth requirement of the SAGES Engineering Core. For such a minor to be posted on a transcript, the student must earn a cumulative grade point average of 2.00 for all courses taken to satisfy minor requirements and for which grades are averaged.

Minor Concentrations

- Accounting
- American Studies
- Anthropology
- Art History
- Artificial Intelligence
- Art Studio (Art Studio/Photography)
- Asian Studies
- Astronomy
- Banking and Finance
- Biochemistry
- Biology
- Biomedical Engineering*
- Chemical Engineering*
- Chemistry
- Childhood Studies
- Chinese
- Civil Engineering*
- Classics
- Communication Sciences
- Computer Engineering*
- 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
- French
- French and Francophone Studies
- Geological Sciences
- German
- German Studies
- Gerontological Studies
- 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
- Religion
- Russian
- Sociology
- Spanish
- Sports Medicine
- Statistics
- Systems and Control Engineering*
- Theater Arts
- Women’s Studies
- World Literature
- * minor based on SAGES Engineering Core

EXPERIENTIAL LEARNING

Inside and outside the classroom, Case offers undergraduates a variety of experiences that are an integral part of a Case education, and 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 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 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 municipality, interning at a local media outlet, tutoring in Cleveland’s Hispanic community, gaining experience in public health clinics, studying history with “the city as classroom,” or collecting aquatic specimens from the ponds at the university’s 389-acre farm.

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 engineering schools that includes Case. 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 bilateral exchange programs with other overseas universities is available from the study abroad advisor in the Office of Undergraduate Studies.

JUNIOR YEAR ABROAD
Full-time undergraduate students who have earned a 3.0 grade point average at the University are eligible to apply for the Junior Year 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 a 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 Junior Year Abroad pay tuition to Case and maintain their student status during the period of study abroad. Financial aid may be applied to the Junior Year 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.

BILATERAL EXCHANGE PROGRAMS
Case Western Reserve University has bilateral exchange agreements enabling students from overseas institutions to attend Case as visiting students and permitting Case 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)
- National University of Singapore (engineering, computer science)
- Case 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.

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 departments offer outstanding upperclassmen 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 departmental honors.”

Undergraduate Research
SOURCE: Support of Undergraduate Research & Creative Endeavors
Research experience enables students to start from a base of established knowledge to formulate research questions, acquire skills in information collection and analysis, develop hypotheses and conclusions from the information gathered, share ideas with research colleagues, and experience both the exhilaration and frustration that accompany intellectual exploration and persistence. The departments and schools of Case and many of its neighboring University Circle institutions provide numerous and diverse opportunities for undergraduates to work on research projects independently or as a member of a research team. During the summer, there are numerous opportunities both on- and off-campus for students to engage in research or creative projects. Students interested in learning about research opportunities should contact the SOURCE (Support of Undergraduate Research and Creative Endeavors) Office: 368-8508 or email: sheila.pedigo@case.edu. The SOURCE office provides funding for on-campus summer research and travel for students presenting their work at national conferences. SOURCE also sponsors “Intersections: SOURCE Symposium and Poster Session” and Discussions, the Case peer-reviewed undergraduate research journal.

WORK EXPERIENCE IN THE PUBLIC AND PRIVATE SECTORS
The Center for Civic Engagement and Learning
The Center for Civic Engagement and Learning connects students and community through
service. The center coordinates both curricular and co-curricular 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 SERVERS 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.

Cooperative Education
Cooperative Education (Co-op) is a formalized academic program that enables students to alternate classroom studies with career-based experiences in industry. It is a learning experience designed to integrate classroom theory with practical experience and professional development. The Co-op Program is available to both undergraduate and graduate students. The undergraduate Co-op Program is available to full-time students in the engineering, science, and business disciplines. Through the Co-op Program, 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 coursework. 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 coursework at the university prior to admission to the Co-op Program. The Co-op Program does not involve any additional coursework, 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. The Co-op Program staff provides assistance with registration, financial aid, housing, and health services for all co-op students. The Co-op Program is housed in the Case School of Engineering and is accredited by the Accreditation Council for Cooperative Education.

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 Case 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 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.

Washington Center Program
Students receive credit for interning in Washington, D.C., through the Washington Center program. The emphasis is on practical 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 9 hours for their internship course (WASH 002A). For a summer internship, students receive 3 credit hours (WASH 002D). In addition, students receive 3 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.

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. In their first three years, students are to fulfill the required mathematics, science, humanities, and social science courses that are comparable to courses at Case. 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.

Students must maintain a 3.0 overall grade point average and a 3.0 in mathematics and science at their liberal arts college. The Binary student generally completes 90 semester hours or 135 quarter hours at their college prior to matriculating at Case. Binary applications are
to be submitted during the 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 or concern 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.

Binary partnerships exist with the following colleges and universities:

- Albion College
- Alban, Michigan
- Allegheny College
- Meadville, Pennsylvania
- Baldwin-Wallace College
- Berea, Ohio
- Bates College
- Lewiston, Maine
- Bethany College
- Bethany, West Virginia
- Capital University
- Columbus, Ohio
- Centenary College of Louisiana
- Shreveport, Louisiana
- Clarion University
- Clarion, Pennsylvania
- College of Charleston
- Charleston, South Carolina
- College of Wooster
- Wooster, Ohio
- Dickinson College
- Carlisle, Pennsylvania
- Duquesne University
- Pittsburgh, Pennsylvania
- Earlham College
- Richmond, Indiana
- Edinboro University
- Edinboro, Pennsylvania
- Fordham University
- Bronx, New York
- Franklin and Marshall College
- Lancaster, Pennsylvania
- Goshen College
- Goshen, Indiana
- Hiram College
- Hiram, Ohio
- Illinois Wesleyan University
- Bloomington, Illinois
- John Carroll University
- University Heights, Ohio
- Kenyon College
- Gambier, Ohio
- Lebanon Valley College
- Annville, Pennsylvania
- Marietta College
- Marietta, Ohio
- Miami University
- Oxford, Ohio
- Muskingum College
- New Concord, Ohio
- Notre Dame College
- South Euclid, Ohio
- Oberlin College
- Oberlin, Ohio
- Ohio Wesleyan University
- Delaware, Ohio
- Otterbein College
- Westerville, Ohio
- State University of New York
- Brockport, New York
- State University of New York
- Cortland, New York
- State University of New York
- Fredonia, New York
- Suffolk University
- Boston, Massachusetts
- Thiel College
- Greenville, Pennsylvania
- Universidad Catolica De Puerto Rico
- Ponce, Puerto Rico
- Washington and Jefferson College
- Washington, Pennsylvania
- Western Illinois University
- Macomb, Illinois
- Westminster College
- New Wilmington, Pennsylvania
- Wheeling Jesuit University
- Wheeling, West Virginia
- Wittenberg University
- Springfield, Ohio

**Cross Registration in Northeast Ohio**

If approved by the Office of Undergraduate Studies, full-time undergraduates in good academic standing may cross-register through the Northeast Ohio Council on Higher Education (NEOCHE) program at Baldwin-Wallace College, the Cleveland Institute of Art, the Cleveland Institute of Music, Cleveland State University, Cuyahoga Community College, Myers 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 students to spend a semester as visiting students at Fisk each year. Up to four Fisk students may spend a semester at Case 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 students who participate in the Case-Fisk Exchange pay tuition to Case, 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 at Case Western Reserve University prepares students to become art educators through a unique partnership. This program integrates professional teacher education with the visual and fine arts disciplines. Students in the program experience a wide range of experiences in art education, including classroom teaching, curriculum development, and art administration. The program is designed to prepare students for a career in teaching art at the elementary, middle, or high school level. The program includes coursework in art education, art history, and studio art, as well as field experiences in art education settings. Candidates in the program also complete a student teaching experience and a final comprehensive examination.
Institute of Art (CIA) enrolls students pursuing the B.S. in Art Education in a program that combines studio art courses at the Cleveland Institute of Art with liberal arts and education courses at Case. Admission to the program requires application to Case 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. 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 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. 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, and the graduate program in speech-language pathology 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 Office 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 the 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, 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-year 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 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 the University. 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 degree progress reports.

First Year Advisors
During a student’s first year at Case, 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 ad-
vice about academic policies and procedures and about specific academic programs from the Handbook for Undergraduates, from newsletters and web sites, 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, Career Center, Educational Services for Students, the Office of Multicultural Affairs, the University Counseling Service, and in specialized programs such as CO-OP (co-operative 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, web sites, 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 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 on-line 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 University Undergraduate Faculty 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 to waive a specific regulation or requirement.

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 also should be 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, or 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 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 ad-
equate 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:
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; 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 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 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 Assistant Vice President for Student 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 Assistant Vice President for Student Affairs (or his or her designee) will convene the board. The board will be composed of three students (voting members) appointed by the Undergraduate Student Government, two faculty 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 Assistant 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 reported after graduation 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 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 Assistant Vice President for Student 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 have filed a formal application for the degree in the Office of Undergraduate Studies by October 10 for January graduation, by December 2 for May graduation, and by July 14 for August graduation; and the student must have discharged all financial obligations to the 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 from 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.

Students unable to attend classes because of illness should notify their instructors and make the appropriate arrangements directly with the instructor. The University Health Service and the Office of Undergraduate Studies do not provide medical excuses for class absence. Information concerning the policy of the Health Service and the Office of Undergraduate Studies is available in both the Office of Undergraduate Studies and the University Health Service.

AUDIT

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. However, a student may take for credit a course he or she audited in an earlier semester. 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.

COURSE CHANGES (DROP/ADD)

Changes in course schedules must be submitted to the Registrar’s Office using the drop/add form or SOLAR before the end of the second week of classes during the fall and spring semesters and on or before the second day of classes during the summer session.

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. Those interested in this opportunity must inform the Office of Undergraduate Studies of his/her intention to use the Course Repeat Option Policy. Upon application of the Course Repeat Option, the first grade will remain visible on the transcript, but will be removed from the calculation of the cumulative grade point average and the original semester in which the grade was earned. The second grade will then be used for calculation into the cumulative grade point average and the original semester in which it was earned, even if it is not the better 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 and the Course Repeat Option will not be applied. Similarly, if a student withdraws from a course that is being repeated, the Course Repeat Option will not be applied and the original grade will stand. If the Course Repeat Option is applied, the student’s transcript will show the comment “GRADE NOT COUNTED. COURSE REPEATED.” directly below the course. This option may be exercised according to the following conditions:

1. A student may not use the Pass/No Pass Option on a course to which the Course Repeat Option is being applied.
2. Students wishing to use the Course Repeat Option Policy must submit the Course Repeat Option Form by 5:00 p.m. on the last day of classes in the term in which the course is being repeated. Late Course Repeat Options forms will not be accepted.
3. 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.
4. All grades earned at Case Western Reserve University, including those grades removed as a result of the application of the Course Repeat Option Policy, will be applied to the Scholarship GPA that is reviewed in order to determine Case Western Reserve University merit-based scholarship retention.
5. 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 use the Course Repeat Option in order to 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.

FOREIGN LANGUAGE

Credit earned for the first semester (101) of a beginning foreign language will appear on the transcript and will be included in the student’s grade point average but will not count towards the total hours required for the degree unless the second semester of the same language is completed as well.

GRADING SYSTEM

See section on Registration.

Incomplete Grade

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 Undergraduate Studies has authorized the grade.

Changing the Incomplete Grade

The instructor shall submit to the Office of Undergraduate Studies for transmission to the Registrar a final evaluative grade to replace the Incomplete upon completion of the work outstanding by a date established for the student by the instructor. When a student fails to submit the work required for removing the Incomplete by the date established, the instructor shall submit to the Office of Undergraduate Studies for transmission 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.

The amount of additional time allowed a student to make up incomplete work should serve to accommodate the student while being fair to other students in the course. It should be proportional to the duration of a student’s illness or absence and might be no more than a few days or weeks. At the extreme, it should not extend past the eleventh week of the session following the one in which the Incomplete grade was received. In certain cases (such as students on probation) the dean may establish a date for completion of courses with Incomplete grades.

PASS/NO PASS

Courses elected on a Pass/No Pass basis and completed with a grade of D or higher will be entered with the grade P on the student’s transcript. Courses taken Pass/No Pass for which a grade of F is earned will have NP entered on the transcript. Courses completed with a letter grade P under this option will be counted for credit toward the baccalaureate. Courses completed with the grades P and NP are not included in computing the grade point average. The Pass/No Pass option is subject to the following regulations:

1. Students may submit a Pass/No Pass Option form at any time in the fall or spring semester after the end of the drop/add period and before 5:00 p.m. on the last day of classes. Once the Pass/No Pass Option form is submitted, it may not be retracted or changed.

2. The Pass/No Pass Option is available only during regular fall and spring semesters to students who are in good academic standing 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. 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.

7. 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.

NOTE: A student may not use the Pass/No Pass option in a course to which the Course Repeat Option is being applied. 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.

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, ENTP, 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 Students is not justification for an exception. Petition forms are available in the Office of Undergraduate Studies, 357 Sears Bldg. Petitions are referred to the appropriate committee of the University Undergraduate Faculty.

**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 can be used by faculty to schedule review sessions for which attendance is optional.

**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 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 that 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 transfer students and does not apply to the summer session.

**After the First Undergraduate Year:**

After consultation with a dean in the Office of Undergraduate Studies, a student may withdraw from a course no later than the end of the 11th week of the semester and receive a grade of W. In extenuating circumstances, the dean may permit a student to withdraw from a course after the final date and receive a W. The grade of W will be posted on the student's transcript.

**For all course withdrawals:**

Notice of a withdrawal from a course must be transmitted by the student to the Registrar on the appropriate form, signed by the student's advisor and dean. Failure to attend class, or providing notice only to the instructor, does not constitute an official withdrawal from a course. Such an unofficial withdrawal normally will result in the student's being assigned the grade of F. A student who withdraws from the University (see below) is dismissed during a semester will receive the grade of WD for each course for which he or she is registered at the time of withdrawal.

**WITHDRAWAL FROM THE UNIVERSITY**
To withdraw from the University during a semester or session, a student must complete an official withdrawal form in the Office of Undergraduate Studies. If unable to complete the withdrawal in person, the student must send written notification to the Office of Undergraduate Studies. If the withdrawal is necessary for reasons of health, a statement from the student’s physician to the University Health Service may be required as a condition of readmission. Grades of WD will be assigned in all courses in which a student is registered at the time of withdrawal, provided that a student follows the procedures stated above. Failure to attend classes or notification of instructors only, does not constitute withdrawal from the University.

A student who ceases to attend or otherwise participate in courses without officially withdrawing will be assigned the grade F for each course in which he or she is enrolled.

Students who do not plan to return for the following semester must notify the Office of Undergraduate Studies, 357 Sears Bldg., 368-2928, E-mail: ugstudies@case.edu, in person or in writing.

ACADEMIC STANDING REGULATIONS

GOOD STANDING

The First Year: For the first two semesters of enrollment, 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. In order to maintain good standing a first year undergraduate must earn at Case a minimum of 9 hours and an average of 1.70 or higher in the first semester and a total of 21 hours with a cumulative average of 1.75 or higher by the end of the second semester of full-time enrollment.

Thereafter: Following the first year, the requirements for good standing for full-time students* are:
1. a semester grade point average of 2.00 or higher and
2. a cumulative grade point average of 2.00 or higher and
3. a minimum of nine credit hours earned each semester and
4. an average of 12 credit hours earned each semester during two consecutive semesters of full-time enrollment

For the purposes of academic standing, a student is full-time if he/she was enrolled for 12 or more hours at the end of the semester drop/add period. Semester and cumulative credit hour expectations for good standing will be adjusted and prorated for a matriculated student who enrolls as a part-time student. For example, a half-time student must have completed successfully one-half of the minimum number of required semester hours.

Students with incomplete grades may be placed on “probation (incomplete)” as described below.

PROBATION

Students who, at the end of any semester, fail to maintain the standard of performance required for good standing as specified above will be placed on probation. Students placed on probation are ineligible to represent the University in intercollegiate activities and may not hold an elective or appointed office or committee chairman ship in any campus organization. There are two categories of probation:

1. Academic Probation: Students will be placed on academic probation for failure to achieve the standards of performance specified above. When placed on academic probation students will be required to meet a standard of improvement established for individual students by the colleges. They are normally eligible for a maximum of two consecutive semesters of probation for the purpose of restoring themselves to good standing. However, the second semester of probation will be granted only in those cases where during a first semester of probation progress has been made toward achieving good standing.

2. Probation (incomplete): A student will be placed on Probation (Incomplete) if he/she has incomplete grades which if converted to F’s would result in the student’s being placed on academic probation. Once the incompletes are converted to grades, the student shall be restored to good standing or placed on academic probation as determined by the semester and/or cumulative grade point average that results.

SEPARATION

Students on academic probation who fail to meet the standard of improvement established by the colleges will be eligible to be separated from the colleges for at least two academic sessions, including the summer session.

A student is eligible for separation without a semester of probation for either of the following reasons:
1. the student’s semester grade point average is less than 1.00
2. the student has not earned at least 19 credit hours in two consecutive semesters of full-time enrollment.

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 2.00 or higher and have attained the 2.00 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 trans-
Students of outstanding ability and attainment who are candidates for the B.A. and who are admitted to professional studies in Case 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 for this privilege should be made during the second semester of the junior year by the Dean of Undergraduate Studies.

Eligibility
Eligibility rules apply to all activities in which students represent the University in any way, official or otherwise. These include intercollegiate athletics, musical or dramatic clubs and performances, oratorical or debating teams, class offices, student government, committee memberships, and publication staffs. Students who are on probation for any reason are ineligible to participate in these activities. Eligibility is based on full-time status (enrollment for 12 hours or more), and students carrying fewer than 12 semester hours are ineligible to participate in intercollegiate competitions. Eligibility is determined at the end of each session as of the last official date of that session.

Students must complete the work of the previous session with a 2.0 grade point average to be eligible for initiation into a social fraternity or sorority.

The dean or the appropriate committee may at any time declare as ineligible those students whose conduct, attendance, or academic standing is unsatisfactory, or whose participation in student activities is detrimental to their academic work.

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 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 students who are candidates for the B.A. and who attend the School of Dentistry, the School of Medicine, the Frances Payne Bolton School of Nursing, or the Mandel School of Applied Social Sciences of Case.

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.
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., 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 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. 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 3.20 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 requirements 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., 368-2928, Email: ugstudies@case.edu.

For Candidates for the B.S. in Accounting
There are two programs that integrate graduate and undergraduate work in accountancy. 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 accoun
tancy 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 coursework, 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, 368-2065, E-mail: lmp3@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 coursework towards their undergraduate degree program, students in this program may begin taking more graduate coursework before completing all of their undergraduate degree requirements. To enroll in this program, students must have:
1. Completed 90 hours of undergraduate coursework
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 3.0 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, 368-2065, email: lmp3@case.edu.

PROGRAMS ALL lowing 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 Doctor's 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 Ph.D. 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. 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, mathemat
cs, 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 coursework 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 the Associate Dean of Engineering Programs 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 coursework 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 rules.
Students may petition to transfer graduate coursework 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. coursework 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.

**PROGRAMS ALLOWING ENTERING STUDENTS CONDITIONALLY GUARANTEED ADMISSION TO THE UNIVERSITY'S PROFESSIONAL SCHOOLS**

The Pre-Professional Scholars Programs in medicine, dentistry, law, and social work grant to a few outstanding, entering first year undergraduates conditional commitments of admission 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-Professional 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 professional schools are free to do so.

The Six-Year Dental Program gives exceptionally able and committed entering first 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 commitment of admission to the Case School of Law. The commitment will be honored upon successful completion of a program planned individually with the Pre-Law Advisor. For additional information, contact Professor JoAnne Jackson, Pre-Law Advisor, 357 Sears Bldg., 368-2928, email: prelaw@case.edu.

**Pre-Professional Scholars Program in Dentistry**

Each year, approximately ten 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 study in the University 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 admission requirements of the School of Dentistry:

2. Biology: BIOL 214, Genes and Evolution; BIOL 215, Cells and Proteins; and BIOL 216, Organisms and Ecosystems
3. Mathematics: MATH 125, Calculus I.

They are required to take the Dental Admission 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 scholar's achievement of cumulative grade point average of 3.0 or higher for all course work completed.

Successful progress in the program will be determined individually and reviewed at regular intervals during the student's undergraduate career.

Pre-Professional Scholars in Dentistry who wish to accelerate their program may apply for the senior year in professional studies privilege.

**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 first 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 Dentistry. 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 University 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 reserved in the School of Dentistry, a student in the program must achieve the following:

1. A cumulative grade point average of 3.00 or higher for all course work completed.
2. Grades of B or higher in the required courses in biology, chemistry, physics, and mathematics.
3. An average score of 16 or higher on both the academic and PAT portions of the Dental 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 the Pre-Professional Scholars Program in Law at Case Western Reserve University. Pre-Professional Scholars receive a conditional commitment of admission to the Case School of Law, to be honored upon completion of the bachelor's degree at the University. The Pre-Professional Scholars in Law are encouraged 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 encourages applications from all majors, including engineering 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 success 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 who wish to accelerate their program may apply for the senior year in professional studies privilege, but early admission/senior year in professional studies is not assured by the Pre-Professional Scholars Program. Students applying for early admission via the Senior Year in Professional Studies program will be evaluated by the Case School of Medicine on the same basis as all non-Pre-Professional Scholars applicants.

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.

* 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 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 3.60, 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, physics, and mathematics. By the end of the sixth semester, they should attain a cumulative grade point average of 3.60 for these courses, and 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.

**Social Work**

**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 3.0 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 re-Professional Scholars and Six-Year Dental Programs**

Prospective students who wish to apply to any of the Pre-Professional Scholars Programs or 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, 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 and three College Board Achievement Tests), 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 coursework. 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, 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 fifty 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, 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 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 averages required with a minimum of 12 hours earned and who have no Fs, NPs, or Incompletes during the same period. Students with a grade point average of 3.75 or higher will be placed on the Dean’s High Honors List. Students with a grade point average of at least 3.50 but less than 3.75 will be placed on the Dean’s Honors List.

Commencement Honors
Commencement Honors are awarded to the top 35 per cent of the graduating class.

• Top 10 per cent summa cum laude
• Next 10 per cent magna cum laude
• Next 15 per cent 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.

Departmental Honors
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 P/NP).

Departmental Awards

**Accountancy**

- 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 Bober, Markey, Fedorovich and Co. Award
- The Andrew D. Braden Award for Excellence in Auditing and Financial Reporting
- The Cohen & Co./Beta Alpha Psi Leadership Award
- 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 Levy Meritorious Service Recognition Award for outstanding service to chapter, school, and community
- Louis E. Levy Scholars in Accountancy
- The Price Waterhouse Coopers Scholarship Award
- The Skoda, Minotti & Company Award for an outstanding underclassman

**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 Hartsogg Prize for excellence in art education
- The Hazel Gibbs Herbruck 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 in Biology for outstanding academic performance in biology
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 Cristina A. Camardo Award to a biomedical engineering student in recognition of his or her leadership and service within the university community
- 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 ’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, Case 1887, a member of the Case faculty for 40 years.

Chemistry
- The Analytical Chemistry Award
- The Freshman Chemistry Achievement Award for the highest achievement in freshman chemistry
- The Hippolyte Gruener Award to a student for merit in chemistry
- The Hypercube Scholar Award
- The Iota Sigma Pi/Frank Howorka Prize to the woman chemistry major with the highest 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.
- The Dumitru and Gheorghe D. Mateescu Citizenship Award
- Mateescu Citizenship Award
- The Merck Index Award to an excellent chemistry student
- The Ignacio Ocasio Award to a junior or senior chemistry major who has demonstrated significant improvement in the study of chemistry
- Polymer Valley Chemical Undergraduate Research Award

Civil Engineering
- The Kenneth M. Haber Award to the outstanding senior in Civil Engineering and Science
- The Roy Harley Prize to a senior or graduate student in civil engineering promising high potential in the practice of engineering
- The Craig J. Miller Memorial Award was established in 1979 by family and friends in memory of Professor Miller. It is given to an undergraduate or graduate student in the general field of civil engineering who has shown outstanding academic achievement.
- The Allison C. Neff Memorial Award was established by family and friends in memory of Mr. Neff, ’25, former vice president and central division manager of Armco Drainage and Metal Products, Inc. The award is presented in recognition of high proficiency in professional studies and participation in professional activities to a junior in engineering whose major field is civil engineering.

Classics
- 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 classics

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. Barloon Book Award for outstanding performance in economics
- The Gardiner Scholarship to a student majoring in economics and is also interested in finance
• 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 Best Senior Project Award in Systems Control Engineering
• 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 Service Award is given to the senior performing outstanding service to his or her class.
• TheEta 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. Everitt Award to a student who has excelled in electrical engineering studies
• The National Electrical Engineering Consortium William L. Everitt 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 graduating senior in computer engineering and science based on performance in the Cooperative Education Program
• 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 the senior who has demonstrated outstanding ability and shows unusual potential for future contributions in the area of electrical sciences and applied physics.
• The Phillips Award for the best senior project in electrical engineering or systems and control engineering
• The Phillips Award for the best senior project in computer engineering and computer science
• The EECS Research Award to the senior demonstrating exceptional research potential

The Senior Project Award
• The Undergraduate Alumni Capital Award in Systems and Control Engineering to a senior for academic excellence and professional promise
• The Michael L. Wolf Prize was established in 1974 by the family and friends of Michael L. Wolf, a Ph.D. candidate and teacher in electrical engineering.

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 Krottinger Prize for excellence in creative writing
• The Karl Lemmerman Prize for the best paper by a freshman
• The Eleanor Leuser Award for outstanding writing for or about children by a student enrolled in a creative writing course at the university
• The Nemet Scholarships for the demonstration of excellence in creative writing
• The Harriet Pelton Perkins Prize to an outstanding student majoring in English
• The Helen B. Sharnoff 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
• The Sigma Psi Prize for excellence in history
• The John Hall Stewart Prize for excellence in historical studies

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 ’95, and his wife, Mrs. Nellie Chittenden Carlton.
• 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 coursework 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 Study to a student who has
completed an entrepreneurial studies minor or sequence and demonstrates high potential for success in venture development.

Materials Science and Engineering
• The Wesley P. Sykes Prize was established in 1961 by Dr. Wesley Pope Sykes, Case ’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 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 ’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, extracurricular activities, and community service.
• The Fred Hale Vose Prize was established by Elmer L. Lindseth, Case ’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.
• 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 Book Prize to a freshman for outstanding work 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 for 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 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 Pediatric Nursing.
• The Bolton Scholar Award for Excellence in Psychiatric/Mental Health Nursing.
• 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 four-year varsity participant with the highest grade point average.
• The Arthur P. Leary Award to the outstanding first-, second- or third-year student who has demonstrated leadership, good sportsmanship, maintained good academic standing, and made contributions to the department and university.

Physics
• The B.S. Chandrasekhar Prize awarded upon completion of the junior year to a physics major who has demonstrated superior performance
• The Leslie L. Foldy Award to the outstanding senior in physics
• 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 ’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 Physics and Society Essay Competition Award to the physics major who writes the best essay on the application of physics to societal problems
• 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

Religion
• The Ratner 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 Leatham/Nadine Miles Award for creativity and general excellence in theater
• The Music and Drama Club Scholarship to a theater arts major for outstanding contributions to the production program with potential for professional work, given by the Music and Drama Club
• The Samuel Rosenthal Center for Judaic Studies
• The Ira and Ruth Bressler Prize to a student who has demonstrated outstanding work in the area of Jewish studies
• The Eudese and Elmer Paull Prize to one or several undergraduate or graduate students who demonstrate an interest in Jewish studies or Jewish contemporary life

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 interested in extending their education by foreign travel or study
• The Alice Seagraves Award to outstanding students for study abroad

Collegiate Awards
• The Robert J. Adler Award to the senior student in The Case School of Engineering who, through high scholarship, technical creativity, and service to his or her peers, best exemplifies the ideals and talents of Professor Robert J. Adler
• Award for Outstanding Senior Capstone Entry in the Senior Capstone Fair
• The Bolton Scholar Award for excellence in leadership and community service
• The Bolton Scholar Award for Excellence in Nursing for the student who has attained the highest academic record at the junior level
• The Bolton Scholar Award for Excellence in Nursing for the student who has attained the highest academic record at the sophomore level
• The Carol and Edward Breznyak G’64 Cooperative Education Student of the Year Award to a student in The Case School of Engineering who has demonstrated outstanding performance in the Cooperative Education 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 Edward J. “Ted” Corcoran Award to a senior for outstanding leadership, character and service
• The Delta Phi Upsilon - Junior Award of the College of Arts and Sciences to juniors with the best academic records at the end of five semesters
• The Raechelle 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 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 Case School 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 the sopho-
mores 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 sophomore outstanding in scholarship, leadership, and service
• The John Schoff Millis Award to the senior with the best academic record in the College of Arts and Sciences
• The Sylvia Green Rosenberg Award to a part-time or full-time non-traditional student
• The Robert and Joyce Shaefer 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 Case School of Engineering
• The Joseph Skigin Memorial Award to an outstanding premedical student for the senior year
• The Kent H. Smith Award was established in 1961 by Case students and presented by the Case Student Senate to honor Kent H. Smith, Case ’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

MAJOR:
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
program of 15-18 hours (optional)
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<tr>
<th>Department Code</th>
<th>Subject</th>
<th>Degree(s)</th>
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<td>ACC</td>
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<td>BS</td>
<td>Major or Minor</td>
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<td>Major</td>
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<td>BA</td>
<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.N, 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 2005, excluding non-degree registrants, totaled 2,062, of which 1,086 were men, 976 were women, and 690 were international. Of those registrants 433 were new students, 1,652 were full-time students, and 410 were part-time students. During the academic year 2005-2006, the school awarded 317 master’s degrees and 185 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. Handbooks for both Postdoctoral Scholars and Fellows are available at the SGS and on the website: http://www.case.edu/provost/gradstudies/postdoc.html

Administration of the School
Charles E. Rozek (Wayne State University)
Dean of Graduate Studies

Denise M. Douglas
(University of Minnesota)
Associate Dean of Graduate Studies

Faculty Senate Committee on Graduate Studies
General responsibility for overseeing postdoctoral affairs, programs of graduate study and for academic and other general regulations applicable to all graduate students and programs is delegated to the University Faculty Senate Committee on Graduate Studies. Each department, school, or interdisciplinary committee is responsible for its particular graduate programs within the framework of the general regulations. The Committee on Graduate Studies consists of the Dean of Graduate Studies, Associate Dean of Graduate Studies, nine faculty members elected by the University Faculty Senate, one appointed postdoc and four graduate students – three elected by the Graduate Student Senate and one appointed from the professional schools.

Graduate Student Senate
Students in the School of Graduate Studies are represented by a Graduate Student Senate, which consists of one student elected from each department that offers graduate programs. The officers of the senate are elected by the graduate student senators, who also select graduate student representatives to the University Faculty Senate and various campus committees.

Financial Information
For financial aid information see the “Financial Information” section of this Bulletin.

Admission to Graduate Study
Applicants with good academic records from fully accredited universities and colleges will be considered for admission to graduate study at Case Western Reserve University. Admission must be recommended by the department or professional school of the university in which the applicant proposes to work and must be approved by the Dean of Graduate Studies.

Application Procedure
Application for admission may be completed on-line or using a paper application both of which can be found on the SGS web site: http://www.cwru.edu/provost/gradstudies/index.htm

An applicant for admission must submit complete credentials to the proposed department or program at least thirty days before the first day of classes for the semester admission is requested. (Allow at least ninety days when applying from outside the United States.) An applicant for admission and concurrent financial aid consideration must have the completed application forms on file generally by March 1 for fall semester or by November 1 for spring semester. Most departments award financial aid for the academic year, which begins in the fall semester. The credentials must include the following items:

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.

Sylvan Learning Systems, Inc. administers the computer-based test year-round at permanent testing centers throughout the world. In addition, testing is offered at supplemental centers on specific dates or during specific time periods. For testing at supplemental centers, students must obtain the “Information Bulletin for Supplemental TOEFL Administrations” from TOEFL Services at P.O. Box 6, Princeton, New Jersey 08541-6151, U.S.A. Information bulletins are also available overseas at the Institute of International Education overseas branch offices; at the American-Korean Foundation in Seoul, Korea; at many U.S. Embassies.

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. 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 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 copies of test scores), or who are required to attain higher achievement levels on standard tests such as the GRE or TOEFL, as specified by either the department or the School of Graduate Studies 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 that want to enroll in classes for personal en-
richment 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. Applicants who are interested in transferring course work into graduate degree programs are encouraged to seek early advice from the departments to which they intend to apply to insure that courses taken as non-degree students will satisfy departmental requirements. Non-degree students cannot assume that they will be admitted to any graduate degree program, or that all course work taken will transfer into the program. Only 400 level and higher course work will be considered for graduate transfer. The term of the earliest approved, transferred course will establish the date of entrance into the degree program. Courses transferred from non-degree status must have been taken within five years of the first term of matriculation as a degree seeking student and passed with a grade of B or better. Students considering transfer into a degree program will need to meet a minimum matriculation requirement of two semesters and six semester hours of course work. Registration information and forms may be found on this web site: http://www.case.edu/provost/gradstudies/index.htm

Non-degree students are not permitted to enroll in more than 21 hours of coursework in one program. In order to continue taking courses in that program, the student must be accepted into the graduate degree program. A Postgraduate Audit Program allowing registration for coursework is available to individuals who hold a doctoral degree such as, M.D., D.N.P., D.D.S., or Ph.D. and are involved in Case research or clinical programs. Visit website for further information and required forms: www.case.edu/provost/gradstudies/index.htm.

PLANNING THE STUDY PROGRAM

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 the major faculty Advisor and department chair have approved the program of study, it should be submitted to the Dean of Graduate Studies to be placed in the student’s file. Students enrolled in Master’s programs must submit an approved program of study by the end of the second semester. For doctoral students, it must be submitted when the student advances to candidacy. A revised program of study must be submitted 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 web site: 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 prompt notification 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. At the point at which students begin registering for course 701, the department must identify a university faculty member who will serve as the doctoral student’s principal research advisor, and formally notify the Dean of Graduate Studies. Students who have been advanced to candidacy may register for 1-9 credits of course 701 each fall and spring semester (or up to 6 credits for the summer when needed). 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.

Course 703 Requirements
Dissertation Fellowship and Post-Candidacy Research
Students who have been advanced to candidacy and are within the five-year time limit for completion of the degree, but have not completed the dissertation, can register for 703 upon departmental recommendation and the approval of the School of Graduate Studies. Students will register for up to 8 credit hours for Dissertation Fellowship (703), but must also co-register for a least 1 credit hour of 701 or one credit hour of 701 and a course, with the total registration hours equaling 9 credit hours. No tuition is charged for 703 when accompanied by a paid credit hour(s) of tuition. This Dissertation Fellowship is available for a maximum of 6 consecutive semesters and cannot exceed a total of 36 credit hours. If the dissertation is not completed and defended in the last semester of the fellowship, the fellow must resume registration for course 701 at a minimum of one credit hour each semester through the allowed five-year limit. Registration for 703 cannot be used to postpone the normal timetable for completion of the 18 credit hour 701 requirement.

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 submit a written 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 written 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 web site: 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 acceptable 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 web site: 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 faculty member, and any full time Case 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.
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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 departmental 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 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. THIS INCLUDES ALL RESEARCH CONDUCTED FOR THESES AND DISSERTATIONS THAT INVOLVE HUMAN SUBJECTS.

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 extra- curricular 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 semester to complete the work required for the original course. 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 last day of class in the semester following the one in which the I was received. Grade changes received after that date must be accompanied by a petition signed by both the advisor and the chair of the department indicating the reason for the late change and must be approved by the Deputy Provost. 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. 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 (see: http://www.case.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 three courses: 651 thesis research, 701 dissertation research, and 703, dissertation fellowship. “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

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

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and a fair hearing will apply. 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 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 an official leave of absence 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 Dean of Graduate Studies. In that case, the departmental standards supersede the minimum standards. Students who do not maintain the minimum quality point average will be placed on academic probation until the minimum standard has been achieved.

Residency Requirement

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 (see web site for forms: http://www.case.edu/provost/gradstudies/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 and Resignation

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

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. 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. (see forms on website: http://www.case.edu/provost/gradstudies/index.htm)
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 term. 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 for graduate credit at Case Western Reserve University have adequate access to faculty and administrative consideration of their grievances concerning academic issues. A three-step procedure has been established for graduate students to present complaints about academic actions they feel are unfair.

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 Chairperson 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 Dean’s 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 (located on the SGS website: http://www.case.edu/provost/gradstudies/index.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 (CSE) offers thirteen degree programs at the undergraduate level (twelve engineering degrees, plus the B.S. in computer science). At the post-graduate level, the CSE offers Master of Science programs and the Doctor of Philosophy for advanced, research-based study in engineering. CSE also offers two specialized degrees at the Master’s level: a Master of Engineering specifically for practicing engineers, and an integrated Master of Engineering and Management jointly administered with the Weatherhead School of Management. The faculty and students participate in a variety of research activities offered through the departments and the interdisciplinary research centers of the University.

At the core of its vision, The Case School of Engineering seeks to set the standards for excellence, innovation, and distinction in engineering education and research prominence.

STATEMENT OF EDUCATIONAL PHILOSOPHY

The Case School of Engineering prepares and challenges its students to take positions of leadership in the professions of engineering and computer science. Recognizing the increasing role of technology in virtually every facet of our society, it is vital that engineering students have access to progressive and cutting-edge programs stressing five areas of excellence:

- Mastery of fundamentals
- Creativity
- Societal awareness
- Leadership skills, and
- Professionalism

Emphasizing these core values helps ensure that tomorrow’s graduates are valued and contributing members of our global society and that they will carry out the tradition of engineering leadership established by our alumni. 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.

BRIEF HISTORY

The Case School of Engineering was established on July 1, 1992, by an action of the Board of Trustees of Case Western Reserve University as a professional school dedicated to serving society and meeting the needs of industry, government and academia through programs of teaching and research. 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 (founded in 1880) and the Case Institute of Technology (1947). The formation of The Case School of Engineering (CSE) is a re-commitment to the obligations of the gift of Leonard Case, Jr., to serve the citizens of Northern Ohio. The CSE 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.
• Ceramics and Materials Science
• Chemical Engineering
• Civil Engineering
• Computer Engineering
• Computing and Information Science
• Electrical Engineering
• Engineering Mechanics
• Macromolecular Science
• Materials Science and Engineering
• Mechanical Engineering
• Systems and Control Engineering

7. Master of Science without Designation.
8. The Doctor of Philosophy without designation (for all programs).

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 elsewhere in this bulletin. Details of the specific curricular requirements for the undergraduate majors are described in the respective departmental descriptions.

ADVANCED DEGREE PROGRAMS

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 on research.

The Master of Engineering Program prepares students to enhance their role as corporate leaders. The program 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. Participants can complete a master's degree within a two-year (six semester), part-time, program of study. 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 a focus area. Core courses aim at equipping participants with knowledge on how engineering is practiced in contemporary industry. Technical elective courses provide depth in a chosen specialty area. All courses are held in the late afternoon or evening hours and many are provided in a distance–learning format to minimize disruption at the workplace and home. Because the program makes extensive use of computers, participants need to have access to computer facilities.

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.

Six Core Courses

• Team Leadership, Presentation Skills and Professional Assessment and Development (EPOM 400 A, B & C)
• Applied Engineering Statistics (EPOM 405)
• Engineering Economics/Financial Analysis (EPOM 407)
• Introduction to Business for Engineers (EPOM 401)
• Product/Process Design and Implementation (EPOM 403)
• Master of Engineering Capstone Project (EPOM 409)
• Four Technical Electives
• Four courses from the chosen technical concentration area are required. The following technical concentration areas are offered:
  • Automation, Manufacturing, and Control Systems
  • Chemical Engineering and Materials Processing and Synthesis
  • Computer and Software Engineering
  • Mechanical Engineering

Master of Engineering and Management Program

The Master of Engineering and Management program is designed to meet the needs of students seeking to excel in engineering careers in industry. The M.E.M. degree requires only 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 Appli-
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2. Completion of nine hours of thesis work
1. Completion of 18 hours of graduate course
ter of Science in a major field under this plan
of Graduate Studies.

department chair, and the Dean of the School
cess of the requirements for an undergraduate
to 6 hours of Special Problems must be at
or constraints to ensure depth and breadth ap-
project must culmi-

at least three professors plus approval by the
chair of the department offering the degree. The
Special Problems course may be waived for
of the student's advisor, the
department offering the degree, and may be
carried out at the student's place of employ-
ment with nominal supervision by a faculty
advisor or in the division laboratories under
direct supervision. The project must culmi-
inate in a written report and examination by
at least three professors plus approval by the
chair of the department offering the degree.

27 hours of
course work and the final oral examina-
tion 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.

2. Non-project track: Students who register
for 27 hours, not including Special Prob-
lems course work, must pass satisfactorily
a comprehensive examination to be ad-
ministered 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, Com-
prehensive 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 program of study, which must
have the approval of the student's advisor and
department head as well as the dean of engi-
neering, 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 engi-
neering.

DOCTOR OF PHILOSOPHY DEGREE

The student's Ph.D. program should be de-
signed 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 contri-
bution 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 ar-
eas related to, but not identical with, the ma-
jor 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 ap-
propriate to its field.

No student may be admitted to candidacy for
the Ph.D. degree before approval of his or her
program of study by the Advisory Committee,
the department, and the dean of engineering.
After this approval has been obtained, it is the
responsibility of the student's department to
notify the Dean of the School of Graduate
Studies of his or her admission to candidacy
after the student has fulfilled any additional
department requirements. Minimal require-
ments in addition to the university require-
ments 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. pro-
gram 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 equiva-

tent to six semester hours (for credit) is re-

quired. This requirement is to be satisfied
by courses that have been previously ap-

proved by the faculty of the department in
which the student is enrolled.

3. The requirement for breadth is normally sat-

isfied 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 in-
clude courses taken to fulfill the basic sci-
ence requirement.

4. A minimum of three teaching experiences
as defined by the student’s department. All
programs of study must include depart-
mental 400T, 500T, and 600T courses to
reflect this requirement.

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 re-
search and grades of R) is required for the
award of the doctor’s degree.

Qualifying Examination
The student must pass a qualifying exami-
nation 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 Re-
serve 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 masters degree the examination should be
taken no later than the end of the third semes-
ter at the University.

Program of Study
Each student is required to submit a program
of study, detailing his or her course work, thesis
schedule, and qualifying examination schedule
and indicating that all the minimum require-
ments of the University and the faculty of The
Case School of Engineering are satisfied. This
program of study must be approved by the ad-
visory committee, the department chairperson
and the dean of engineering 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, the pro-
gram of study should be accompanied by a
petition to the dean of engineering to waive
the requirement of the M.S. degree. All re-
quired courses taken at the University beyond
the M.S. degree should be shown on the pro-
gram 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
attached to the program of study.

The program of study must be submitted
within one semester after passing the qualify-
ing examination.

UNDERGRADUATE COURSES
(ENGR)

ENGR 101. Freshman Engineering Service
Project (2)
This course is intended to provide engineering
fresher 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
project, with the assignment of working out
and implementing an engineering solution. Collab-
oration 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 Program-
ming (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 im-
portant part of learning the fundamentals of com-
puter 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. Ap-
lication of chemistry principles to develop an un-
derstanding 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 de-
sign of mechanical/structural systems. Course top-
ics include: concepts of equilibrium; geometric
properties and distributed forces; stress, strain and
mechanical properties of materials; and, linear elas-
tic behavior of elements. Prereq: PHYS 121.

ENGR 210. Introduction to Circuits and
Instrumentation (4)
Modelling and circuit analysis of analog and digital
circuits. Fundamental concepts in circuit analy-
sis: voltage and current sources; Kirchhoff’s Laws;
Thévenin and Norton equivalent circuits, inductors
capacitors, and transformers; modeling sensors
and amplifiers and measuring DC device characteristics;
characterization and measurement of time depend-
ent waveforms; transient behavior of circuits; fre-
cquency dependent behavior of devices and amplifi-
ers; frequency measurements; AC power and power
measurements; noise in real electronic systems; elec-
tronic devices as switches; digital logic circuits; in-
roduction to computer interfaces; and analog/digi-
tal systems for measurement and control. Prereq:
MATH 122. Coreq: PHYS 122.

ENGR 225. Thermodynamics, Fluid Dynam-
ics, Heat and Mass Transfer (4)
Elementary thermodynamic concepts: first and sec-
ond laws, and equilibrium. Basic fluid dynamics,
heat transfer, and mass transfer: microscopic and
macroscopic perspectives. Prereq: CHEM 111 and
ENGR 145 and PHYS 121. Coreq: MATH 223.

ENGR 400C. Graduate Cooperative Educa-
tion (0)
An academic opportunity designed for graduate
students to enhance their classroom, laboratory, and
research learning through participation and experi-
ence in various organizational/industrial environ-
ments where theory is applied to practice. Graduate
Cooperative Education experiences may be inte-
grated with the student’s thesis or research project
areas, or be solely for the purpose of gaining pro-
fessional 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.

GRADUATE COURSES

Master of Science in
Engineering Program

EPOM 400A. Engineering Professionalism:
Team Leadership in Effective Groups (1)
This course is designed as an experience-based pro-
cess 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 facilita-
tor. Students will be encouraged to examine group
processes with 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 interplay 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 understanding of the many aspects of the engineering design process and the management of technology. The course focuses on the engineering and management activities used to develop and bring to market new products and processes. The first part of the course focuses on the techniques used to develop new ideas, the second part focuses on the management of technology and innovation. Prereq: EPOM 401.

EPOM 405. Applied Engineering Statistics (3)
In this course a combination of lectures, demonstrations, case studies, and individual and group computer problems provides an intensive introduction to fundamental concepts, applications and the practice of contemporary engineering statistics. Each topic is introduced through realistic sample problems to be solved first by using standard spreadsheet programs and then using more sophisticated software packages. Primary attention is given to teaching the fundamental concepts underlying standard analysis methods.

In this course, money and profit as measures of “goodness” in engineering design are studied. Methods for economic analysis of capital investments are developed and the financial evaluation of machinery, manufacturing processes, buildings, R&D, personnel development, and other long-lived investments is emphasized. Optimization methods and decision analysis techniques are examined to identify economically attractive alternatives. Basic concepts of cost accounting are also covered. Topics include: economics criteria for comparing projects: present worth, annual worth analysis; depreciation and taxation; retirement and replacement; effect of inflation and escalation on economic evaluations; case studies; use of optimization methods to evaluate many alternatives; decision analysis; accounting fundamentals: income and balance sheets; cost accounting. Prereq: EPOM 405.

EPOM 409. Master of Engineering Capstone Project (3)
This is the capstone course for the Master of Engineering Program providing students with the opportunity to integrate the Program’s topics through an intensive case study project. Interdisciplinary teams are assigned a major engineering project that covers the stages from design concept through development to final manufacture, including business and engineering decision making to maximize market penetration. Topics also include safety, environmental issues, ethics, intellectual property, product liability and societal issues. Prereq: EPOM 401, EPOM 403, EPOM 405, and EPOM 407.

Master of Engineering and Management Program
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 acquiring new professional knowledge and skills throughout their career. Prereq: 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. Prereq: 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. Prereq: 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 to 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. Prereq: 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. Prereq: Accredited Bachelor’s in Engineering.

IIME 425. People Issues and Change in Organizations (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. Prereq: Accredited Bachelor’s in Engineering.
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. Prereq: Accredited Bachelor's 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 WSOM and CSE, 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. Prereq: Accredited Bachelor's in Engineering plus summer job experience.

IIME 430B. Product and Process Design, Development, and Delivery II (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 WSOM and CSE, 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. Prereq: IIME 430A.

IIME 435A. Design for Manufacturing and Manufacturing Management I (3)
This course introduces concepts for helping make designs more manufacturable and for making the manufacturing process 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. The course begins the identification of the need for a manufacturing strategy at the corporate level, including an integrated production system. The product and process design process then considers how to optimize the design for manufacturability. Following that, we study how to plan and control the manufacturing process, given the design for manufacturing. This includes strategic planning decision, such as the location for manufacturing, as well as control decisions to facilitate shop floor execution. The course ends with a capstone manufacturing simulation to "put it all together." Prereq: Accredited Bachelor's in Engineering plus experience.

IIME 435B. Design for Manufacturing and Manufacturing Management II (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. The course begins the identification of the need for a manufacturing strategy at the corporate level, including an integrated production system. The product and process design process then considers how to optimize the design for manufacturability. Following that, we study how to plan and control the manufacturing process, given the design for manufacturing. This includes strategic planning decision, such as the location for manufacturing, as well as control decisions to facilitate shop floor execution. The course ends with a capstone manufacturing simulation to "put it all together." Prereq: IIME 435A.

IIME 440A. Engineering Statistics and Quality I (3)
This course focuses on process optimization and control using both qualitative and quantitative techniques. At the completion of the course the student should have a thorough understanding of the importance of quality in all organizations, as well as the tools to ensure that the required levels of quality are established and maintained. Prereq: Accredited Bachelor's in Engineering plus experience.

IIME 440B. Engineering Statistics and Quality II (3)
This course focuses on process optimization and control using both qualitative and quantitative techniques. At the completion of the course the student should have a thorough understanding of the importance of quality in all organizations, as well as the tools to ensure that the required levels of quality are established and maintained. Prereq: IIME 440A.

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 pharmaceuticals suppliers). Prereq: Permission of department. Cross-listed as HSMC 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. Prereq: Enrollment in the MEM Biomedical Entrepreneurship Track or consent of instructor. Cross-listed as BIOS 447 and HSMC 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., entrepreneurship) 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. Prereq: Accredited Bachelor's in Engineering plus summer job experience.

IIME 450B. Engineering Entrepreneurship II (3)
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 en-
compass 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.

Case Advanced Power Institute (CAPI)
124 A.W. Smith Building (7217)
www.capiweb.org
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 Applied Polymer Research (CAPRI)
202 Wickenden Building (7207)
www.cse/emac/Centers/InfoOnDeptCenters.html#CAPRIPhone 216-
368-4186; fax 216-368-6329
Anne Hiltner, Director
e-mail pah6@case.edu

CAPRI performs interdisciplinary applied and basic research on structure-property relationships in polymer materials of interest to industry. Recent work of the center has focused on the attributes of polymer blends and alloys and ways to improve their performance, on processing of micro- and nano-layered materials and structures, on polymers for medical applications, and on new thermoplastics and polyolefin systems.

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, Ph.D., 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 in four major tissue-organ systems: skeletal muscle, brain, heart, and liver. 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. In general, these dynamic models of spatially lumped and/or distributed systems involve highly nonlinear phenomena. 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.

Center On Hierarchical Structures (CHS)
420 Kent Hale Smith Building (7202)
phone 216-368-4203; fax 216-368-6329
Eric Baer, Director
e-mail exb6@case.edu

The aims of this center are to understand how the unique performance of natural materials arises from precise hierarchical organization, to apply lessons from biology to the design of new hierarchical material systems, and to develop new processes for building complex
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 accelerated motor relearning. FES is particularly powerful and clinically relevant, since many people with neurological disabili- ties 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 VA Medical Center (CVAMC). The Center is a consortium with three institutional partners: CVAMC, Case Western Reserve University (CWRU), and the MetroHealth Medical Center (MHMC). The Center accomplishes 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.

**Ernest B. Yeager Center**

**For Electrochemical Sciences (YCES)**

404 White Building (7204)

http://electrochem.case.edu/yeager/default.htm

phone 216-368-4218; fax 216-368-3209

Joe H. Payer, Director
e-mail jhp@case.edu

The Ernest B. Yeager Center for Electrochemical Sciences (YCES) promotes and coordinates research and education in electrochemistry at Case Western Reserve University. Electrochemistry and the technologies derived from it are by their nature highly interdisciplinary. They require expertise in fields as widely divergent as surface physics, solid and liquid state physics, electronics, applied mathematics, polymer science, chemical engineering, and, of course, chemistry.

The center facilitates the undertaking of research projects in electrochemistry of a highly interdisciplinary nature, requiring resources and expertise beyond that of any one faculty research group, and usually involving faculty from several of the participating departments. Eight academic departments of the University participate in the center. Approximately 35 faculty from these departments are affiliated with the center’s regular members. The center fosters interactions and collaborations among all of the students within these departments who are involved in electrochemical research. The center serves as an international focal point for electrochemical education. Besides the traditional educating of graduate and post-doctoral students, it offers annual workshops for educating and updating industrial and governmental scientists and engineers. Numerous seminars, special topic symposia and lectureships keep the faculty, students, and the technical community aware of the most recent advances in the field. The center attracts visiting scientists, postdoctoral research associates, and graduate students from the world’s leading academic institutions and industrial and governmental laboratories.

The center is to be viewed as a national resource to which industry and government can turn for research and education in electrochemistry.

**Nano and Micro Systems Institute (NAMSI)**

112 Bingham Building (7200)

http://www.engineering.case.edu/research/inter.html

http://mems.case.edu/

phone 216-368-2934; fax 216-368-8738

Chung-Chiuan Liu, Director
e-mail cxl9@case.edu

NAMSI 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 NAMSI 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.

NAMSI facilities support a state-wide network, Ohio MEMSNet, for MEMS research and development.

**National Center for Microgravity Research on Fluids and Combustion (NCMR)**

103 Crawford Hall (7074)

http://mae1.cwru.edu/mae/

phone 216-368-0748; fax 216-368-0718

Simon Ostrach, Director
e-mail sostrach@ncmr.org

The Universities Space Research Association (USRA) and Case Western Reserve University have established a National Center for Microgravity Research on Fluids and Combustion (NCMR) under the sponsorship of the National Aeronautics and Space Administration (NASA). The National Center is located on the campus of Case Western Reserve and at Glenn Research Center where it will enjoy access to the world-class research facilities of NASA. Housed in the Zero-Gravity Facility of the Space Experiments Laboratory are laboratories for ground research, diagnostics development; a high-bay area, visitor information, flight hardware storage, shipping and receiving as well as office areas. These facilities enable NCMR and NASA to fulfill the rapidly expanding mission in microgravity research and technology development.
At NCMR, critical path research is conducted in support of NASA’s mission objectives. For long-term manned space exploration, many mission operations and life-support technologies are crucially affected by fluids and transport phenomena. The center’s vision is to become a focal point for microgravity fluids and combustion research that will develop a knowledge base for the design and development of reliable, efficient, and cost-effective space systems. A major part of the effort will be to aid in the development of the next-generation technologies that will have to operate for long periods of time in alien environments under extreme conditions. NCMR promotes the idea that “Research for Design” must be performed to compensate for the limited databases available to designers and builders of space hardware. Through research for design, scientists will become intimately involved at an earlier stage of the hardware development process. To promote free-flow of information, NCMR will hold directed in- and out-reach workshops with industry that will bring together systems engineers, hardware builders and scientists.

**Neural Engineering Center**
112 Wickenden (7207) http://nec.case.edu/  
(216) 368-3974 phone  
(216) 368-4872 fax  
Dominique Durand, Director  
ddx6@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: Quantitative Neurophysiology, Neural Dynamics, Neuro-Mechanical Systems, Neural Regeneration, Neural Interfacing, Neural Prostheses, 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.

**DEPARTMENT OF BIOMEDICAL ENGINEERING**
309 Wickenden Building (7207)  
Phone 216-368-4063; Fax 216-368-4969  
Patrick E. Crago, Chair  
e-mail bmedept@case.edu  
http://bme.case.edu

**BACKGROUND**

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 engineers also use their undergraduate training as a basis for careers in business, medicine, law, and other professions.

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 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**

**Eben Alsb erg, 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 differentiation; mechanotransduction and the influence of mechanics on cell and tissue function; 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

**Harihara Baskaran, Ph.D.**  
(Pennsylvania State University)  
Assistant Professor, Biomedical Engineering (Radiology, University Hospitals)  
Biomimetic tissue engineer; innovative biomaterials and drug delivery vehicles for functional tissue regeneration and cancer therapy; control of stem cell differentiation; mechanotransduction and the influence of mechanics on cell and tissue function; cell-cell interactions

**Patrick E. Crago, Ph.D.**  
(Case Western Reserve University)  
Primary Appointments  
Professor and Chairperson;
Allen H. and Constance T. Ford Professor
Control of neuroprostheses for restoration of motor function; neuromechanics; modeling of neuromusculoskeletal systems
Cheri Deng, Ph.D. (Yale University)
Assistant Professor
Ultrasound mediated drug and gene delivery; ultrasound imaging; ultrasound tissue characterization; ultrasound contrast agents; high intensity focused ultrasound ablation.
Dominique Durand, Ph.D. (University of Toronto, Canada)
Elmer W. Lindseth Professor
Director, Neural Engineering Center
Neural Engineering, neural interfacing, neural prostheses, computational neuroscience, neuropsychology 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, osteophilic biomaterials, ultrasonic studies of tissue anisotropy, scanning acoustic microscopy
Robert F. Kirsch, Ph.D. (Northwestern University)
Associate 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, Zurich, CH)
Associate Professor (joint with Mechanical and Aerospace Engineering)
Development of preventative, treatment and replacement measures for bone disease and failure; Multi-scale modeling of the interplay between mechanics and transport in biological systems: cell mechanics through tissue engineering
Young Jik Kwon, Ph.D. (University of Southern California)
M. Frank and Margaret Domiter Rudy Assistant Professor
Development of semi-artificial viral vectors; synthesis of polymeric gene carriers; targeted drug delivery; cancer vaccine; in vivo imaging; bioartificial liver; stem cell bioreactors; mathematical modeling
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
Mark D. Pagel, Ph.D. (University of California, Berkeley, CA)
Assistant Professor
Molecular imaging; MR imaging of functional and molecular biomarkers; MR high throughput screening methods
P. Hunter Peckham, Ph.D. (Case Western Reserve University)
Donnell Professor of Biomedical Engineering, Director, Functional Electrical Stimulation Center
Rehabilitation engineering in spinal cord injury, neural prostheses, functional electrical stimulation and technology transfer
Andrew M. Rollins, Ph.D. (Case Western Reserve University)
Assistant Professor
Biophotonics and biomedical optics; optical coherence tomography (OCT) for microscopic biomedical imaging in vivo; development of OCT imaging technology and quantitative image analysis for medical diagnostics, screening and guided therapy and for biomedical science
Gerald M. Saidel, Ph.D. (The Johns Hopkins University)
Professor
Director, Center for Modeling Integrated Metabolic Systems
Cellular, tissue, organ, and whole body analyses of mass and heat transport and metabolic processes; mathematical modeling, nonlinear parameter estimation, and optimal experimental design applied to biomedical systems
Anirban Sen Gupta, Ph.D. (The University of Akron)
Assistant Professor
Targeted drug delivery; targeted molecular imaging: image-guided therapy; platelet substitutes; novel polymeric biomaterials for tissue engineering scaffolds
Dawn M. Taylor, Ph.D. (Arizona State University)
Assistant Professor
Brain-computer interfaces for control of computers, neural prostheses, and robotic devices; invasive and non-invasive brain signal acquisition; adaptive decoding algorithms for retraining the brain to control alternative devices after paralysis
Dustin J. Tyler, Ph.D. (Case Western Reserve University)
Assistant Professor
Neuromimetic neuroprostheses; laryngeal neuroprostheses; clinical implementation of nerve electrodes; cortical neuroprostheses; minimally invasive implantation techniques; modeling of neural stimulation and neuroprostheses
Horst A. von Recum, Ph.D. (University of Utah)
Assistant Professor
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

**Secondary Appointments**

Jay Alberts, Ph.D. (Arizona State University)  
Assistant Professor of Biomedical Engineering  
(Cleveland Clinic Foundation)  
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  
Biocompatibility of implants

Marco Cabrera, Ph.D.  
(Case Western Reserve University)  
Assistant Professor, Pediatric Cardiology  
Modeling and control of metabolic processes; metabolic regulation in hypoxia, ischaemia and exercise

Arnold Caplan, Ph.D.  
(Johns Hopkins University)  
Professor, Biology  
Tissue engineering

Peter Cavanagh, Ph.D.  
(University of London at Royal Free Medical School, London, England)  
Professor, Molecular Medicine (Biomedical Engineering, Cleveland Clinic Foundation)  
Foot complications of diabetes, bone biomechanics

Ronald L. Cechner, Ph.D.  
(Case Western Reserve University)  
Technical Director, Anesthesia Simulation Laboratory, University Hospitals  
Assistant Professor of Anesthesiology and Associate Professor of Biomedical Engineering and Pathology  
Simulation in 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; neuromechanical system modeling; analysis of neural network dynamics

**Guy Chisolm, Ph.D.**  
(University of Virginia)  
Professor, Cell Biology, Cleveland Clinic Foundation  
Vascular biology; lipoprotein-cell interactions

Margot Damaser, Ph.D.  
(University of California)  
Assistant Professor, Molecular Medicine (Biomedical Engineering, Cleveland Clinic Foundation)  
Biomechanics as it relates to function and dysfunction of the lower urinary tract

Brian Davis, Ph.D.  
(Pennsylvania State University)  
Assistant Professor, Molecular Medicine (Biomedical Engineering, Cleveland Clinic Foundation)  
Human locomotion and biomechanics

David Dean, Ph.D.  
(City University of New York)  
Associate Professor, Neurosurgery and Anatomy, University Hospital  
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

Kathleen Derwin, Ph.D.  
(University of Michigan)  
Assistant Professor, Molecular Medicine (Biomedical Engineering, Cleveland Clinic Foundation)  
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, MetroHealth Medical Center  
Magnetic resonance imaging; image processing

Claire M. Doerschuk, M.D.  
(Rush University, Chicago, IL)  
Professor, Pediatrics and Pathology, Rainbow Babies & Children Hospitals  
Regulation of the inflammatory response in the lungs, particularly the recruitment of white blood cells, during pneumonia, sepsis, and the acute respiratory distress syndrome

Jeffrey L. Duerk, Ph.D.  
(Case Western Reserve University)  
Professor, Radiology, University Hospitals  
Magnetic resonance imaging; flow visualization

Agata Exner, Ph.D.  
(Case Western Reserve University)  
Assistant Professor, Radiology, University Hospitals  
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  
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 Foundation)  
Quantitative image analysis for application to multiple sclerosis and neurodegenerative diseases

Linda M. Graham, M.D.  
(University of Michigan)  
Professor, Molecular Medicine (Vascular Surgery and Biomedical Engineering, Cleveland Clinic Foundation)  
Magnetic resonance imaging; flow visualization

Marc Griswold, Ph.D.  
(University of Wuerzburg, Germany)  
Associate Professor, Radiology, University Hospitals  
Rapid magnetic resonance imaging, image reconstruction and processing and MRI hardware/instrumentation

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
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 Foundation)
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 Foundation)
Musculoskeletal oncology, adult reconstructive 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, University Hospitals
Experiment design and analysis for positron emission tomography
Sherif Nour, M.D. (University of Cairo, School of Medicine, Egypt)
Assistant Professor, Radiology, University Hospitals
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 Foundation)
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
Radioisotope 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)
Assistant Professor, Molecular Medicine (Biomedical Engineering, Cleveland Clinic Foundation)
Neural control of movement
Maciej Zborowski, Ph.D.
(Polish Academy of Science)
Assistant Professor, Molecular Medicine (Biomedical Engineering, Cleveland Clinic Foundation)
Membrane separation of blood proteins
Nicholas P. Ziats, Ph.D.
(Case Western Reserve University)
Associate Professor, Pathology, University Hospitals
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 Foundation)
Electrophysiological monitoring; EEG processing; medical informatics
Yuanna Cheng, Ph.D.
(Oita Medical University, Japan)
Adjunct Associate Professor (Cardiovascular Medicine, Cleveland Clinic Foundation)
Cardiac fluorescent imaging, mechanisms of arrhythmias, implantable defibrillators, cardiac remodeling, antiarrhythmic therapy
Janis J. Daly, Ph.D. (University of Akron)
Adjunct Associate Professor, Dept of Neurology, Case School of Medicine (Director, Stroke Motor Control and Motor Learning Laboratory, VA Medical Center)
Cognitive and motor processes involved in motor control
Igor Efimov, Ph.D. (Moscow Institute of Physics and Technology)
Adjunct Associate Professor (Biomedical Engineering, Washington University in St. Louis) 
Mechanisms of cardiac arrhythmias and anti-arrhythmia electrotherapy, optical imaging in cardiac electrophysiology 
Jimming Gao, Ph.D. (Harvard University) 
Adjunct Associate Professor (Simmons Comprehensive Cancer Center, University of Texas, Southwestern School of Medicine) 
Biomolecular engineering; imaging-guided drug delivery; controlled-release drug delivery; elastic biomaterials 
Warren Grill, Ph.D. (Case Western Reserve University) 
Adjunct Associate Professor (Biomedical Engineering, Duke University) 
Neural engineering and neural prostheses, electrodes and stimulation methods, the electrical properties of tissues and cells, computational neuroscience 
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 
Vincent J. Hetherington, D.P.M. (Pennsylvania College of Podiatric Medicine) 
Adjunct Assistant Professor of Biomedical Engineering (Surgery, Ohio College of Podiatric Medicine) 
Biomaterials and biomechanics of foot prostheses 
David Huang, Ph.D. (Massachusetts Institute of Technology), M.D. (Harvard University) 
Adjunct Assistant Professor (Dohenyi Eye Institute, University of Southern California) 
Optical coherence tomography of the eye, laser vision correction, corneal wound healing, corneal topography 
Brian Johnstone, Ph.D. (University College, University of London) 
Adjunct Associate Professor of Biomedical Engineering, (Orthopaedics, Oregon Health Science University) 
Chondrogenesis, cartilage regeneration, mesenchymal stem cells, tissue engineering and mechanobiology 
Jill W. Kawalec-Carroll, Ph.D. (Case Western Reserve University) 
Adjunct Assistant Professor of Biomedical Engineering (Research Director, Ohio College of Podiatric Medicine) 
Biomaterials and biomechanics of foot prostheses 
Kevin L. Kilgore, Ph.D. (Case Western Reserve University) 
Adjunct Assistant Professor of Biomedical Engineering (Orthopaedics, MetroHealth Medical Center) 
Functional electrical stimulation; neuromuscoskeletal models 
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Adjunct Professor of Biomedical Engineering (Microbiology, Immunology and Biochemistry, Northeastern Ohio Universities College of Medicine) 
Mineralization of vertebrates, effect of mechanical force on mineralization, calcium transport in mineralization, tissue engineering 
Jonathan Lewin, M.D., Ph.D., (Yale University) 
Adjunct Professor, Biomedical Engineering (Division of Radiology, Johns Hopkins University) 
Magnetic Resonance Imaging 
James Thomas., M.D. (Harvard) 
Adjunct Professor, Biomedical Engineering (Cardiovascular Imaging, Cleveland Clinic Foundation) 
D. Geoffrey Vince, Ph.D. (University of Liverpool Medical School, United Kingdom) 
Adjunct Assistant Professor of Biomedical Engineering (Volcano Corporation) 
Image and signal processing of intravascular ultrasound images, mechanics of coronary plaque rupture, cellular aspects of atherosclerosis 
UNDERGRADUATE PROGRAMS 
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. 
At the undergraduate level, we direct our efforts towards five broad educational objectives: 
(1) mastery of fundamentals, 
(2) creativity, 
(3) social awareness, 
(4) leadership skills, and 
(5) professionalism. 

We believe that students who are soundly based in these five areas will venture out into the world and advance our department’s mission by “playing leading roles ranging from basic science discovery to the creation, clinical evolution, and commercialization of new technologies, devices and therapies.” 

Our objectives are related to our mission in the following ways: 
Mastery of fundamentals is essential across all the target roles of our students. This is what allows them to communicate with ease in the community of engineers. In addition, the individuals participating in the endeavors of basic science discovery and creation of new technology utilize fundamentals on a daily basis. Of all our objectives, our curriculum places the most emphasis on the mastery of fundamentals. We operate under the assumption that students who have mastered the fundamentals will provide valuable contributions in any role once they enter the workforce. 
Creativity is an essential trait in the generation of both new basic science knowledge and new technologies. It is also a prerequisite skill to playing true leading roles as opposed to a more clerically oriented management of people. With this said, we also recognize that this is a very difficult trait to instill in our students and to assess. Our program is designed to emphasize more of the fundamentals during the first two years and then to transition to providing an environment that increasingly allows students to explore and demonstrate their creative abilities. This process culminates in their senior capstone experience. 
Social Awareness is the mindset that allows an engineer to chose a problem whose solution will be of value to society. All the target roles of our students require them to maintain social awareness so that, at worst, they do not act in an unethical manner and at best they use their time wisely. 
Leadership skills allow an individual to synthesize the above three objectives and then work within a group to achieve a solution that would be more difficult if not impossible to attain alone. We do not restrict ourselves to defining leadership as being displayed only by the individual in charge of the group. For a group to work together effectively, all the members must understand the skills involved in leadership. Our objective is to train students so that
they perform effectively within groups that lead the way in their chosen fields. For each objective, we define specific program outcomes as follows.

Mastery of Fundamentals:
- Acquire a strong integrated background in the fundamentals of mathematical, chemical, physical, and biomedical sciences and engineering.
- Become knowledgeable in a special discipline of biomedical engineering such as biomaterials, tissue engineering, biomechanics, instrumentation, modeling and biomedical systems, biomedical imaging, biomedical sensors, or bioelectricity.
- Measure phenomena relevant to medicine and biology using state-of-the-art instrumentation.
- Describe biomedical phenomena by mathematical modeling

Creativity:
- Design devices, materials, instruments, models, and software for biomedical science and health applications.
- Expand the knowledge base through innovative approaches to biomedical research

Societal Awareness:
- Understand issues presented by the biomedical community and translate them into solvable engineering problems.
- Recognize the role of biomedical engineering in developing technology for commercial application and economic development of society.

Leadership Skills:
- Communicate technical information to both technical and non-technical audiences.
- Work effectively in a team setting with others of different backgrounds.

Professionalism:
- Recognize and respond to biomedical ethical issues.
- Acquire skills for self-instruction and lifelong learning.

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 premedical programs. The undergraduate program has three major components (1) Engineering Core, (2) BME Core, and (3) BME Specialty Sequence. A typical program of study is shown in the table. The Engineering Core provides a fundamental 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.

Biomedical Engineering Specialty Electives
Common BME specialties are biomaterials (orthopaedic, polymeric, tissue engineering), biomechanics (prosthetics and tissues), bioelectricity, biomedical instrumentation (devices and sensors), biomedical computing and imaging, and biomedical systems and control. Courses for these specialties are presented in the table. Complete descriptions and suggested schedules for approved specialties are available on the department’s web page (http://bme.case.edu). These specialties provide the student with a solid background in a well-defined area of biomedical engineering. To meet specific educational needs, students may choose electives from among the suggested electives or design unique specialties subject to departmental guidelines and faculty approval.

Co-op and Internship Programs
Opportunities are available for students to alternate studies and work in industry as a co-op student, which is integrated in a five-year program. Alternatively, students may obtain employment as summer interns.

Minor in Biomedical Engineering
A minor in biomedical engineering is offered to students who have taken the Engineering Core requirements. The minor consists of 15 credit hours based on two required courses, EMBE 201/EBME 202 and an approved set of three electives chosen from among the following EMBE courses: 303, 306, 308, 309/359, 310/360, 315, 316, 317, 320, 325, 327, and 350.

B.S./M.S. Program
Undergraduates with a strong academic record may apply in their junior year for admission to the integrated B.S./M.S. program. A senior research project that begins in the summer after the junior year is designed to expand into an M.S. thesis. Also, the student begins to take graduate courses in the senior year. With continuous progress in research during three summers and the academic years, this program can lead to both the B.S. and M.S. in five years.

Biomedical Engineering Specialty Classes

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Courses</th>
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<tbody>
<tr>
<td>Biomechanics</td>
<td>BME 317, BME 327, BME 337, BME 338, EECS 340, EECS 354, EECS 355, EECS 346, BME 378, BME 407, BME 408, BME 329, BME 350</td>
</tr>
<tr>
<td>Bioelectric Engineering</td>
<td>EECS 245, EECS 281, EECS 309, BME 317, BME 327, EECS 311, EECS 321, EECS 322, EECS 344, EECS 382, BME 418, EECS 233, EECS 337, EECS 338, EECS 340, EECS 351, EECS 354, EECS 355, EECS 346, BME 378, BME 407, BME 408, BME 329, BME 350</td>
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<tr>
<td>Biomaterials (polymeric)</td>
<td>EMAC 270, CHEM 223, CHEM 233, EMAC 351, and BME 303; and technical electives from EMSE 316, BME 315, BME 325, BME 350, BME 405, EMAC 377, ECHE 360, EMAC 376, BME 406, BME 408, EMAC 426, EMAC 276, EMAC 370, and EMAC 352</td>
</tr>
<tr>
<td>Biomaterials (orthopaedic)</td>
<td>EMSE 201, ECIV 310, EMSE 303, and EMAC 270; and technical electives from EMSE 316, BME 416, EMSE 202, BME 172, EMSE 270, EMSE 313, EMSE 411, EMAC 372, EMAC 276, EMSE 305, BME 303, BME 407, BME 406, EMAC 415, EMSE 301, EMSE 307, and EMSE 203</td>
</tr>
<tr>
<td>Biomaterials (Tissue Engineering)</td>
<td>CHEM 223, CHEM 233, BIOL 362, EMAC 270, and ECHE 340; and technical electives such as BME 315, BME 316, BME 325, BME 405, BME 320, and BME 350</td>
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EBME 416, EMAC 351, EMAC 377, EBME 406, EBME 408, ECHE 364, ECHE 360, ECHE 474, EMAC 376, and EBME 303.

Biomedical Computing and Imaging
EECS 233, EECS 337, and EBME 320; and technical electives from EECS 281, EBME 431, EECS 375, EECS 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, EECS 309, EBME 403, EBME 320, EBME 321, EBME 311, EBME 418, PHYS 326, EECS 282, EECS 322, EECS 344, ECHE 370, ECHE 380, and ECHE 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, EMBE 307, and EECS 346.

Notes: This gives 129 credits. Varies from sequence to sequence.

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 hours is 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 hours 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 joint degree offered by The Institute for the Integration of Management and Engineering (TiME), in 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 degree is completed in one additional year beyond the B.S., for a total of five years.

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 MD/MS 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 MD/MS in Engineering program.

Students must complete the normal requirements in either MD program. Portions of the medical school curriculum earn graded credit toward the MD/MS degree. Six credit hours can be applied to the MS 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. All students attend monthly seminars focusing on the integration of engineering and medicine, with the opportunity to present their own research and to hear and interact with other presenters. Students must also complete training in the responsible conduct of research.

The 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 13 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 chairperson. Eighteen hours of EBME 701 registration are required.

Ph.D. candidacy requires passing certain milestones. A student is advanced to Ph.D. candidacy after passing the Ph.D. Qualifying Exam and 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.
Biomedical Imaging, and small animal imaging.

contrast agents. In vivo microscopic and mo

visual perception, image-guided intervention,
elastography, optical coherence tomography,
MRI, PET, SPECT, CT, ultrasound, acoustic

molecular targeting of therapeutics, and imaging their
development technologies for physical and chemi

molecular simulation. The BioNETT Center
biopolymer and biomaterial interfaces, and
laboratories for biomaterials microscopy,

Nanoscale Engineering for Targeted Therapeu
tics (BioNETT), the Neural Engineering

Primary BME faculty also have laboratories
and Centers in other locations. The Endoscopy Research Laboratory in University Hospi
tals is the center for work on optical coherence
tomography and biophotonics. The FES (Functional Electrical Stimulation) Center,
with laboratories in three medical centers, de
velops techniques for restoration of movement
in paralysis, control of the nervous system,
and implantable technology. Also, it promotes
technology transfer and disseminates informa
tion about functional electrical stimulation,
and evaluates clinical functionality of neu
roprostheses. The APT (Advanced Platform
Technology) Center develops advanced tech
ologies that serve the clinical needs of veter
ans and others with motor and sensory deficits
and limb loss.

The Coulter-Case Translation and Innovation Partnership (CCTIP) is a department-based
program that accelerates the introduction of
new technologies into patient care through trans
lational research and commercialization.
The department faculty and students have ac
cess to the facilities and major laboratories of the Case School of Engineering and of the
School of Medicine. Faculty have numerous
collaborations at University Hospitals, Metro
Health Medical Center, VA Medical Center,
and the Cleveland Clinic Foundation. These
provide extensive research resources in a clini
cal environment for both undergraduate and
graduate students.

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 re
search in biomedical engineering, are strongly
couraged 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 engi
neering 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 posi
tions in biomedical engineering, rather than
the traditional M.D./Ph.D. career pathway in
academic medicine.

Both M.D./Ph.D. programs require ap
proximately 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 ac
commodate 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 im
plantation, including neural, orthopaedic, and
cardiovascular tissue engineering, biomimetic
materials, liposomal and other structures for
targeted drug delivery, and bio
compatible polymer surface modifications.
Analysis of synthetic and biologic polymers
by AFM, nanoscale structure-function rela
tionships of biomaterials. Applications in the
nervous system, the cardiovascular system, the
musculoskeletal system, and cancer.

Biomedical Sensing

Optical sensing, electrochemical and chemical
fiber-optic sensors, chemical measurements in
cells and tissues, endoscopy.

Neural Engineering and Neural Prosthe
ses

Neuronal mechanisms; neural interfacing for
electric and magnetic stimulation and record
ning; neural dynamics, ion channels, second
messengers, nitric oxide, signal processing in
the retina; neural prostheses for control of
limb movement, bladder, bowel, and respira
tory function.

Transport and Metabolic Systems Engi
neering

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 (car
diac).

Biomechanical Systems

Computational musculoskeletal modeling,
bone biomechanics, soft tissue mechanics,
control of neuroprostheses for motor func
tion, neuromuscular control systems, human
locomotion, cardiac mechanics.

Cardiovascular Systems

Normal cardiac physiology, pathogenesis of
cardiac diseases, therapeutic technologies;
electrophysiological techniques, imaging tech
nologies, mathematical modeling, gene regu
lation, 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 cen
ters. Major interdisciplinary centers include
the Center for Cardiovascular Biomateri
als (CCB), the Center for Biomolecular and
Nanoscale Engineering for Targeted Therapeu
tics (BioNETT), the Neural Engineering
Center (NEC), the Center for Modeling In
tegrated Metabolic Systems (MIMS), and the
In-situ Imaging Center. The CCB includes
laboratories for biomaterials microscopy,
biopolymer and biomaterial interfaces, and
molecular simulation. The BioNETT Center
develops technologies for physical and chemi
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 me
tabolism and physiological responses of tissue
organ systems and the whole body. The Bio-
medical Imaging Laboratories, housed in the
Small Animal Imaging Center and the Radi
ology department at University Hospitals, im
age structure and function from the molecular
level to the tissue-organ level, using many mo
dalities, including ultrasound, MRI, CT, PET,
SPECT, bioluminescence, and light. Biomed-
ical Sensing Laboratories include facilities for
electrochemical sensing, chemical measure
ments in individual cells, and minimally inva
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and the Cleveland Clinic Foundation. These
provide extensive research resources in a clini
cal environment for both undergraduate and
graduate students.
EBME 201. Physiology-Biophysics I (3)

EBME 202. Physiology-Biophysics II (3)
Biological control systems. Cardiovascular, renal, respiratory, gastro-intestinal, and immune systems.

EBME 300. Dynamics of Biological Systems: A Quantitative Introduction to Biology (3)
(See BIOL 300.) Cross-listed as BIOL 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. Prereq: EBME 202. Cross-listed as EMAC 303.

EBME 306. Introduction to Biomedical Materials (3)
Applications of biomaterials in different tissue and organ systems. Relationship between physical and chemical structure of materials and biological system response. Choosing, fabricating and modifying materials for specific biomedical applications. Prereq: 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 neuropsychoses with applications to paralyzed upper and lower extremities. Prereq: Consent of instructor and senior standing.

EBME 308. Biomedical Signals and Systems (4)

EBME 309. Modeling of Biomedical Systems (3)
Mathematical modeling of biomedical systems. lumped and distributed models of electrical, mechanical, and chemical processes applied to cells, tissues, and organ systems. Prereq: EBME 308. Coreq: EBME 359.

EBME 310. Principles of Biomedical Instrumentation (3)

EBME 316. Biomaterials in Drug Delivery (3)
This course is designed to provide students with a basic understanding of the principles behind controlled-release drug delivery. Through lectures, paper reviews, in class discussions and homework assignments, students will develop an in-depth understanding of the various ways a drug can be administered to the body and how these approaches have overcome the problems associated with typical oral and intravenous administration. Various types of drug and gene delivery routes including transdermal, implantable, targeted and pulmonary will be discussed. The course will highlight the rational design of drug delivery devices based on the fundamental understanding in pharmacology, chemistry, biomaterials science and engineering. Integration of biomaterial structure and function will be emphasized throughout the course. Prereq: EBME 306.

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. Prereq: EBME 201 or equivalent.

EBME 318. Biomedical Engineering Laboratory I (1)
Experiments for measurement, assisting, replacement, control of various biomedical systems. Not available for students with credit in EBME 313. Prereq: EBME 201, EBME 202, and ENGR 210.

EBME 319. Biomedical Engineering Laboratory II (1)
Experiments for measurement, assisting, replacement, control of various biomedical systems. Not available for students with credit in EBME 314. Prereq: EBME 201, EBME 202, and ENGR 210.

EBME 320. Medical Imaging Fundamentals (3)
Physical principles of medical imaging. Imaging devices for x-ray, ultrasound, magnetic resonance, etc. Image quality descriptions. Patient risk. Prereq: EBME 201, EBME 202, EBME 308, and EBME 310 or equivalent and consent of instructor.

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 microenvironment 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. Prereq: EBME 306, BIOL 362, and CHEM 223.

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 of skin and cartilage. Prereq: ENGR 225, Cross-listed as ECHE 355.

EBME 359. Biomedical Computer Simulation Laboratory (1)

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 380. Design for Biomedical Engineers (3)
Design of a useful product with potential commercial value. This course offers a design experience that builds on the fundamentals of biomedical engineering through the effective use of teams and team design. Requirements include periodic reporting of
EBME 396. Special Topics in Undergraduate Biomedical Engineering I (1-18) (Credit as arranged.) Prereq: Consent of instructor.

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. The class is 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 is responsible for formal documentation of the design process, resulting in an executive summary and complete design history file of the project. The course culminates with a public presentation of the team's device to a panel of experts. This course is expected to provide the student with a real-world, capstone design experience. Approved SAGES capstone. Prereq: EBME 310 and consent of department.

EBME 399. Senior Project Laboratory II (3) Continuation of EBME 398. Approved SAGES capstone. Prereq: EBME 398 and consent of department.

EBME 400T. Graduate Teaching I (0) This will provide the Ph.D. candidate with experience in teaching undergraduate or graduate 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 student. Prereq: UNIV 400, BME Ph.D. student.


EBME 403. Biomedical Instrumentation (3) Analysis and design of biomedical instruments with special emphasis on transducers. Body, system, organ, tissue, cellular, molecular, and nano-level measurements. Applications to clinical problems and biomedical research.


EBME 406. Polymers in Medicine (3) Distribution of plastic implants in the body, including history and statistics; chemical and physical characteristics of biomedical polymers, including general implant requirements, reactions of the host to implants, reactions of implants to physiological conditions, physiological and biomechanical basis for soft-tissue implants; plastic materials used in medicine and surgery; frontiers in biomedical polymers (current topics directed to the design and development of new biomedical polymers). Prereq: Consent of instructor. Cross-listed as EMAC 471.

EBME 407. Applied Neural Control (3) Fundamental concepts related to electrical stimulation of the nervous system. Cable equation, currents in volume conductors, electrical models of axons, interaction between axons and electrical fields, tissue damage of electrical stimulation, electrochemistry of electrical stimulation, electrodes for electrical stimulation, applications to neuromuscular, sensory, and other physiological systems. Prereq: EBME 451 and EBME 409.

EBME 408. Tissue and Cellular Engineering (3) Tissue engineering approach for augmentation or replacement of compromised tissue function in nerve, microvessels, skin and cartilage. Integrative exploration of the use of three-dimensional polymeric scaffolds and drug delivery vehicles, and gene therapy and cellular engineering for functional repair of injured tissues. Prereq: Consent of instructor.


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. Prereq: EBME 308 and EBME 310 or equivalent.


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. Example 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. Prereq: EBME 201 or equivalent.

EBME 418. Electronics for Biomedical Engineering (3) Review of electronic circuits. Analog design for biomedical electronics. Low noise, precision amplification, shielding, grounding, interfacing, and electrical safety. Electrophysiological amplifiers and biomagnetic field measurements. Prereq: EBME 308 or consent of instructor.


EBME 426. Gene and Drug Delivery (3) Compared with traditional therapeutics, new therapeutics require comprehensive understandings of modern biology (e.g., molecular biology and genomics, etc.).
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 rehabilitation, outpatient medical and rehabilitation management and finally to community re-entry. Prereq: Consent of department.

**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.

**EBME 452. Tissue and Organ Systems Physiology (3)**

**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. Prereq: EBME 431 or PHYS 431. Cross-listed as PHYS 460.

**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. Prereq: EBME 409 or equivalent.

**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 interdisciplinary problem-based approach to investigate the application of biomedical imaging to biological and disease areas. Prereq: EBME 410 and EBME 451 or consent of instructor.

**EBME 474. Biotransport Processes (3)**

**EBME 478. Computational Neuroscience (3)**
Computer simulation 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 circuits, as well as to cable theory, passive and active compartmental modeling, numerical integration methods, models of plasticity and learning, models of brain systems, and their relationship to artificial neural networks. Term project required. Two lectures per week. Cross-listed as EECS 478.

**EBME 479. Seminar in Computational Neuroscience (3)**
Readings and discussion in the recent literature on computational neuroscience, adaptive behavior, and other current topics. Cross-listed as BIOL 479.

**EBME 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 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 conduct the educational plan to ensure that it provides an educational opportunity for the students. Prereq: EBME 400T, BME Ph.D. student.

**EBME 502. Cardiac Excitation, Rhythm, and Control (3)**

**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 dynamic aqueous 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
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. Prereq: EBME 500T, BME Ph.D. student.

**EBME 601. Research Projects (1-18)**

Prereq: Consent of instructor.

**EBME 602. Special Topics (1-18)**

This teaching experience will be conducted based upon the specific departmental needs and teaching obligations. It will be open 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 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. Prereq: Consent of instructor.

**EBME 612. BME Departmental Seminar II (0)**

Continuation of EBME Departmental Seminar I. 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 622. BME Research Rotation II (0)**

Opportunity for trainees to participate in BME research under supervision of faculty.

**EBME 651. Thesis M.S. (1-18)**

Ph.D. candidates only.

**EBME 701. Dissertation Ph.D. (1-18)**

Ph.D. candidates only.

**EBME 703. Dissertation Fellowship (1-8)**

**BACHELOR OF SCIENCE IN ENGINEERING DEGREE**

**Major in Biomedical Engineering a**

Majors in Biomedical Engineering choose a specialization sequence, with sequence-specific courses. The listing below is a generic description of requirements for a B.S. Degree in BME. Please refer to the BME website for more specific sequence information: http://bme.case.edu

**First Year Class-Lab-Credit Hours**

**Fall**

**EBME 105, Introduction to Biomedical Engineering b (3-0-3)**

**CHEM 111, Chemistry for Engineers (4-0-4)**

**MATH 121, Calculus for Science and Engineering I (4-0-4)**

**ENGR 131, Elementary Computer Programming (2-2-3)**

**FSCC 100, The Life of the Mind (4-0-4)**

**PHED 101, Physical Education (0-3-0)**

Total (17-5-18)

**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 (4-0-4)**

**USXX University Seminar c (3-0-3)**

**PHED 102, Physical Education (0-3-0)**

Total (15-3-15)

**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)**

**BME Specialty Sequence d or Science Elective (3-0-3)**

**USXX University Seminar c (3-0-3)**

**Total (16-0-16)**

**Spring**

**EBME 202, Physiology - Biophysics II (3-0-3)**

**MATH 234, Calculus for Science and Engineering III (3-0-3)**

**ENGR 210, Intro to Dynamic Systems (3-3-4)**

**BME Specialty Sequence d or Science Elective e (3-0-3)**

**H/SS (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 f (2-0-2)**

**ENGR 398 Professional Communication for Engineers f (1-0-1)**

**EBME 308, Biomedical Systems & Signals (3-3-4)**

**ENGR 225, Intro to Circuits & Instrumentation (3-3-4)**

**BME Specialty Sequence d or Science Elective e (3-0-3)**

**H/SS (3-0-3)**

**Total (13-6-15)**

**Spring**

**EBME 319, Biomedical Engineering Lab II (0-3-1)**

**MATH 323, Mechanics and Materials (3-3-4)**

**ENGR 360, BME Instrumentation Lab (0-3-1)**

**ENGR 200, Mechanics and Materials (3-0-3)**

**H/SS (3-0-3)**

**BME Specialty Sequence d (3-0-3)**

**BME Specialty Sequence d (3-0-3)**

**Total (15-6-17)**

**Fourth Year**

**Fall**

**EBME 398, Senior Project g (0-9-3)**
or Open elective (3-0-3)
EBME 370, Principles of Biomedical Engineering Design (2-0-2)
BME Specialty Sequence d (3-0-3)
BME Specialty Sequence d (3-0-3)
Statistics h (3-0-3)
H/SS (3-0-3)
Total (14-9-17) or (17-0-17)

Spring
EBME 309, Modeling of Biomedical Systems (3-0-3)
EBME 359, BME Computer Simulation Lab (0-3-1)
EBME 380, Design in BME g (1-6-3)
or Open Elective (3-0-3)
BME Specialty Sequence c (3-0-3)
BME Specialty Sequence c (3-0-3)
H/SS (3-0-3)
Total (13-9-16) or (15-3-16)

a This is a typical program. Specialty sequences are designed with courses in a desired order that might vary from the one here. Programs must be planned with a faculty adviser 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 Students must take either EBME 398 (Fall) or EBME 380 (Spring)
h 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
116 A.W. Smith Building (7217)
Phone 216-368-4182; Fax 216-368-3016
Peter N. Pintauro, Chair
e-mail: pnp3@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, and 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 chemical engineering. Breadth 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 eight biochemistry, biology, and bioengineering courses into the normal chemical engineering curriculum. In addition, for students with a strong interest in polymer 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 fifteen full-time faculty members, all of whom are pursuing active research programs. The research of the faculty is aimed at advanced and cutting-edge areas of chemical engineering.

FACULTY
Peter N. Pintauro, Ph.D.
(University of California, Los Angeles)
Kent Hale Smith Professor of Engineering and

Department Chair
Electrochemical engineering, membrane fabrication, membrane transport modeling, organic electrochemical synthesis, fuel cells
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)
Assistant Professor
Transport Phenomena in Biology and Medicine
Robert V. Edwards, Ph.D.
(Johns Hopkins University)
Professor
Laser anemometry, mathematical modeling, data acquisition
Donald L. Feke, Ph.D.
(Princeton University)
Professor of Chemical Engineering and Vice Provost for Undergraduate Education
Colloidal phenomena, dispersive mixing, fine particle processing
Robert E. Harris, Ph.D. (Northeastern University), M.B.A.
(Case Western Reserve University)
Adjunct Professor of Engineering
Process design, process synthesis, analysis, design and simulation
Daniel Lack, 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-Chiu Liu, Ph.D.
(Case Institute of Technology)
Wallace R. Persons Professor of Sensor Technology & 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, biomemetics,
molecular electronics
Heidi B. Martin, Ph.D.
(Case Western Reserve University)
Nord Assistant Professor of Engineering
Conductive Diamond Films; Electrochemical Sensors; Chemical Modification of Surfaces for Electrochemical and Biomedical Applications; Biomaterials; Micofabrication of Sensors and Devices
Syed Quutubuddin, 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)
John C. Angus Legacy Assistant Professor of Engineering
Microplasmas, nanoparticle synthesis
Robert F. Savinell, Ph.D.
(University of Pittsburgh)
George S. Dively Professor and Dean of Engineering
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:
1) are broadly educated in the fundamentals of mathematics, science, and engineering principles, with particular emphasis on those that apply to chemical engineering practice.
2) are able to apply their expertise alone or in a team setting to identify and solve chemical engineering problems, design chemical engineering processes, and conduct and analyze experiments, using the most up-to-date engineering tools and techniques.
3) are able to work effectively with others, communicate effectively within their discipline and in interdisciplinary situations, and assume a leadership role in their profession.
4) are capable of carrying out their work in a professional and ethical manner, are aware of contemporary issues and how their professional activities might impact such issues, and understand the impact of their work in a global and societal context.
5) are able to function in an engineering profession that is continually evolving and understand the need for life-long learning.
Program Outcomes
In preparation for meeting the above program objectives, the graduates of the Department of Chemical Engineering are expected to have:
(i) A strong background in the fundamentals of chemistry, physics, mathematics, and statistics.
(ii) A broad education in chemical engineering fundamentals, including mass and energy balances, separation processes, reaction engineering, thermodynamics, transport processes, and control.
(iii) Training in computers as tools of the profession, including experience with spreadsheets, simulators, computer-aided design software, and mathematical/statistics packages.
(iv) Comprehensive design experiences involving problem definition, literature searching, synthesis, economics, communications, teamwork, project management, equipment choice, and safety.
(v) Laboratories that include hands-on experience with equipment, design of experiments, data/statistical analysis, and reinforcement of fundamental physical concepts.
(vi) Courses in which the technological needs of industry, government, and society are considered.
(vii) A sufficiently broad education to understand the impact of engineering on society.
(viii) Multiple and integrated opportunities to develop written and oral communication skills.
(ix) Knowledge in a specialty elective area, such as biomedical engineering, biochemical engineering, computing, electrochemical engineering, environmental engineering, management, polymer science, or research.
(x) Leadership roles in group-based course activities encouraging a “can-do” positive attitude and developing skills in teamwork.
(xi) A commitment to excellence and integrity.
(xii) An emphasis on safety and ethical issues, and the environmental consequences of the practice of chemical engineering.
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 bio-organisms to bring-forth biotransformation. Biochemical engineering applications are versatile, ranging from waste-water treatment to production of therapeutic proteins. For students with an interest in biochemical engineering, but who want to major in chemical engineering, an eight course sequence (26-27
Two Science Electives (7 credit hours):
BIOI 300: Dynamics of Biological Systems (3)
BIOI 303: Principles of Chemical Biology (4)
Four Breath Electives (13 credit hours):
BIOC 307: General Biochemistry (4)
BIOC 343: Microbiology (3)
ECHE 340: Biochemical Engineering (3)
BIOC 301 Biotechnology Lab: Genes and Genetic Engineering (3)

Two Advanced BioElectives (6-7 credit hours) to replace the Materials Elective CHEM 336, to be selected from:
BIOC 308 Genes and Genetic Engineering (3)
BIOC 334 Proteins and Enzymes (4)
BIOC 382 Drugs, Brain and Behavior (3)
EVHS 401B & EVHS 402B Biochemical Toxicology (3)

Minor in Polymer Engineering
For students wanting to pursue an interest in polymers, but major in chemical engineering, two five-course minor sequences, Polymer Processing and Characterization, and Polymer Production are available.

Polymer Processing and Characterization
EMAC 270, Introduction to Polymer Science (F, Sp)
EMAC 376, Polymer Engineering (F, Sp)
EMAC 377, Polymer Processing (F)
EMAC 372, Polymer Processing and Testing Laboratory (Sp)
EMAC 375, Polymer Rheology
Polymer Production
EMAC 270, Introduction to Polymer Science (F, Sp)
EMAC 272, Polymer Analysis Laboratory (Sp)
EMAC 276, Polymer Properties and Design (Sp)
EMAC 378, Polymer Production and Technology (Sp)
EMAC 398, Polymer Science and Engineering Project (F, Sp)

Minor Sequence in Chemical Engineering
A minor sequence in chemical engineering is available for students majoring in engineering, chemistry, or physics.

A minimum of 15 credits must be completed, and must include:
ECHE 260 Introduction to Chemical Systems
ENGR 225 Thermodynamics, Fluid Mechanics, Heat and Mass Transfer (F,Sp)
ECHE 360 Transport Phenomena (F)
and any two of the following:
ECHE 361 Separation Processes (Sp)
ECHE 363 Thermodynamics of Chemical Systems (Sp)
ECHE 364 Chemical Reaction Processes (Sp)

ECHE 365 Measurements Laboratory (Sp)
ECHE 367 Process Control (F)

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 our undergraduate 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 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 13 courses (37 credit hours) is typical for the Ph.D. degree. The minimum course requirements are as follows:

Depth Courses
All programs of study must include ECHE 401, Chemical Engineering Communications (1), ECHE 460, Thermodynamics (3), ECHE 461, Transport Phenomena (3), ECHE 462, Chemical Reaction Engineering (3), and ECHE 475, Chemical Engineering Analysis (3) plus a minimum of three other chemical engineering courses.

Breadth and Basic Science Courses
A minimum of four courses outside the department must be taken. These can be chosen from other engineering departments and the departments of mathematics, chemistry, physics, biology, and geological sciences. A minimum of two elective courses must be in mathematics.

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 attach a statement to the Planned Program of Study justifying the departure from the guidelines. It should be noted that the above guidelines are a minimum requirement. It is expected that the elective courses will form a coherent whole with a concentration in one area, e.g., systems, polymers, surface science, etc., rather than a smattering of introductory courses in many diverse subjects. 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 (Independent) 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. A thesis proposal and an independently generated proposal are also required. All Ph.D. students must satisfy the residency requirements of the university and the Case School of Engineering. Some teaching is also required. 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:

- Electrochemical Engineering
- Fuel cell technology
- Membrane synthesis and modeling
- Bipolar discrete electrodes
- Microelectronic materials, fabrication and processing
- Solid-state electrochemical and biomedical sensors
- Modeling of electrochemical systems, batteries and fuel cells
- Microfabrication by electrodeposition
- Electrodeposition of semiconductors and alloys
- Diamond electrodes
- Corrosion protection
- Biochemical Engineering
- Biotransport
- Design of microvascular flow analogs
- Predictive methods for cancer metastasis potential
- Sensors for neurologically active molecules
- Biotelemetric micro systems
- Advanced Materials Processing
- Combustion and plasma synthesis of thin films
- Low pressure synthesis of diamond
- Synthesis of bulk gallium nitride
- Aerosol synthesis
- Fine particle processing strategies
- Colloidal route to nanoparticles
- Monolayers and ultrathin films
- Computation of phase diagrams
- Langmuir Blodgett multilayers
- Polymeric surfactants and polymer-substrate interactions
- Polymer nanocomposites
- Molecular simulations
- Statistical mechanics of materials
- Process Engineering
- Separations using acoustic fields
- Process monitoring
- Separation using microemulsions
- Carbon dioxide sequestration
- Process intensification using centrifugal fields
- Spreading phenomena
- Rheology of emulsions and coatings, microemulsions and micelles
- Membrane separations

FACILITIES
The department is housed in the Albert W. Smith Building on the Case Quadangle. Professor Smith was chair of industrial chemistry at Case from 1911 to 1927. Under his leadership a separate course of study in chemical engineering was introduced at Case in 1913. Professor Smith was also a close associate of Herbert Dow, the Case alumnus who founded Dow Chemical in 1890 with the help and support of Professor Smith. The Albert W. Smith Chemical Engineering Building contains two classrooms, one designed for computer and television instruction; the undergraduate Unit Operations Laboratory; an undergraduate computer lounge; a high bay area for process-related research; and the normal complement of offices and research laboratories. The department has unusually strong facilities for electrochemical and fuel cell research, for microfabrication, and for chemical vapor deposition and thin film synthesis. In addition, a full range of biochemical, analytical and materials characterization instrumentation is available in the Case School of Engineering. Analytical instrumentation is available within the Department of Chemical Engineering, the Department of Chemistry, and the Materials Research Laboratory.

CHEMICAL ENGINEERING (ECHE)

Undergraduate Courses
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 London, 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.) Prereq: 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. Prereq: BIOC 307, BIOL 343 and ECHE 364, or permission of instructor.

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 of skin and cartilage. Prereq: ENGR 225. Cross-listed as EBME 350.

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. Prereq: 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. Prereq: 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. Prereq: ECHE 360, ECHE 361, ECHE 363, and ECHE 364.

ECHE 362L. Chemical Engineering Laboratory in London (4)
A version of ECHE 362 taught during the summer at University College of London. Prereq: ECHE 360, ECHE 361, ECHE 363, and ECHE 364.

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. Prereq: ECHE 260 and ENGR 225 or consent of instructor. Coreq: 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. Extracion 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. Prereq: ECHE 360.

ECHE 366. 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. Prereq: MATH 224 and ECHE 260 or permission of instructor.

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. Prereq: MATH 224 and ECHE 260 or permission of instructor.

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. Prereq: ECHE 260 or permission of instructor. Cross-listed as ECHE 480.

ECHE 383. Chemical Engineering Applied to Microfabrication and Devices (3)
Silicon based microfabrication and micromachining requiring 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 will be introduced. Oxidation processing, chemical vapor deposition, etching and patterning techniques, electroplating and other technologies will be discussed.

ECHE 385. Membrane Separation Processes (3)
A review and analysis of different membrane separation processes (reverse osmosis, ultrafiltration, pervaporation, electrodialysis, gas separations, facilitated transport, and emulsion liquid membranes). For each membrane separation scheme, the following topics will be addressed: (I) the underlying principles of operation, (II) choice of membrane materials and membrane modules, (III) process design considerations, (IV) applications, (V) cost estimates, (VI) membrane separations experiments, and (VII) membrane transport theories. Prereq: ECHE 360 or equivalent or permission of instructor.

ECHE 386. Research Frontiers in Chemical Engineering (3)
This course will provide students with an opportunity to learn about current research areas in chemical engineering, and the process of conducting research. Possible research areas to discuss include electrochemical engineering, advanced materials, bioengineering, and colloids and surface science. Example topics within these fields include fuel cells, batteries, sensors, tissue engineering, nanoparticles and nanocomposites, diamond and other semiconductor materials, and novel separation and chemical synthesis methods.

ECHE 397. Special Topics in Chemical Engineering (3)
Five-year B.S./M.S. students use this course for theses research.

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. Approved SAGES Capstone. Prereq: ECHE 398.

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. Prereq: Entering Ph.D. student in Chemical Engineering.

ECHE 401. Chemical Engineering Communications (1)
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 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. Prereq: 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, flow phenomena, capillarity, the surface of solids, relation of bulk to surface properties of materials, non-catalytic surface reactions. Prereq: CHEM 335 or equivalent.

ECHE 466. Colloid Science (3)

ECHE 467. Statistical Theories of Materials (3)
The classic ensembles of statistical thermodynamics will be developed and used to compute molecular properties, properties of fluids, liquids and solids. Molecular dynamics for computing properties will be explained and illustrated. Monte Carlo techniques will be discussed. An introduction to the theory of transport coefficients will be given. Applications will include interfacial systems, polymer systems and electrochemical systems.

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 474. Biotransport Processes (3)
(See EBME 474). Cross-listed as EBME 474.

ECHE 475. Chemical Engineering Analysis (3)

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. Prereq: ECHE 260 or permission of instructor. Cross-listed as ECHE 381.

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. Prereq: ECHE 363 and ECHE 371.

ECHE 495. Membrane Separation Processes (3)
(See ECHE 395.) Prereq: 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. Prereq: Ph.D. student in Chemical Engineering.

ECHE 560. Advanced Chemical Thermodynamics (3)
Chemical and phase equilibria in complex, multiphase systems. Review of relevant theory. Sources of thermochemical data, methods of calculation and applications to phase diagrams, materials synthesis, electrochemistry, corrosion, water chemistry, silicon processing, chemical vapor deposition. Prereq: ECHE 460 or equivalent.

ECHE 561. Advanced Transport Phenomena (3)
(Extension of ECHE 461.) In-depth examination of methods of solving transport problems. Emphasis on coupled systems where two or more transport processes interact. Prereq: ECHE 461.

ECHE 575. Advanced Chemical Engineering Analysis (3)
Advanced analytical techniques for exact and approximate engineering analysis. Scale analysis and recursion techniques; asymptotic analysis of ordinary differential equations (regular and singular perturbations, WKB theory); approximation of integrals; methods of characteristics, shocks; application to heat, mass and momentum transfer. Prereq: ECHE 475.

ECHE 600T. Graduate Teaching III (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. Prereq: Ph.D. student in Chemical Engineering.

ECHE 601. Independent Study (1-18)
ECHE 651. Thesis M.S. (1-18)
ECHE 660. Special Problems (1-18)
Research course taken by Plan B M.S. students.

ECHE 701. Dissertation Ph.D. (1-18)
ECHE 703. Dissertation Fellowship (1-8)
ECHE C100. Co-op Seminar I for Chemical Engineering (1)
Professional development activities for students returning from cooperative education assignments. Prereq: COOP 001.

ECHE C200. Co-op Seminar II for Chemical Engineering (2)
Professional development activities for students returning from cooperative education assignments. Prereq: COOP 002 and ECHE C100.

Graduate Courses
BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Chemical Engineering

First Year Class-Lab-Credit Hours

Fall
PHYS 121 General Physics I Mechanics (4-3-4)
CHEM 111 Principles of Chemistry I (4-0-4)
MATH 121 Calculus for Science and Engineering I (4-0-4)
USFS 100 University First Seminar (3-1-4)
PHED 101 Physical Education Activities (0-3-0)
Total (15-7-16)

Second Year
Fall
CHEM 223/323 Organic Chemistry (3-0-3)
MATH 223 Calculus for Science & Engineering III (3-0-3)
ENGR 210 Circuits & Instrumentation (2-2-4)
PHED 102 Physical Education Activities (0-3-0)
Total (17-8-18)

Third Year Class-Lab-Credit Hours

Fall
ECHE 361 Separation Processes (3-0-3)
ECHE 365 SAGES Departmental Seminar - Measurements Laboratory (0-3-3)
ENGL 398N Professional Communication (3-0-3)
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)
Humanities/Social Science Elective II (3-0-3)
Total (12-4-16)

Spring
ECHE 365 SAGES Departmental Seminar - Fall (3-0-3)
ECHE 361 Separation Processes (3-0-3)
Humanities/Social Science Sequence III (3-0-3)
Total (18-0-18)

Hours required for graduation: 131–133

(appending breadth elective sequence)

a. Selected students may be invited to take
PHYS 125, 126 General Physics I, II Honors in place of PHYS 121,122.

b. Science Electives I and II. Students must take any two of the following courses—
PHYS 221 General Physics III. Modern (F, Sp), CHEM 224/324 Organic Chemistry II (Sp), BIOL 205 Chemical Biology (Sp)
c. One materials elective is required. Suggested courses include:
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; or course approved by the chemical engineering faculty.
d. A three course (9 credit hours minimum) breadth sequence (approved by the Chemical Engineering faculty). Preapproved sequences include biochemical engineering, biomedical engineering, computing, electrochemical engineering, electronic materials processing, environmental engineering, management/entrepreneurship, polymer science, systems and control, research, and advanced study (B.S./M.S.).
e. Register for the specific Chemical Engineering section

f. Must take one course each from: USST –Thinking about the symbolic world, 
USNA –Thinking about the natural world, and USSO – Thinking about the social world. Specific seminar topics will change periodically.

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)
EBME 201, Physiology-Biophysics I (3)
Fall, third year
EBME 202, Physiology-Biophysics II (3)
Spring, third year
EBME 309, Modeling of Biomedical Systems (3)
or
EBME 310, Biomedical Instrumentation (3) Spring, fourth year
Comuting (Advisor: Dr. Edwards)
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)
Fall, fourth year
Electrochemical Engineering
(Advisor: Dr. Landau)
ECHE 380 Electrochemical Technology (3)
Fall, third year or
ECHE 381 Electrochemical Engineering (3)
Spring, third year
ECHE 383 Chemical Engineering Applied to Microfabrication and Devices (3) Fall, fourth year
plus one additional course selected from:
EMSE 314 Electronic, Magnetic, and Optical Properties of Materials (F) Fall, fourth year
EECS 309 Electromagnetic Fields I (3) Fall, Spring
EECS 321 Semiconductor Electronic Devices (4) Spring, fourth year
EMSE 411, Environmental Effects on Materials Behavior (3) Spring, fourth year
Electronic Materials (Advisor: Dr. Liu)
ECHE 383 Chemical Engineering Applied to Microfabrication and Devices (3) Fall, third year
EECS 309 Electromagnetic Fields I (3) Fall, Spring
Plus one additional course selected from:
EMSE 314 Electronic, Magnetic, and Optical Properties of Materials (F) Fall, fourth year
EECS 321 Semiconductor Electronic Devices (4) Spring, third year
Environmental Engineering (Advisor: Dr. Pintauro)
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)
Spring, third year
BIOL 350 Introduction to Ecosystems Analysis and Environmental Science (3), Fall, fourth year
Management Entrepreneurship (Advisor: Dr. Harris)
ACCT 303/403, Survey of Accounting (3)
Fall, third year
BAPI 353, Corporation Finance (3)
g. Research Elective. Students should take a 300-level undergraduate or introductory graduate course that would be benefit their research project and is approved by the department.

DEPARTMENT OF CIVIL ENGINEERING
Bingham Building (7201)
Phone 216-368-2950; Fax 216-368-5229
Robert L. Mullen, Chair
rlm@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, subsurface and ex situ remediation, colloid behavior in environmental systems, and contaminated sediment dynamics.

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 College 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.

FACULTY

Robert L. Mullen, Ph.D.
(Northwestern University), P.E.

Frank H. Neff Professor and Chair
Computational mechanics; finite elements; boundary elements.

Roberto Ballarini, Ph.D.
(Northwestern University)
Lenord Case Junior Professor
Mechanics of solids, including civil engineering materials, advanced composites, microelectromechanical systems, mollusks, and bone. Mechanics education.

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.

Vassilis P. Panoskaltsis, Ph.D.
(University of California, Berkeley)
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.

Karen L. Skubal, Ph.D.
(University of Michigan)
Assistant Professor
Bioremediation of recalcitrant organic pollutants in soils and aquifers; environmental microbiology.

Xiangwu Zeng, Ph.D.
(Cambridge University)
Professor
Geotechnical earthquake engineering; centrifuge modeling; foundation vibration.

Secondary Faculty
Xiong (Bill) Yu, Ph.D.
(Purdue University), P.E
Assistant Professor
Geotechnical Engineering; Infrastructure; Construction Material Testing; Information Technology.

ADJUNCT FACULTY
Cynthia Collyard, Adjunct Instructor
Philip DeSantis, Adjunct Professor
Dan Ghiocel, Adjunct Professor
Samuel S. Jayanayagam, Adjunct Professor
Kenneth L. Klika, Adjunct Professor
Winston Perera, Adjunct Professor
Mark D. Rotoff, Adjunct Assistant Professor
Randall H. Rudderman, 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.

EDUCATIONAL OBJECTIVES
Mastery of Fundamentals:

• Graduates will master the fundamentals of mathematics and the sciences that form the basis for engineering.
• Graduates will have a thorough knowledge of the technical requirements for the practice of the profession of civil engineering and be prepared for advanced scholarship.
• Creativity:
• Graduates will be proficient in state of the art analytical and computational techniques for the modeling, analysis and design of civil engineering systems.
• Graduates will be aware of the critical role that innovation has played, and will continue to play, in the profession of civil engineering.
• Societal Awareness:
• Graduates will have an understanding of the legal, social economic and environmental constraints within which the civil engineering profession must function.
• Graduates will be aware of the special role the profession of civil engineering plays in the protection of public health, safety and welfare.
• Leadership Skills:
• Graduates will be aware of the legal, moral and ethical standards expected of leaders in the profession of civil engineering.
• Graduates will be able to function effectively and lead professional teams as well as work independently.
• Graduates will develop their written and oral communication skills, including the use of modern electronic tools such as presentation software, the World Wide Web, and e-mail.
• Professionalism:
• Graduates will be aware of the moral, ethical and technical standards expected of the practitioners in the profession of civil engineering.
• Graduates will be prepared for and aware of the necessity for a lifetime of learning and continued professional growth including professional registration.

Samples Of Courses From Which Elective Sequences May Be Chosen
The approved electives constitute a sequence of four courses in one of the major areas of civil engineering. They are chosen by the student to coincide with his or her interests.

Structural Engineering
ECIV 321, Structural Analysis II (3)
ECIV 323, Structural Design II (3)
ECIV 405, Solid Mechanics I (3)
ECIV 406, Constitutive Modeling Theories (3)
ECIV 411, Applied Elasticity (3)
ECIV 415, Structural Modeling and Experimental Methods (3)
ECIV 420, Finite Element Analysis (3)
ECIV 421, Advanced Reinforced Concrete Design (3)
ECIV 422, Advanced Structural Steel Design (3)
ECIV 423, Prestressed Concrete Design (3)
ECIV 424, Structural Dynamics (3)
ECIV 430, Foundation Engineering (3)

Geotechnical Engineering
ECIV 323, Structural Design II (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)
ECIV 431, Special Topics in Geotechnical Engineering (3)
ECIV 433, Soil Dynamics (3)
GEOL 110, 119, Physical Geology (3), Lab (1)
GEOL 330, Geophysical Field Methods (4)

Engineering Mechanics
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)
ECIV 433, Soil Dynamics (3)
EMAE 372, Relation of Materials to Design (3)

Environmental Engineering
ECIV 361, Water Resources Engineering (3)
ECIV 362, Solid and Hazardous Waste Management (3)
ECIV 450, Environmental Engineering Chemistry (3)
ECIV 460, Environmental Remediation (3)
GEOL 220, Environmental Geology (3)
GEOL 321, Hydrogeology (3)

Construction Engineering & Management
Two of the four elective courses must be from within civil engineering.
ACCT 303, Survey of Accounting (3)
BAFI 355, Corporation Finance (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)
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, BAFI 355, BLAW 329, ECON 361, LHRP 251, LHRP 311.
MINOR IN ENVIRONMENTAL 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.

GRADUATE PROGRAM IN 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 microstructural 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. A controlled climate room is in regular use.

**The Asphalt Concrete Laboratory**
This laboratory is properly equipped to prepare and test (following ASTM standard specifications) both cylindrical and beam asphalt concrete specimens. Engineering and material properties of asphalt concrete specimens, such as Marshall stability, resilient modulus, Poisson’s ratio, fracture toughness, and fatigue characteristics, among others, can be determined in a controlled temperature environment between 20o F and 100o F.

**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/YP 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
- Modeling of concrete, of geomaterials and of asphalt concrete
- Constitutive theories and numerical implementation; plasticity, viscoplasticity, viscoelasticity and damage mechanics
- Finite deformation viscoelasticity and numerical implementation; application to rubber materials
- High and low-cycle fatigue
- Fracture mechanics of steel, concrete, and ceramics
- Plasticity of metal matrix composites
- Structural mechanics of implants
- Geotechnical/Pavement Materials
- Static behavior of anisotropic clays and sands
- Soil liquefaction
- Fracture of over consolidated clay
• Bifurcation and shear banding in soils
• Centrifuge modeling of static and dynamic soil behavior
• Dynamic soil structure interaction
• Non-destructive testing evaluation of soils and pavement materials
• Micromechanical behavior of asphalt concrete under fatigue loading
• Measurement of dynamic soil properties
• Design of Structures for High-Speed Velocities
• Stability of tailings dams
• Environmental Engineering
• Environmentally conscious manufacturing
• Remediation of “old” metal-contaminated soils
• Ex-situ ”heap” remediation
• Brownfields/structural remediation
• Environmental modeling/software development
• Environmental decision analysis
• Geoenvironmental engineering
• Preferential pathway flow development
• Environmental fluid mechanics
• Sediment remediation
• Contaminated sediment dynamics
• Colloid-facilitated contaminant transport in porous media
• In-situ remediation of non-aqueous phase liquids
• Influence of remediation techniques on hydraulic conductivity in clay soils
• Forces at clay-water-contaminant interfaces
• Environmental microbiology
• Bioremediation

CIVIL ENGINEERING (ECIV)

Undergraduate Courses

ECIV 160. Surveying and Computer Graphics (3)
Principles and practice of surveying; error analysis, topographic mapping, introduction to photogrammetry and GIS; CAD. 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. Prereq: Consent of the instructor and department.

ECIV 310. Strength of Materials (3)

ECIV 320. Structural Analysis I (3)

ECIV 321. Structural Analysis II (3)
Stiffness and flexibility formulations for plane frames, grids, and space frame with classical and matrix methods. Introduction to nonlinear analysis and stability. Structural behavior of arches, cable networks, and other structural systems. Prereq: ECIV 320.

ECIV 322. Structural Design I (3)

ECIV 323. Structural Design II (3)
Continuation of ECIV 322. Torsion of concrete members, reinforcing steel details, compression reinforced flexural members, two-way slabs, slender columns, torsion of steel members, lateral and local buckling of steel members, plate girders, prestressed concrete design and wood design. Design laboratory. Prereq: ECIV 320 and ECIV 322.

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, embankments, retaining walls, and footings. Standard laboratory tests performed for the determination of the physical and mechanical properties of soils. Laboratory. Prereq: 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. Prereq: 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. Coreq: ENGR 225.

ECIV 360. Civil Engineering Systems (3)

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. Prereq: ECIV 351.

ECIV 362. Solid and Hazardous Waste Management (3)

ECIV 368. Environmental Engineering (3)
Principle and practice of environmental engineering. Water and waste water 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. Prereq: 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. Prereq: Consent of instructor.

ECIV 397. Civil Engineering Topics II (3)
Special topics in civil engineering in which a regular course is not available. Conferences and report. Prereq: Consent of instructor.

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. Approved SAGES capstone.

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 chairperson. 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 405. Solid Mechanics I (3)

ECIV 406. Constitutive Modeling Theories (3)

ECIV 411. Applied Elasticity (3)

ECIV 420. Finite Element Analysis (3)

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. Prereq: 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. Prereq: ECIV 322.

ECIV 423. Prestressed Concrete Design (3)
Design of prestressed concrete structures, mechanical behavior of concrete suitable for prestressing and prestressing steels, load balancing, partial prestressing, prestressing losses, continuous beams, prestressed slab design, columns. Prereq: 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. Prereq: 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. Prereq: ECIV 424.

ECIV 426. Structural Reliability (3)

ECIV 430. Foundation Engineering (3)

ECIV 431. Special Topics in Geotechnical Engineering (3)
Static and dynamic horizontal loading of piles; dynamics of pile driving; behavior of a group of piles including yielding. Soil-foundation-structure interaction due to static loading. Slope stability analysis using circular and non-circular failure surfaces. Use of available computer programs in analysis and design. Prereq: ECIV 430.

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. Prereq: ECIV 330 and consent of instructor.

ECIV 433. Soil Dynamics (3)

ECIV 435. Rock Mechanics and Design (3)
Physical properties and classification of intact rock and rock masses, rock exploration, engineering properties of rock, stresses in rock near underground openings. Rock tunneling, rock slope stability, bolting, blasting, grouting and rock foundation design. Prereq: ECIV 330.

ECIV 437. Pavement Analysis and Design (3)
Analysis and design of rigid and flexible airfield and highway pavements. Pavement evaluation and rehabilitation, overlay design. Prereq: ECIV 330.

ECIV 450. Environmental Engineering Chemistry (3)
Fundamentals of inorganic, organic, and physical chemistry with emphasis on the types of problems encountered in the environmental engineering field. Equilibria among liquid, gaseous, and solid phases; kinetics to the extent that time permits. A strong mathematical approach is taken in solving the equilibrium and kinetic problems presented. Equilibrium speciation software for solution of more complex problems. Topics that will be covered in the course include chemical equilibrium, acid/base reactions, mathematical problem solving approach, graphical approaches, titration curves, solubility of gases and solids, buffering systems, numerical solution of equilibrium problems, thermodynamics, oxidation-reduction reactions, principles of quantitative chemistry and analytical techniques, introduction to the use of analytical instrumentations, and chemical kinetics. Prereq: ECIV 368 or consent of instructor.

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. Prereq: Consent of instructor.

**ECIV 453. Infrastructure Rehabilitation Design (4)**
Rehabilitation materials and systems; mechanical, 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. Prereq: Consent of instructor.

**ECIV 454. Modeling Infrastructure Systems (4)**
Examination of the properties that distinguish infrastructure performance models from more traditional engineering analysis models. Infrastructure software implementation strategies. Application of existing models to problems such as water distribution systems, mass transport, pavement management, and brownfield redevelopment. Development of new models to address infrastructure performance and sustainability. Prereq: Consent of instructor.

**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 integrated 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. Prereq: ECIV 368 or consent of instructor.

**ECIV 464. Environmental Engineering Microbiology (3)**
This course presents an introduction to microbiology and microbial processes in natural and engineered environmental systems. Topics include redox chemistry and the stoichiometry of microbial reactions, biogeochemical cycling of nutrients and elements, microbial classification, cell metabolism, enzyme and growth kinetics, microbial ecology and diversity, biodegradation of environmental pollutants, and methods and applications in microbial ecology and environmental bioremediation.

**ECIV 500T. Graduate Teaching II (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 chairperson. 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 Elasticity (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. Prereq: ECIV 405 or consent of instructor.

**ECIV 510. Computational Mechanics (3)**

**ECIV 520. Random Processes in Engineering (3)**
Random vectors and second moment theory. Time and frequency domain characterization of random processes and fields. Poisson and Markov processes. Random vibration. The first passage problem. Digital simulation of random processes and analysis of time series. Applications focus on stochastic models for phenomena such as earthquakes, wind turbulence, ocean waves, traffic flow, and others related to civil engineering. Prereq: 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. Prereq: ECIV 405 or ECIV 411, ECIV 520 or consent of instructor.

**ECIV 560. Environmental Engineering Modeling (3)**

**ECIV 561. Groundwater Analysis (3)**
Principles of mass transport through porous media, formulation of saturated and unsaturated flow equations in alternative coordinate systems, analytical and numerical solutions of flow equations, application of existing groundwater software, analysis of solute transport problems.

**ECIV 584. Theory of Plasticity and Damage Mechanics (3)**

**ECIV 585. Fracture Mechanics (3)**
Crack tip fields, stress intensity factors, singular solutions, energy changes with crack growth, cohesive zone models, fracture toughness, small scale yielding, experimental techniques, fracture criteria, J-integral, R-curve, fatigue cracks, fracture of composites, dynamic fracture. Prereq: ECIV 405, ECIV 411 and consent of instructor.

**ECIV 587. Advanced Mechanics Seminar (3)**
Advanced topics in mechanics of solids. Thermo-dynamics with internal variables; thermoelasticity; plasticity; gradient theories; finite theories of plasticity; damage mechanics; endochronic plasticity; non-linear fracture mechanics; probabilistic mechanics. Prereq: 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. 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 student’s dissertation advisor and the department chairperson. As-
signments 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 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 infrastructure engineering principles to a complex infrastructure 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)

ECIV 703. Dissertation Fellowship (1-8)

Graduate Courses

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Civil Engineering

Freshman Year (Class-Lab-Credit Hours)

Fall
Open Elective (3-0-3)
CHEM 111 Principles of Chemistry for Engineers (4-0-4)
ENGR 131 Elementary Computer Programming (2-3-3)
SAGS 100 SAGES First Seminar (4-0-4)
MATH 121 Calculus for Science and Engineering I (4-0-4)
PHED 101 Physical Education Activities (0-3-0) Total (17-5-18)

Spring
SAGS University Seminar I (3-0-3)
ENGR 145 Chemistry of Materials (4-0-4)
MATH 122 Calculus for Science and Engineering II (4-0-4)
PHED 102 Physical Education Activities (0-3-0)
PHYS 121 General Physics I. Mechanics (4-0-4) Total (23-3-15)

Sophomore Year

Fall
SAGS University Seminar II (3-0-3)
ECIV 160 Surveying and Computer Graphics 2-3-3)

ECIV 211 Civil Engineering Materials (1-3-3)
ECIV 360 Civil Engineering Systems (3-2-3)

Junior Year

Fall
Humanities or Social Science (3-0-3)
ECIV 211 Civil Engineering Materials (1-3-3)
ECIV 320 Structural Analysis I (3-0-3)
ENGR 398N Professional Communications for Engineers (3-0-3)
ENGR 210 Introduction to Circuits and Instrumentation (3-2-4)
MATH 224 Elementary Differential Equations (3-0-3) Total (15-2-16)

Spring
ECIV 322 Structural Design I (2-2-3)
ECIV 330 Soil Mechanics (3-2-4)
ECIV 351 Engineering Hydraulics and Hydrology (3-0-3)
ECIV 368 Environmental Engineering (2-2-3)
Approved Elective (3-0-3)b Total (13-6-16)

Senior Year

Fall
Humanities or Social Science (3-0-3)
ECIV 340 Construction Management (3-0-3)
ECIV 398 Civil Engineering Senior Project (0-6-3)
Approved Elective (3-0-3)b Approved Elective (3-0-3)b 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 (3-0-3)b 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

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 (i.e.: high-tech surrounds us), profoundly impacting medicine, arts, sciences, business, law, social behavior, etc. EECS drives intellectual property generation. EECS drives wealth generation. Many other industries build on EECS. For example, healthcare builds on EECS technology at a pace that is consistently increasing (e.g., medical informatics, bioinformatics, systems 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 synergetic 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...
EDUCATIONAL PHILOSOPHY
The EECS department is dedicated to developing high-quality graduates who will take positions of leadership as their careers advance. 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 and
- 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.

DEPARTMENT STRUCTURE
EECS at Case is organized internally into two informal divisions: (i) Computer Science; and (ii) Electrical and Computer Engineering. The Associate Chair of Computer Science (CS) is Professor Gultekin Ozsoyoglu. The Associate Chair of Electrical and Computer Engineering is Professor Frank Merat.

FACULTY

Electrical and Computer Engineering Division
Michael S. Branicky, Sc.D.
(Massachusetts Institute of Technology)
Associate 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
Gaming and Simulation, Virtual Reality, Digital signal Processing, wavelets, joint time frequency analysis

M. Cenk Cavusoglu
(University of California, Berkeley)
Assistant 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.
(Case Western Reserve University)
Associate Professor
Mixed-signal integrated circuit design, microelectromechanical system integration, sensor/actuator interfacing, data conversion, wireless communication, analog neural network circuits, medical instrumentation

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
Intelligent architectures and networks, artificial neural networks, biological systems, intelligent decision making, design and multi-objective optimization of manufacturing/production/operations systems

Carlos Mastrangelo, Ph.D.
(University of California, Berkeley)
Associate Professor
MEMS, microfluidics, biomedical microsystems

Mehran Mehregany, Ph.D.
(Massachusetts Institute of Technology)
Goodrich Professor of Engineering Innovation
Silicon and silicon carbide micro/nano systems technology (including MEMS/NEMS), micromachining and microfabrication technologies, materials and modeling issues related to MEMS/NEMS and (in some cases) integrated circuits technologies, MEMS packaging

Frank Merat, Ph.D.
(Case Western Reserve University)
Associate Professor and Associate Chair of ECE
Wireless networks, RF communications, optical MEMS devices, computer and robot vision, image processing, artificial intelligence

Mihajlo D. Mesarovic, Ph.D.
(University of Belgrade)
Cady Staley (Hanna) Professor of Systems Engineering and Mathematics
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  
Massood Tabib-Azar, Ph.D.  
(Rensselaer Polytechnic Institute)  
*Professor*  
Semiconductor material and device characterizations, optical signal processing, novel high-frequency and high-power devices and circuits, novel super-resolution near-field imaging probes, quantum computing, nanotechnology applications in electronics and biology  
Norman Tien, Ph.D.  
(University of California, Berkeley)  
*Nord Professor of Engineering and Chair of EECS*  
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)  
*Associate Professor*  
Materials and processing techniques for MEMS and NEMS, wide bandgap semiconductors, development of materials and fabrication techniques for polymer-based MEMS and bioMEMS  
Xinmiao Zhang, Ph.D.  
(University of Minnesota)  
*Assistant Professor*  
VLSI Architecture design for Communications, Digital Signal Processing, Cryptosystems and Medical instruments.  

**Computer Science Division**  
George W. Ernst, Ph.D.  
(Carnegie Institute of Technology)  
*Associate Professor*  
Learning problem solving strategies, artificial intelligence, expert systems, program verification  
Shudong Jin, Ph.D. (Boston University)  
*Assistant Professor*  
Computer networks and protocols, multimedia networking, Internet content delivery and performance evaluation  
Jing Li, Ph.D.  
(University of California, Riverside)  
*Assistant Professor*  
Bioinformatics  
Vincenzo Liberatore, Ph.D.  
(Rutgers University)  
*Associate Professor*  
Distributed Systems, Internet computing, randomized algorithms  
Gultekin Ozsoyoglu, Ph.D.  
(University of Alberta, Canada)  
*Professor and Associate Chair of CS*  
Databases, bioinformatics, multimedia computing, digital libraries  
Z. Meral Ozsoyoglu, Ph.D.  
(University of Alberta, Canada)  
*Professor*  
Database systems, database query languages and optimization, data models, index structures, bioinformatics  
Andy Podgurski, Ph.D.  
(University of Massachusetts, Amherst)  
*Associate Professor*  
Software engineering methodology and tools, software testing and reliability assessment, computer security, distributed system design  
Michael Rabinovich, Ph.D.  
(University of Washington)  
*Professor*  
Computer networks, Internet performance evaluation, databases, utility computing  
Lee J. White, Ph.D.  
(University of Michigan)  
*Professor*  
Software testing: regression testing, GUI testing, specification-based testing, testing of object-oriented software  
Jiong Yang, Ph.D. (University of Illinois at Urbana-Champaign)  
*Assistant Professor*  
Data mining, databases, bioinformatics  
GQ (Guo-Qiang) Zhang, Ph.D.  
(Cambridge University, England)  
*Associate Professor*  
Programming languages, theory of computation, logic and topology in computer science, knowledge representation, information technology  

**Active Emeritus Faculty**  
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  
Yoh-Han Pao, Ph.D.  
(Pennsylvania State University)  
*George S. Devly Emeritus Professor*  
Pattern recognition, signal and image processing, computational intelligence, intelligent systems  

**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 Radivojevitch, Ph.D.

**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, as well as Nord hall, and are networked via the Case university network. The Case university 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 home dial-up or broadband connections to access many on campus resources, as well as software, as if they were physically connected to the university network. The department and the University also participate in the Internet2 project, which provides a 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 university network users can take advantage of numerous on-line 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.

**Microfabrication Facilities**
The Microfabrication Laboratory (MFL) is a state-of-the-art clean room facility for the fabrication of microelectromechanical systems (MEMS) and microelectronic devices. The Class 100 facility supports the University's strong interdisciplinary MEMS/microsystems research program by providing on-campus fabrication capabilities for a broad range of research projects by investigators from a number of departments within the university; it is also accessible by external organizations for prototype fabrication and R&D. The MFL offers a broad spectrum of micromachining processes, including bulk and surface micromachining, wafer bonding, and micro-molding. The lab enables the nanofabrication activities of its users by offering substrate preparation processes that support nanofabrication using off-campus facilities as well as the electron-beam lithography tool in the Center for Surface Analysis of Materials at Case.

**ADDITIONAL DEPARTMENT FACILITIES**

**Sally & Larry Sears Undergraduate Design Laboratory**
This laboratory supports all department circuits courses 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 electronics classes laboratory has been supported by Hewlett-Packard, Agilent, and...
Keithley corporations and 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 classwork and exploration of the art of computing. This lab has both PCs and Sun Unix workstations, and includes two high-speed laser printers.

ENGR 131 Freshman Computing Laboratory
This laboratory is used to support the freshman ENGR 131 Elementary Computer Programming class. Twenty-two student workstations 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, 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 PC’s 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 architcting. It includes optimization, simulation, artificial intelligence, 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 architcting 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 Semi-conductor 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-perfor-
mance 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 probe stations, a vacuum probe station, a multipurpose vacuum chamber, and an interferometric load-deflection station. Two large (8 x 2 ft2) vibration isolated air tables are available for custom testing setups. The laboratory has a wide variety of electronic testing instruments, including a complete IV-CV testing setup.

Advanced Metrology and Nano-Device Applications (Amanda) Laboratory
http://www.eecs.cwru.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 photoconductivity, 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 on-line 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 tooling useful in characterizing materials for MEMS applications. The laboratory contains a PC-based apparatus for load-deflection 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, tooling 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.

Lester J. Kern Computational Laboratory
This laboratory is used by students enrolled in “Electromechanical Energy Conversion,” as well as for research in robotics and mechatronics. Laboratory facilities include: four lab stations for demonstrating machine characteristics and basic steady-state and dynamic system performance, four PC based QNX workstations, and real-time data acquisition systems for interaction with lab experiments and control of machines.

Process Control Laboratory
This laboratory contains process control pilot plants, computerized hardware for process control, and demonstration/research facilities. This laboratory also has access to steam and compressed air for use in the pilot plants.

Timken Foundation Dynamics and Control Laboratory
This laboratory contains PLCs, motors, and robotics systems mechanical, pneumatic, and electrical laboratory experiment for teaching and research purposes.

Rockwell Automation Machinery Diagnostics and Control Laboratory
This laboratory is focused upon machinery diagnostics and failure prediction. Several test stands provide instrumentation for machinery lifetime prediction and sensor development. Additional instrumentation provides for remote operation of the test stands.

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 (c) Computer Science. These programs give our students a strong background in the fundamentals of mathematics, science, and engineering. Our students can use their technical and open electives to pursue such concentrations as bioelectrical engineering, complex systems, controls, 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
**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
- ENGR 210 Introduction to Circuits and Instrumentation
- EECS 281 Logic Design and Computer Organization
- EECS 245 Electronic Circuits
- EECS 246 Signals and Systems
- EECS 309 Electromagnetic Fields I
- STAT 332 Statistics of Signal Processing
- EECS 321 Semiconductor Electronic Devices
- EECS 398 Engineering Projects I
- EECS 399 Engineering Projects II

**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: Electromagnetics**
- EECS 309 Electromagnetic Fields I
- EECS 310 Electromechanical Energy Conversion
- EECS 311 Electromagnetic Fields II
- EECS 412 Electromagnetic Fields III

**Area II: Signals & Systems**
- EECS 246 Signals and Systems
- EECS 313 Signal Processing
- EECS 347 Network Synthesis
- EECS 351 Communications and Signal Analysis
- EECS 354 Digital Communications
- EECS 381 Hybrid Systems

**Area III: Computer Software**
- EECS 233 Data Structures
- EECS 337 Systems Programming
- EECS 338 Operating Systems

**Area IV: Solid State**
- EECS 321 Semiconductor Electronic Devices
- EMSE 314 Electrical, Optical and Magnetic Properties of Matter
- EECS 322 Integrated Circuits and Electronic Devices

**Area V: Control**
- EECS 304 Control Engineering I
- EECS 310 Electromechanical Energy Conversion
- EECS 383 Microprocessor Applications to Control
- EECS 346 Engineering Optimization
- EECS 381 Hybrid Systems

**Area VI: Circuits**
- EECS 245 Electronic Circuits
- EBME 310 Biomedical Instrumentation
- EECS 344 Electronic Circuit Design
- EECS 382 Microprocessor Based Design
- EBME 418 Biomedical Electronics
- EECS 426 MOS Integrated Circuit Design

**Area VII: Computer Hardware**
- EECS 281 Computer Organization
- EECS 382 Microprocessor Based Design
- EECS 301 Computer Design Lab
- EECS 314 Computer Architecture
- EECS 315 Digital Systems Design

**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 351, EECS 313 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 student 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**

The department also offers a minor in electronics for students in the College of Arts and Science. This program requires the completion of 29 credit hours, of which 10 credit hours may be used to satisfy portions of the students’ skills and distribution requirements. The following courses are required for the electronics minor:
- MATH 125 Mathematics I (4)
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 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
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
EECS 323 Design of Engineering Experiments
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
BIOL 250 Intro. Cell, Molec. Biol. Systems

AREA 3 Manufacturing, Robotics and Operational Systems
EECS 323 Design of Engineering Experiments
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. A graduate of this program will be able to use these fundamentals to analyze and evaluate computer systems, both hardware and software. A computer engineer-
ing graduate would also be able to design and implement computer systems, both hardware and software, which are state of the art solutions to a variety of computing problems. This includes systems which have both a hardware and a 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 and the 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.

**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 (or equivalent)
- EECS 233 Introduction to Data Structures

The two-course hardware sequence is:

- EECS 314 Computer Architecture
- EECS 315 Digital Systems Design

The corresponding two-course software sequence is:

- EECS 337 Systems Programming
- EECS 338 Introduction to Operating Systems

In addition to these two standard sequences, a student may design his/her own 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.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, computational neuroscience, databases, software engineering, data mining and visualization, and pervasive networks and distributed systems.

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)**

**Undergraduate Courses**

**EECS 120. Introduction to Electrical, Systems, and Computer Engineering (3)**
This course is an introduction to the fields of Electrical, Systems, and Computer Engineering through exposure to selected applications such as the digital generation of music, the processing of digital images, coding of information, digital communication, and computer networks. Discussions of each field (Electrical, Systems, and Computer Engineering) using guest speakers as well as such topics as ethics and professionalism (as examined in the context of the course projects) will also be included. The course is intended to be taken as an open elective by freshmen who are interested in applying of fundamental mathematical and science concepts to the solution of interesting engineering problems. Students who are considering choosing a major in Electrical, Systems, or Computer Engineering (among other fields) can use this course to help in their decision making. Prereq: Freshman standing.

**EECS 212. Signals, Systems, and Control (3)**

**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. Coreq: 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. Prereq: 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. Prereq: ENGR 131.

**EECS 245. Electronic Circuits (4)**

**EECS 246. Signals and Systems (4)**

**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. Prereq: 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. Prereq: ENGR 131.

**EECS 285. Engineering in Community Service II (3)**
Project-oriented course; students work on “real” engineering projects of benefit to the community and in partnership with community “customers.” Project teams consist of a mix of sophomores, juniors, and seniors. Students perform engineering design tasks as appropriate to their technical background. Emphasis on teamwork, communication skills, customer awareness, and professional responsibility. Prereq: Sophomore standing in EECS.

**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. Prereq: EECS 281.


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. Prereq: EECS 212 or equivalent. Coreq: EECS 304.

EECS 306. Control Engineering II 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. Prereq: EECS 304.

EECS 309. Electromagnetic Fields I (3) Maxwell's integral and differential equations, boundary conditions, constitutive relations, energy conservation and Poynting 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. Prereq: MATH 223 and PHYS 122. Coreq: MATH 224.


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, multiport networks, scattering matrix formulation, radiation and antennas, radiation from dipoles, apertures and simple arrays. Prereq: EECS 309.

EECS 312. 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. Prereq: EECS 309.

EECS 332. 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. Prereq: EECS 321.

EECS 337. Systems Programming (4) Lexical analyzers; symbol tables and their searching; assemblers, one-pass and two-pass, conditional assembly, and macros; linkers and loaders; interpreters, pcodes, threaded codes; introduction to compilation, grammar, parsing, and code generation; preprocesors; text editors, line-oriented and screen-oriented; bootstrap loaders, ROM monitors, interrupts, and device drivers. Laboratory. Prereq: 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. Prereq: EECS 337.

EECS 339. 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 page rank algorithms, link analysis, web resource discovery, web, resource description framework (RDF), XML, Web Ontology Language (OWL).

Prereq: EECs 338, EECs 341.

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.
Prereq: 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.
Prereq: EECs 233.

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-problematic 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.
Prereq: MATH 304. Crosslisted as 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.
Prereq: 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.
Prereq: 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.
Prereq: 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.
Prereq: 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, queueing 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.
Prereq: EECs 246 or equivalent.

EECS 352. Engineering Economics and Decision Analysis (3)

EECS 354. Digital Communications (3)
Prereq: EECs 351 recommended.

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.
Prereq: 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.
Prereq: EECs 311.

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.

EECS 366. Computer Graphics (3)
Prereq: EECs 233.

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. Prereq: Junior/Senior standing.

EECS 375. Autonomous Robotics (3)
Introduction to the design, construction and control of autonomous mobile robots. The first half of the course consists of focused exercises on mechanical construction with LEGO, characteristics of sensors, motors and batteries, and control strategies for autonomous robots. In the second half of the course, students design, build and program their own complete robots that participate in a public competition. All work is performed in groups. Biologically-inspired approaches to the design and control of autonomous robots are emphasized throughout. Prereq: Consent of instructor. Cross-listed as BIOL 375.

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. Prereq: 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. Prereq: ENGR 210 and also EECS 281.

EECS 383. Microprocessor Applications to Controls (3)
Digital control and its implementation using microprocessors. Z-transforms. Time response characteristics, steady-state error, mapping from the s-plane to the z-plane. Digital controller design-stability testing methods, gain and phase margins, PID controllers, digital filter structures. Prereq: EECS 246 or equivalent.

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 consist 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. Prereq: Junior or Senior standing in EECS.

EECS 391. Introduction to Artificial Intel-ligence (3)
Overview of artificial intelligence, knowledge representation, search, game-playing, logic rule-based systems, AI programming languages, learning, neural networks, evolutionary algorithms, natural language understanding, planning, robotics. Prereq: ENGR 131.

EECS 393. Software Engineering (3)
Issues in the development of complex software systems. Software engineering methodology, requirements analysis, specification, design, implementation, validation and maintenance. Team development of a significant applications program. Various teams, e.g., the design team and the implementation team, report to the entire class throughout the semester. Each team prepares a final written report and gives a final oral presentation. Approved SAGES capstone.

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. Approved SAGES capstone. Prereq: Senior standing.

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. Prereq: EECS 398 or co-registration.

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. Prereq: Ph.D. student in EECS department.

EECS 401. Digital Signal Processing (3)

EECS 405. Data Structures and File Management (3)
Fundamental concepts: sequential allocation, linked allocation, lists, trees, graphs, internal sorting, external sorting, sequential, binary, interpolation search, hashing file, indexed files, multiple level index structures, b-trees, hashed files. Multiple attribute retrieval; inverted files, multi lists, multiple key hashing, htd trees. Introduction to data bases. Data models. Prereq: 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 Petrinets, 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

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-Bendixson, describing functions for single-input single-output systems, averaging methods, bifurcation theory, stability, and an introduction to the study of complicated dynamics and chaos. Coreq: EECS 408.

EECS 414. Complex Systems Modeling and Analysis (3)
The concept of a complex system as a relationship of identifiable subsystems. Modeling of large-scale systems by aggregation, perturbation, via system identification and by the use of fuzzy logic. The structural properties of large-scale systems. A hierarchical, multi-level approach to large-scale systems analysis and synthesis. Coordination by the interaction balance and by interaction prediction principles. Decentralized decision making and control of large-scale systems. Near optimum system design. Structure and stability of fuzzy control systems.

EECS 415. Integrated Circuit Technology I (3)
Review of semiconductor technology. Device fabrication processing, material evaluation, oxide passivation, pattern transfer technique, diffusion, ion implantation, metallization, probing, packaging, and testing. Design and fabrication of passive and active semiconductor devices. Prereq: EECS 322.

EECS 416. Convex Optimization for Engineering (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. Prereq: 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 properties, 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 quadratic Gaussian problem, and the separation theorem. Prereq: EECS 408.

EECS 418. System Identification and Adaptive Control (3)

EECS 419. Computer System Architecture (3)
Interaction between computer systems hardware and software. Pipeline techniques - instruction pipelines - arithmetic pipelines. Instruction level parallelism. Cache mechanism. I/O structures. Examples taken from existing computer systems.

EECS 420. Solid State Electronics I (3)

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. Prereq: EECS 338.

EECS 424. Introduction to Nanotechnology (3)
(See EMAE 424.) Cross-listed as EMAE 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 gyroscopes. 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 and implicit Congestion control. 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. Prereq: 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. Prereq: EECS 337 or consent of instructor.

EECS 431. Software Engineering (3)
Design of software systems working from specifications; top-down decomposition using stepwise refinement; object-oriented methods; prototyping. Software metrics and testing; software quality and reliability; maintenance; human factors. Homework involves working in teams on large software projects. Prereq: EECS 337.

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. Prereq: 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. Prereq: EECS 322 or EECS 419.

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. Prereq: 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. Prereq: 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. Prereq: EECS 340, 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 macromolecules, cells, and tissue with high throughput and in many cases massively parallel formats. This course covers several applications of microfabricated 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, resource description framework (RDF), XML, Web Ontology Language (OWL). Prereq: EECS 338, EECS 341.

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 secure software 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. Prereq: 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. Prereq: MATH 304 and (EECS 340 or EECS 405). Cross-listed as OPRE 454.

EECS 456. Microwave Engineering (3)

EECS 458. Introduction to Bioinformatics (3)
Fundamental algorithmic methods in computational molecular biology and bioinformatics discussed. Sequence analysis, pairwise and multiple alignment, probabilistic models, phylogenetic analysis, folding and structure prediction emphasized. Prereq: EECS 340, EECS 233.

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 for analysis include: multi-objective optimization, artificial intelligence, and heuristics for combinatorial problems.

EECS 466. Computer Graphics (3)
Theory and practice of computer graphics: object and environment representation including coordinate transformations, interaction, and rendering. Covers a wide range of graphic display devices and systems with emphasis in interactive shaded graphics. Laboratory. Prereq: EECS 233.

EECS 470. Intelligent Networks and Systems (3)
(See EECS 370.) Prereq: Graduate or Senior level standing in any major in EECS.

EECS 475. Autonomous Robotics (3)
Introduction to the design, construction and control of autonomous mobile robots. The first half of the course consists of focused exercises on mechanical construction with LEGO, characteristics of sensors, motors and batteries, and control strategies for autonomous robots. In the second half of the course, students design, build and program their own complete robots that participate in a public competition. All work is performed in groups. Bio-
logically-inspired approaches to the design and control of autonomous robots are emphasized throughout. Prereq: Consent of instructor. Cross-listed as BIOL 475.

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. Prereq: ENGR 131 and MATH 224. Cross-listed as BIOL 477.

EECS 478. Computational Neuroscience (3)

Computer simulation 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 circuits, as well as to cable theory, passive and active compartmental modeling, numerical integration methods, models of plasticity and learning, models of brain systems, and their relationship to artificial neural networks. Term project required. Two lectures per week. Cross-listed as BIOL 478, EBME 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. Cross-listed as BIOL 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 fundamentals 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. Functionals 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 systems. The topics include, but are not limited to, system specification, architecture modeling, component partitioning, estimation metrics, hardware/software co-design, diagnostics.

EECS 489. Robotics I (3)


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-pass 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 491. Artificial Intelligence (3)

Artificial intelligence and programming techniques used in design and implementation of intelligent systems. Problem solving and game playing by computer, different representation of problems and games, and their associated solution methods. Knowledge representation: logic, semantic networks, frames, Programming in LISP and Prolog.

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. Prereq: Ph.D. student in EECS 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. Prereq: EECS 416.

EECS 518. Nonlinear Systems: Analysis and Control (3)


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 roles 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. Prereq: 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 in-
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. Prereq: 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, effect 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. Prereq: 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. Prereq: 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 600T. 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. Prereq: 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)

EECS 703. Dissertation Fellowship (1-8)

BAOCHLOR 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 126 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)
ENGR 145 Chemistry of Materials (4-0-4)
PHYS 121 Physics I: Mechanics (4-0-4)
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)

EECS 600. Special Topics (1-18)

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 c (3-0-3)
ENGR 200 Statics & Stress of Materials (3-0-3)
EECS 246 Signals & Systems (3-2-4)
Approved Tech. Elective d (3-0-3)
Total (15-2-16)

Fourth Year
Fall
HM/SS Elective (3-0-3)
EECS 321 Semiconductor Elect. Devices (3-2-4)
Applied Statistics Req.e (3-0-3)
Approved technical elective d (3-0-3)
Approved technical elective d (3-0-3)
Total (15-2-16)

Hours Required for Graduation: 129
a. Although not required students may elect to take ENGR 101 Freshman Engineering Field 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 122 Physics II: Electricity & Magnetism b (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)

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 e(3-0-3)
Open elective (3-0-3)
Total (15-2-16)

Fourth Year

Fall
HM/SS elective (3-0-3)
ENGR 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 d (0-8-4)
Approved technical elective f (3-0-3)
Total 12-0-16

Spring
HM/SS elective (3-0-3)
EECS 399 Engineering Projects II (0-8-4)
Approved technical elective f (3-0-3)
Approved technical elective f (3-0-3)
Approved technical elective f (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 during the freshman year.

b. Selected students may be invited to take PHYS 123 and PHYS 124 in place of PHYS 121 and 122.

c. Choose from STAT 312, STAT 332, or STAT 333.

d. 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.

e. Signal Processing or Communication Systems technical elective to be taken in any semester after EECS 246. This elective should be chosen from EECS 313, EECS 351, or EECS 354.

f. Technical electives from an approved list.

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 (4-0-4)
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)
PHYS 122 Physics II: Electricity & Magnetism b (4-0-4)
PHYS 123 and PHYS 124 in place of PHYS 121 and 122.
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 b (4-0-4)
PHYS 123 and PHYS 124 in place of PHYS 121 and 122.
ENGR 145 Chemistry of Materials (4-0-4)
PHED 102 Physical Education (0-3-0)
Total (15-3-15)

Spring
SAGES University Seminar (3-0-3)
PHYS 122 Physics II: Electricity & Magnetism b (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 c (3-0-3)
ENGR 200 Statics & Strength of Materials (3-0-3)
ENGR 225 Fluid and Thermodynamics (4-0-4)
Total (16-0-16)

Spring
SAGES University Seminar (3-0-3)
PHYS 122 Physics II: Electricity & Magnetism b (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)
PHYS 122 Physics II: Electricity & Magnetism b (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)
PHYS 122 Physics II: Electricity & Magnetism b (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)
PHYS 122 Physics II: Electricity & Magnetism b (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)
PHYS 122 Physics II: Electricity & Magnetism b (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)
PHYS 122 Physics II: Electricity & Magnetism b (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)
PHYS 122 Physics II: Electricity & Magnetism b (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)
PHYS 122 Physics II: Electricity & Magnetism b (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)
PHYS 122 Physics II: Electricity & Magnetism b (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)
PHYS 122 Physics II: Electricity & Magnetism b (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)
PHYS 122 Physics II: Electricity & Magnetism b (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)
PHYS 122 Physics II: Electricity & Magnetism b (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)
General Bulletin 2007-2008

Fourth Year
Fall
HM/SS elective (3-0-3)
Statistics elective (3-0-3)
EECS 318 VLSI/CAD b (3-2-4)
Technical elective b (3-0-3)
Technical elective a (3-0-3)
Open elective (3-0-3)
Total (15-2-16) or (15-0-15)

Spring
HM/SS elective (3-0-3)
HM/SS elective (3-0-3)
EECS 398 Engineering Projects I (0-8-4)
Technical elective a (3-0-3)
Open elective (2-0-2)
Total (11-8-15)

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.

b. The student must take either EECS 318 VLSI/CAD (Fall Semester) or EECS 338 Introduction to Operating Systems (Spring Semester), and a three credit hour technical elective.


d. Course other than mathematics or computer science.

e. Technical electives must come from an approved list of courses available from the department.

Bachelor of Arts Degree

Computer Science

First Year Class-Lab-Credit Hours
Fall
SAGES First Year Seminar (4-0-4)
MATH 121 Calculus I (4-0-4)
ENGR 131 Elementary Computer Programming (3-0-3)
PHED 101 Physical Education (0-3-0)
Total (15-3-15)

Spring
SAGES University Seminar (3-0-3)
HM/SS elective or open elective a (3-0-3)
PHYS 121 Physics I: Mechanics (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 (18-3-18)

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)
ECES 281 Comp. Organization Logic Design (3-2-4)
Technical elective b (3-0-3)
Total (16-2-17)

Spring
HM/SS Elective (3-0-3)
MATH 224 Differential Equations (3-0-3)
MATH 304 Discrete Mathematics (3-0-3)
EECS 233 Intro Data Structures (3-2-4)
Technical elective e (3-0-3)
Total (15-2-16)

Third Year Class-Lab-Credit Hours
Fall
HM/SS Elective (3-0-3)
Statistics elective c (3-0-3)
EECS 337 Systems Programming (3-2-4)
EECS 340 Algorithms and Data Structures (3-0-3)
Technical elective e (3-0-3)
Total (15-2-16)

Spring
ENGL 398 Professional Communication (2-0-2)
ENGR 398 Professional Communication (1-0-1)
EECS 314 Computer Architecture (3-0-3)
EECS 338 Intro to Operating Systems (3-2-4)
EECS 343 Theoretical Computer Science (3-0-3)
Technical elective e (3-0-3)
Total (15-2-16)

Fourth Year
Fall
PHIL 304 Science and Engr. Ethics (3-0-3)
EECS 393 Software Engineering (3-0-3)
EECS 345 Programming Language Concepts (3-0-3)
Open elective (3-0-3)
Open elective d (3-0-3)
Total (15-0-15)

Spring
HM/SS elective (3-0-3)
EECS 341 Intro. to Database Systems (3-0-3)
EECS 391 Intro. to Artificial Intelligence (3-0-3)
Technical elective e (2-0-2)
Open elective (3-0-3)
Total (14-0-14)

Hours Required for Graduation: 127

a. One of these must be a humanities/social science course.

b. ENGR 210 is recommended because it provides flexibility in choice of major and advanced EECS courses.


d. Course other than mathematics or computer science.

e. Technical electives must come from an approved list of courses available from the department.

Bachelor of Science Degree

Major in Computer Science

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)
PHED 101 Physical Education (0-3-0)
Total (15-3-15)

Spring
SAGES University Seminar (3-0-3)
HM/SS elective or open elective a (3-0-3)
PHYS 121 Physics I: Mechanics (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 (18-3-18)

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)
ECES 281 Comp. Organization Logic Design (3-2-4)
Technical elective b (3-0-3)
Total (16-2-17)

Spring
HM/SS Elective (3-0-3)
MATH 224 Differential Equations (3-0-3)
MATH 304 Discrete Mathematics (3-0-3)
EECS 233 Intro Data Structures (3-2-4)
Technical elective e (3-0-3)
Total (15-2-16)

Third Year Class-Lab-Credit Hours
Fall
SAGES Departmental Seminar (3-0-3)
EECS 233 Intro Data Structures (3-2-4)
Technical Elective a (3-0-3)
Open elective (3-0-3)
Total (12-2-13)

Spring

Bases of Engineering Science

Science Course

- case-school-of-engineering
The program must be approved by the dean 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, EMAC351 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 should be developed with the help of the Associate Dean for the undergraduate program in the Case School of Engineering. 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 James McGuffin-Cawley, Associate Dean at <cawley@case.edu>

**BACHELOR OF SCIENCE IN ENGINEERING DEGREE**

**Major in Engineering (Undesignated)**

**First Year Class-Lab-Credit Hours**

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<thead>
<tr>
<th>Fall</th>
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<tbody>
<tr>
<td>EECS 340 Algorithms and Data Structures (3-0-3)</td>
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<tr>
<td>Technical elective (3-0-3)</td>
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<td>Open elective (3-0-3)</td>
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<td>Open elective (3-0-3)</td>
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<tr>
<td>Open elective (2-0-2)</td>
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<td>Total (14-0-14)</td>
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<tr>
<th>Spring</th>
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<tbody>
<tr>
<td>SAGES capstone (3-0-3)</td>
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<tr>
<td>Technical elective (3-0-3)</td>
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<td>Open elective (3-0-3)</td>
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<td>Total (15-0-15)</td>
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**Hours Required for Graduation: 120**
a. One technical elective must be a computer science course. The other two technical electives may be computer science, MATH or STAT courses.

**DEGREE PROGRAM IN ENGINEERING, UNDESIGNATED**

<table>
<thead>
<tr>
<th>500 304 Nord Building (7220)</th>
<th>Phone 216-368-6482; Fax 216-368-0327</th>
</tr>
</thead>
<tbody>
<tr>
<td>James D. McGuffin-Cawley, Associate Dean</td>
<td>e-mail <a href="mailto:cawley@case.edu">cawley@case.edu</a></td>
</tr>
</tbody>
</table>

The Undesignated Engineering program prepares students who seek a technological background but do not wish to pursue pure engineering careers. For example, some needs in the public sector, such as pollution remediation, transportation, low-cost housing, elective medical care, and crime control could benefit from engineering expertise. To prepare 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 for undergraduate programs of The Case School of Engineering. The program must be approved by the dean 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, EMAC351 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 should be developed with the help of the Associate Dean for the undergraduate program in the Case School of Engineering. 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 James McGuffin-Cawley, Associate Dean at <cawley@case.edu>
Fourth Year
Fall
Humanities or Social Science elective (3-0-3)
Exxx 398 Engineering Senior Project (0-6-3)
Major Concentration Course (3-0-3)
Minor Concentration Course (3-0-3)
Minor Concentration Course (3-0-3)
Total(12-6-15)

Spring
Humanities or Social Science elective (3-0-3)
Major Concentration Course(3-0-3)
Major Concentration Course (3-0-3)
Minor Concentration Course (3-0-3)
Open elective (3-0-3)
Total(15-0-15)

Hours required for graduation: 129
a. One of these courses must be a humanities/ social science course.

ENGINEERING PHYSICS
Rockefeller Building (7079)
Phone 216-368-4017; 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 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 development of technology. This education at the intersection of engineering and physics will enable students to seek employment in engineering upon graduation while, at the same time, provide a firm foundation for the pursuit of graduate studies in either 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. The program will provide a curriculum and environment to develop interdisciplinary collaboration, ethical and professional outlooks, communication skills, and the tools and desire for life-long learning. In order to realize this mission, the Engineering Physics Program will pursue the following objectives:

Graduates of the Engineering Physics program will have a deep knowledge of physics, equal to that of students in the B.S. Physics program. This will provide students with the tools to address new engineering problems and contribute to emerging technology.

Graduates of the Engineering Physics program will have a strong grounding in engineering design, science, practice, and the application of physics to engineering.

Graduates of the Engineering Physics program will have extensive experience with laboratory methods, instrumentation, materials, and data analysis.

Graduates of the Engineering Physics program will have developed strong communication skills, work well in teams, and be knowledgeable in ethical and societal issues important for practicing engineers and scientists.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Engineering Physics
First Year Class-Lab-Credit Hours
Fall
CHEM 111 Principles of Chemistry for Engineers (4-0-4)
CHEM 113 Principles of Chemistry Laboratory (1-3-2)
MATH 121 Calculus for Science and Engineering Ia(4-0-4)
PHYS 121 General Physics I. Mechanicb (4-3-4)
ENGL 150 Expository Writing (3-0-3)
PHED 101 Physical Education Activities (0-3-0)
Total (16-9-17)

Spring
MATH 122 Calculus for Science and Engineering IIa (4-0-4)
PHYS 122 General Physics II. Electricity & Magnetism I (4-3-4)
ENGR 131 Elementary Computer Programming (2-2-3)
ENGR 145 Chemistry of Materials (4-0-4)
PHED 102 Physical Education Activities (0-3-0)
Total (14-8-15)

Second Year
Fall
MATH 223 Calculus for Science & Engineering IIIa (3-0-3)
PHYS 221 General Physics III – Modern Physics (3-0-3)
ENGR 200 Statics and Strength of Materials (3-0-3)
ENGR 210 Circuits & Instrumentation (3-2-4)
Humanities/Social Science Elective (3-0-3)
Total (15-2-16)

Spring
MATH 224 Differential Equations (3-0-3)
PHYS 208 Instrumentation and Signal Analysis Lab (2-4-4)
PHYS 250 Mathematics, Physics and Computing (3-0-3)
PHYS 310 Classical Mechanics (3-0-3)
ENGR 225 Thermodynamics, Fluids, Heat & Mass Transfer (4-0-4)
Total (15-4-17)

Third Year Class-Lab-Credit Hours
Fall
PHYS 313 Thermodynamics and Statistical Mechanics (3-0-3)
PHYS 317 Engineering Physics Lab I(2-4-4)
PHYS 331 Introduction to Quantum Mechanics I (3-0-3)
Engineering Concentration (3-0-3)
Humanities/Social Science Elective (3-0-3)
Total (14-4-16)

Spring
PHYS 318 Engineering Physics Lab II (2-4-4)
PHYS 324 Electricity and Magnetism I (3-0-3)
ENGL 398N Professional Communications (3-0-3)
Humanities/Social Science Sequence I (3-0-3)
Engineering Concentration (3-0-3)
Total (14-4-16)

Fourth Year
Fall
PHYS 315 Introduction to Solid State Physics (3-0-3)
PHYS 325 Electricity and Magnetism II (3-0-3)
PHYS 353 Senior Engineering Physics Project (0-6-3)
Engineering Concentration (3-0-3)
Humanities/Social Science Sequence II (3-0-3)
Total (12-6-15)

Spring
PHYS 353 Senior Engineering Physics Project (0-6-3)
Applied Quantum Mechanics d (3-0-3)
Engineering Concentration (3-0-3)
Humanities/Social Science Elective (3-0-3)
Humanities/Social Science Sequence III (3-0-3)
Total (12-6-15)

Hours required for graduation 129
a. Selected students may be invited to take MATH 123, 124, 227, and 228 in place of MATH 121, 122, 223, and 224.
b. Selected students may be invited to take PHYS 123, 124 Physics and Frontiers I, II
Honors in place of PHYS 121, 122.
c. Engineering Physics Concentration courses are flexible, but must be in a specific engineering discipline or study area and be 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, Macromolecular Science, Materials Science and Engineering, Mechanical Engineering, Signal Processing, Systems Analysis and decision making.
d. PHYS 332, PHYS 327/427, EECS 321, EECS 420, EMSE 314, or EMSE 405

DEPARTMENT OF MACROMOLECULAR SCIENCE AND ENGINEERING
314 Kent Smith Building (7202)
Phone 216-368-4172; Fax 216-368-4202
Alexander Jamieson, Chair
e-mail amj@case.edu
http://polymers.case.edu

Macromolecular science and engineering is the study of the synthesis, structure, processing, and properties of polymers. These giant molecules are the basis of synthetic materials including plastics, fibers, rubber, films, paints, membranes, and adhesives. Research is constantly expanding these applications through the development of new high performance polymers, e.g. for engineering composites, electronic, optical, and biomedical uses. 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) can all be classified as 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
Alexander M. Jamieson, D. Phil.
(Oxford University, England)
Professor and Chair
Lasers; 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.
Eric Baer, D. Eng.
(The Johns Hopkins University)
The Herbert Henry Dow Professor of Science and Engineering
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)
Leonard Case Jr. Professor
Determination of the solid state structure and morphology of polymers. X-ray analysis of the structure of thermotropic copolyesters, copolyimides, polyurethanes, polysaccharides; supramolecular assemblies, fluoropolymers; molecular modeling of semi-crystalline and liquid crystalline polymers; rheological properties of polysaccharides and glycoproteins.
Elena Dormidontova, Ph.D.
(Moscow State University)
Asst. Professor
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)
Professor

Structure-property relationships; irreversible deformation, crack propagation and fracture of polymers, blends and composites; microlayer processing of polymers; structure-function relationships in collogenous tissues; biostability of biomaterials.
Hatsu 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.
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 crystal polymers.
Ica Manas-Zloczower, D.Sc.
(Israel Institute of Technology)
Professor
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)
Associate Professor
Organic chemistry, synthesis, supramolecular chemistry, conducting polymers, interlocked macromolecules (polyrotaxanes and polycatenanes), peptide nucleic acids, supramolecular polymerization, reversible ‘dynamic’ chemistry and combinatorial libraries.
David Schiraldi, Ph.D.
(University of Oregon)
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)
Associate 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
Charles E. Rogers, Ph.D.
(Syracuse University and State University of New York)
Emeritus Professor
Transport and mechanical properties of polymers; synthesis and properties of multicomponent systems; environmental effect on polymers; adhesion, adhesives, and coatings.

Robert Simha, Ph.D. (University of Vienna)
Emeritus Professor

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.

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.

Majors in Polymer Science and Engineering

The department offers a program leading to the Bachelor of Science in Engineering (Polymer Science and Engineering) which is designed to prepare the student both for employment in polymer-based industry and for graduate education in polymer science and engineering. This program is accredited by the Engineering Accreditation Commission (EAC) of ABET, Inc., 111 Market Place, Suite 150, 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.

Adjunct Faculty
Steven D. Hudson, Ph.D.
(University of Massachusetts)
Adjunct Professor
Development of polymeric materials with novel structure and properties; electron microscopy; diffraction; coalescence, aggregation, phase inversion, nanocomposites, liquid crystals, and supramolecular assemblies.

John C. Weaver, Ph.D.
(University of Cincinnati)
Adjunct Professor
Conducting polymers; microdevices; polymer electrodes; polymer adhesion.

Kenneth Singer, Ph.D., (University of Pennsylvania)
Professor of Physics
Experimental condensed matter physics; liquid crystal physics.

Philip Taylor, 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
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.

Majors in Polymer Science and Engineering 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 GPA 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, primarily 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 experiences, capitalizing on the strength of our graduate program.

Specifically, the undergraduate program provides the following educational objectives:

Mastery of Fundamentals
1. Ability to apply knowledge of mathematics, science, and engineering, in general, and synthetic chemistry, polymer processing and structure property relationships of polymeric materials, in particular.
2. Ability to design and conduct experiments (safely and efficiently), to analyze and interpret data, and to critically evaluate hypotheses, by providing experience with synthetic chemistry, polymer processing and measurement techniques.
3. Practical ability to use analytical techniques, computers, information databases and tools for electronic communication.

Creativity
4. Ability to identify, formulate and solve engineering problems that involve materials selection or improvement.
5. Ability to design a polymeric material or process to meet desired needs.

Societal Awareness
6. Broad education necessary to understand the environmental and economic impact of engineering solutions in a global and societal context.
7. Knowledge of contemporary economic, political, scientific and industrial issues.

Leadership Skills
8. Proficiency in oral and written communication, being able to describe clearly either the results of a project or the need for a proposed one.
9. Awareness of the multidisciplinary nature of macromolecular science and engineering, including, synthetic chemistry, polymer fabrication and processing, biomaterials and biomimicry, and mechanical, fluid, electrical, optical and sensing properties of polymers.
10. Ability to function in teams.

Professionalism
11. Exposure to the issues of professional and ethical responsibility.
12. Recognition of the need for, and an ability to engage in life-long learning.

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 or her 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 facility 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 spectroscopy. 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 plastocorder, 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 acces-
sories 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 photoconductivity, 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, 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 conformation 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, 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 bio-compatible polymers for application as biomaterials.

MACROMOLECULAR SCIENCE AND ENGINEERING (EMAC)

Undergraduate Courses

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 review 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. Approved SAGES departmental seminar. Prereq: ENGR 145.

EMAC 303. Structure of Biological Materials (3)

This course on the structure of biological materials is designed to provide students with: (i) a fundamental understanding of the structure of biologic materials including globular and structural proteins, connective tissue and bone, from the molecular to the microscopic levels of structure (approx. 65% of course); (ii) an introduction to the basic principles and applications of instruments for imaging, identification and measurement of biologic materials (approx. 25% of course) and (iii) an introduction to methods of bioengineering, biological materials, and novel biomaterials (approx. 10% of course). Prereq: EBME 201 and EBME 202. Cross-listed as EBME 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. Prereq: 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, thermochemistry, solutions, phases and chemical equilibrium, kinetics of chemical reaction, solutions of electrolytes and introduction to quantum mechanics, atomic structure and molecular statistics. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: ENGR 225.

EMAC 376. Polymer Engineering (3)
Mechanical properties of polymer materials as related to polymer structure and composition. Viscoelastic behavior, yielding and fracture behavior including irreversible deformation processes. Prereq: EMAC 276 and ENGR 200.

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. Prereq: ENGR 225.

EMAC 378. Polymer Production/Technology (3)
Students examine case studies from the literature, which combine the design and structure-property tradeoffs of polymeric materials vs. product requirements, with constraints imposed by economics, ethics, intellectual property, regulatory and legal factors. Students work in small teams, each tasked with a design project which requires consideration of the above factors. Prereq: EMAC 276.

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 (1-3)
(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. Approved SAGES capstone. Prereq: Senior standing.

EMAC 399. Polymer Science and Engineering Project II (1-9)
(Senior project.) Research under the guidance of staff, culminating in thesis. Prereq: Majors only and senior standing.

Graduate Courses

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 homeworks 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. Prereq: Ph.D. student in Macromolecular Science.

EMAC 470. Macromolecular Synthesis (3)
Organic chemistry of macromolecules; mechanism of polymerizations; preparation of addition, condensation, and biopolymers; the chemical reactions of polymers. Prereq: EMAC 270. Cross-listed as CHEM 470.

EMAC 471. Polymers in Medicine (3)
Distribution of plastic implants in the body, including history and statistics; chemical and physical characteristics of biomedical polymers, including general implant requirements, reactions of the host to implants, reactions of implants to physiological conditions, physiological and biomechanical basis for soft-tissue implants; plastic materials used in medicine and surgery; frontiers in biomedical polymers (current topics directed to the design and development of new biomedical polymers). Prereq: Consent of instructor. Cross-listed as EBME 406.

EMAC 472. Physical Chemistry of Macromolecules (3)
Major areas of physical chemistry of macromolecules; theories and experimental methods of polymer solutions, physical methods for determination of chemical structure, configuration. Prereq: EMAC 270.

EMAC 474. Macromolecular Physics (3)

EMAC 475. Introduction to Rheology (3)
(See EMAC 375.)

EMAC 476. Polymer Engineering (3)
Mechanical properties of polymer materials as related to polymer structure and composition. Viscoelastic behavior, yielding and fracture behavior including irreversible deformation processes. A term paper is required. Prereq: EMAC 276 and ECIV 110.

EMAC 477. Polymer Processing (3)
Rheological, molecular, structural, engineering, and compounding factors affecting processibility and properties of polymers; principles and procedures for mixing, extrusion, melting, calendaring, injection molding, and other primary processing methods. Pertinent mechanisms and theories; the application of theory to practice. Prereq: EMAC 376.

EMAC 478. Polymer Production and Technology (3)
(See EMAC 378.) Prereq: Graduate Standing.

EMAC 479. X-ray Crystallography (3)
Scattering of X-rays by crystalline and semi-crystalline solids, including polymers. Techniques of structure analysis.

EMAC 480. Polymer Morphology (3)
The morphology of semicrystalline and amorphous polymers, fibers, blends, liquid-crystalline polymers, and composites; and the physical and chemical mechanisms that control morphology. Practical knowledge of optical and electron microscopy: lab experiments and a project are included. Prereq: EMAC 474.

EMAC 482. Fundamentals of Adhesives, Sealants, and Coatings (3)
Film formation, application methods, and related fabrication factors and procedures. Relevant adhesion theories and practices, aspect of rheological treatments, and factors which affect these applications. Properties of constituent polymer materials, pigments, solvents, and other additives.

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. Prereq: Ph.D. student in Macromolecular Science.

EMAC 570. Functional and Reactive Polymers: Synthesis and Properties (3)
The design, synthesis, and properties of a number of new and growing areas of polymer science and chemistry. Topics will include: (1) Functional poly-
mers e.g., conducting, light emitting, and liquid crystalline polymers; (2) Reactions with polymers e.g., solid-phase synthesis (peptide and DNA synthesis and combinatorial chemistry), polymers reagents; (3) Supramolecular chemistry in polymeric systems e.g., molecular imprinting, main chain supramolecular polymers, effect on miscibility, etc.; (4) Synthesis and properties of different polymeric architectures: dendrimers, ladder polymers, polyrotaxanes, etc. and (5) New developments in polymer catalysts.

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. Prereq: 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. Prereq: EMAC 376 or EMAC 476.

EMAC 677 Colloquium in Macromolecular Science (0)
Lectures by invited speakers on subjects of current interest in polymer science.

EMAC 678 Characterization of Macromolecules (3)
Laboratory experience through synthesis and characterization of polymers. Methods include light scattering, viscosity, infrared, and NMR spectroscopy. Solid samples characterized by x-ray diffraction, electron and optical microscopy, thermal analysis, and physical properties. Prereq: EMAC 470 and EMAC 472.

EMAC 690 Special Topics in Macromolecular Science (1-18)

EMAC 701 Dissertation Ph.D. (1-18)
(Credit as arranged.)

EMAC 703 Dissertation Fellowship (1-8)

EMAC C100 Co-op Seminar I for Macromolecular Science and Engineering (1)
Professional development activities for students returning from cooperative education assignments. Prereq: COOP 001.

EMAC C200 Co-op Seminar II for Macromolecular Science and Engineering (2)
Professional development activities for students returning from cooperative education assignments. Prereq: COOP 002 and EMAC C100.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Polymer Science and Engineering

First Year Class-Lab-Credit Hours

Fall

Humanities/Social Sciences (3-0-3)
CHEM 111 Principles of Chemistry for Engineers a (4-0-4)
ENG 131 Elementary Computer Programming a (2-2-3)
MATH 121 Calculus for Science and Engineering a (4-0-4)
FSCC 100 Sages First Seminar a (4-0-4)
PHED 101 Physical Education Activities (0-3-0)
Total (17-5-18)

Spring

SAGES University Seminar Ib (3-0-3)
ENGR 145 Chemistry of Materials a (4-0-4)
MATH 122 Calculus for Science and Engineering II a (4-0-4)
PHYS 121 General Physics I a (4-0-4)
EMAC 125 Freshman Research on Polymers (1-0-1)
PHED 102 Physical Education Activities (0-3-0)
Total (16-3-16)

Second Year

Fall

SAGES University Seminar IIb (3-0-3)
CHEM 223 Organic Chemistry I (3-0-3)
EMAC 270 Introduction to Polymer Science and Engineering (3-0-3)
MATH 223 Calculus for Science and Engineering IIa (3-0-3)
PHYS 122 General Physics IIa (4-0-4)
Total (16-0-16)

Spring

Humanities or Social Science (3-0-3)
ENG 210 Introduction to Circuits & Instrumentation (4-0-4)
EMAC 377 Polymer Processing (3-0-3)
EMAC 398 Polymer Science & Engineering Project (SAGES Capstone Course)a,f (0-9-3)
Technical elective (3-0-3)
Total (13-9-16)

Fourth Year

Fall

Humanities or Social Science (3-0-3)
ENGR 200 Statics and Strength of Materials (3-0-3)
ENGL 398N Professional Communication (3-0-3)
Total (14-4-15)

Spring

Open Elective (3-0-3)
EMAC 372 Polymer Processing Laboratory (2-4-3)
EMAC 378 Polymer Production and Technology (3-0-3)
Technical elective (3-0-3)
Technical elective (3-0-3)
Total (14-4-15)

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: PHYS 221 or 223, General Physics III; BIOL 210, Molecular Cell Biology; BIOL 205, Chemical Biology; 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.
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.

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. Ultimately, however, materials is an engineering discipline, bringing basic science tools to bear on the technological challenges related to materials products and their manufacture.

**FACULTY**

**Gary M. Michal, Ph.D.**  
*(Stanford University)*  
*LTV Steel Professor and Chair*

Physical metallurgy; rapid solidification technology; application of rapid annealing to nonequilibrium precipitation reactions; transmission electron microscopy; surface science; composite materials; interfacial phenomena.

**James D. McGuffin-Cawley, Ph.D.**  
*(Case Western Reserve University)*  
*Great Lakes Professor of Ceramic Processing and Associate Dean of Engineering*

Powder processing of ceramics; aggregation phenomena; oxidation, diffusion, and solid state reactions; silicate and active metal brazing of ceramics; ceramic matrix composites.

**Mark R. DeGuire, Ph.D.**  
*(Massachusetts Institute of Technology)*  
*Associate Professor*


**Frank Ernst, Ph.D.**  
*(University of Göttingen)*  
*Professor*

Microstructure and microcharacterization of ceramics; 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 and Kyocera Professor of Ceramics*

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, 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 H. Payer, Ph.D.**  
*(Ohio State University)*  
*Professor*

Electrochemistry and corrosion; reliability and life prediction; hydrogen storage, fuel cells, corrosion monitoring and sensors; polymer/metal adhesion.

**P. Pirouz, Ph.D.**  
*(Imperial College of Science and Technology, England)*  
*Professor*

Defects in semiconductors; heteroepitaxial growth of electronic materials; diffraction theory; transmission electron microscopy and its applications in materials science; fiber-reinforced composites; synthetic growth of diamond.

**David Schwam, Ph.D.**  
*(The Technion University)*  
*Research Associate Professor*

Gating of advanced aluminum and magnesium alloys, development of die and permanent mold materials, thermal fatigue testing, recycling.

**Gerhard E. Welsch, Ph.D.**  
*(Case Western Reserve University)*  
*Professor*

Metals and oxides; high temperature properties, mechanical and electrical properties.
Materials for capacitive energy storage; metal sponges; high temperature materials, metal-cell composites. Synthesis of materials with designed micro- and nano-structures.

**Emeritus Faculty**

John Wallace  
(Massachusetts Institute of Technology)  
Professor  
Metallurgical processing, casting processes, effect of processing and material properties, die steels

**Secondary Faculty**

John Angus, Ph.D. (University of Michigan)  
Professor of Chemical Engineering  
Russell Wang, D.D.S.  
(University of Toronto)  
Associate Professor of Dentistry

**Adjunct Faculty**

Arnon Chait  
AdjunctProfessor  
NASA Glenn Research, Brookpark, Ohio  
Marc Constantino  
Adjunct Professor  
Lawrence Livermore Laboratory, Livermore, CA  
George Fischer  
Adjunct Professor  
IVAC Technologies, Cleveland  
N. J. Henry Holroyd  
Adjunct Professor  
Lusfer, USA, Riverside, California  
Warren H. Hunt, Jr.  
Adjunct Professor  
Aluminum Consultants Group, Inc., Murrysville, PA  
Jennie S. Hwang  
Adjunct Professor  
H-Technologies Group, Cleveland  
Terence Mitchell  
Adjunct Professor  
Los Alamos National Laboratory, Los Alamos, NM  
Gary Ruff  
Adjunct Professor  
Intermet Corp., Troy, Michigan

**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.

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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 completed at least one cooperative education assignment. Most students complete the recommended two assignments. 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.

The department offers two academic courses, EMSE C100 and EMSE C200, that may be taken for credit upon return from the first and second experience respectively.

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 the department. Interested students should contact Associate Dean James D. McGuffin-Cawley.

GRADUATE PROGRAMS
The department offers programs leading to the Master of Science and Doctor of Philosophy degrees with research specialties in metallurgy, ceramics, electronic materials, composite materials, and materials science. A broad range of studies of the theory, properties, and engineering behavior of materials is encompassed in the academic courses and research within the department, with primary areas of specialization 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 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 fill out 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^{7} 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 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.

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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 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:

- a. Mechanical Behavior
- b. Structure
- c. Physical Properties
- d. Processing
- e. Thermodynamics and Kinetics
- f. 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 areas 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 try that 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, computer-aided 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 apparatus. 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 dilatometer 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.

A Computational Materials Processing Laboratory has recently been established. The core of the facilities is a Silicon Graphics Origin 2000 which has high speed networking with an array of Octane workstations. A host of software packages are available as tools for the simulation and design of materials processing activities that range from crystal growth to powder consolidation to plastic deformation and also maintains a computer lab expressly for student use, including IBM-compatible and Macintosh computers, laser printers, DEC-net terminals, and a VAX-station 2000 with a large screen high resolution display.

Mechanical Testing Facility

The 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 room temperature while a gas (i.e. Ar) based apparatus can be used with an internal furnace.

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.

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 experiments 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 Testing:** 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 thermogravimetric studies and polymer/metal adhesion test fixtures.

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 spectroscopy (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 (WBDF) 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 atomistic 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 real-time 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 at 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 pelletron 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 turbo-molecular pumped high...
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 thermoelectrically cooled Pelletier 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.

MATERIALS SCIENCE AND ENGINEERING (ESME)

Undergraduate Courses
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. Prereq or Coreq: EMSE 201.

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, 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 material selection and of design of materials for particular performance requirements. Prereq: ENGR 145 and PHYS 121 and MATH 121.

EMSE 202. Phase Diagrams and Transformations (3)

Basic thermodynamics principles as applied to materials. Application of thermodynamics to material processing and performance including condensed phase and gaseous equilibria, stability diagrams, corrosion and oxidation, electrochemical and vapor phase reactions. Prereq: CHEM 301.

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. Prereq: 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. Prereq: 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, ap-
Applications of thermodynamics to molten metal re-actions, application of the principles of fluid flow and heat transfer to gaging and riser/writing techniques, and introduction to basic foundry and metal casting technology. Prereq: 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. Prereq: 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, manufacture (including machining), abuse allowance (safety factors), and cost. Interrelationships among parameters based on total systems design concepts. Case history studies. Systems of failure analysis. Prereq: 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. Prereq: 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. Approved SAGES capstone.

EMSE 399. Senior Project in Materials II (1)
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. The EMSE 398 and 399 sequence form an approved SAGES capstone. Approved SAGES capstone. Prereq: EMSE 398 or concurrent registration.

Graduate Courses

EMSE 400T. Graduate Teaching I (0)
To provide teaching experience for all Ph.D.-bound graduate students. This will include preparing exams/quizze, 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. Prereq: 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; injection molding; slip and tape casting; dry, isostatic, and hot isostatic pressing. Prereq: EMSE 316 (or concur).

EMSE 404. Diffusion Processes in Solids and Melts (3)

EMSE 405. Dielectric, Optical and Magnetic Properties of Materials (3)
Electrical properties of nonmetals: 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, multilayer capacitors, soft and hard magnets, optical fibers, and lasers. Prereq: Consent of instructor.

EMSE 407. Solidification (3)
Fundamental science of solid-liquid phase transformations and the application of these basics to the solidification processing of materials. Prereq: EMSE 301.

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. Prereq: EMSE 303.

EMSE 411. Environmental Effects on Materials Behavior (3)
Aqueous 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)
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. Prereq: Consent of instructor.

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. Prereq: Consent of instructor.

EMSE 500T. Graduate Teaching II (0)
To provide teaching experience for all Ph.D.-bound graduate students. This will include preparing exams/quiz/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. Prereq: 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. Prereq: 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 TEM, conventional TEM imaging, and scanning TEM. Examples from various fields of materials research illustrate the application and significance of these techniques. Prereq: 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. Prereq: EMSE 201 and EMSE 303 and ENGR 200; or consent.

EMSE 512. Advanced Electron Microscopy Techniques (3)
Theory and laboratory experiments to learn advanced techniques in electron microscopy; high resolution electron microscopy (HREM), convergent beam electron microscopy (CBED), and chemical analysis using energy dispersive x-ray spectroscopy (EDXS) and electron energy loss spectroscopy (EELS). Prereq: EMSE 515 and EMSE 516.

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. Prereq: EMSE 426.

EMSE 515. Analytical Methods in Materials Science (3)
Microcharacterization techniques of materials science and engineering: SPM (scanning probe microscopy), SEM (scanning electron microscopy), FIB (focused ion beam) techniques, SIMS (secondary ion mass spectrometry), EPMA (electron probe microanalysis), XPS (X-ray photoelectron spectroscopy), and AES (Auger electron spectroscopy), ESCA (electron spectrometry for chemical analysis). The course includes theory, application examples, and laboratory demonstrations.

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/quiz/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. Prereq: 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 Master's 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.

EMSE 703. Dissertation Fellowship (1-8)

EMSE C100. Co-Op Seminar I for Materials Science and Engineering (1)
Professional development activities for students returning from cooperative education assignments. Prereq: COOP 001.

EMSE C200. Co-Op Seminar II for Materials Science and Engineering (2)
Professional development activities for students returning from cooperative education assignments. Prereq: COOP 002 and EMSE C100.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE
Major in Materials Science & Engineering (pending approval by CSE USC)
First Year Class/Lab/Credit Hours
Fall
<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tr>
<td>CHEM 111</td>
<td>Principles of Chemistry for Engineers</td>
<td>4-0-4</td>
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<tr>
<td>ENGR 131</td>
<td>Elementary Computer Programming</td>
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<td>SAGES</td>
<td>SAGES First year Seminar</td>
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<td>MATH 121</td>
<td>Calculus for Science and Engineering I</td>
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<td>PHED 1xx</td>
<td>Physical Education Activities</td>
<td>0-3-0</td>
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<td>Open Elective or Humanities/Social Science Elective</td>
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**Spring**

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<tr>
<td>PHYS 121</td>
<td>General Physics I - Mechanics</td>
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**Second Year**

**Fall**

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<td>PHYS 122</td>
<td>General Physics II - Electricity &amp; Magnetism</td>
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<td>SAGES</td>
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**Spring**

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<td>Numerical Methods</td>
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<tr>
<td>EMSE 202</td>
<td>Phase Diagrams &amp; Phase Transformations</td>
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<td>EMSE 270</td>
<td>Materials Laboratory I</td>
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<td>Elementary Differential Equations</td>
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<td>Statics and Strength of Materials</td>
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**Third Year Class/Lab/Credit Hours**

**Fall**

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<td>ENGR 210</td>
<td>Introduction to Circuits and Instrumentation</td>
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<td>EMSE 203</td>
<td>Applied Thermodynamics</td>
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<td>EMSE 314</td>
<td>Electronic, Magnetic, and Optical Properties of Materials</td>
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<td>ENGR 398</td>
<td>Professional Communication</td>
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<td>EMSE 303</td>
<td>Mechanical Behavior of Materials</td>
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<td>ENGR 225</td>
<td>Thermodynamics, Fluid Mechanics &amp; Heat &amp; Mass Transport</td>
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**Fourth Year**

**Fall**

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<td>EMSE 301</td>
<td>Fundamentals of Materials Processing</td>
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<td>Fundamentals of Materials Processing Lab</td>
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<td>EMSE 310</td>
<td>Applications of Diffraction Principles</td>
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<td>Diffraction Principles</td>
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<td>EMSE 398</td>
<td>Senior Project in EMSE I</td>
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**Spring**

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**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. Satisfied 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 biennial 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></td>
<td>Annual</td>
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<td>ECIV 420</td>
<td>Finite Element Structural Analysis</td>
<td>X</td>
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<td>Annual</td>
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<tr>
<td>EECS 245</td>
<td>Circuits, Signals and Systems I</td>
<td>X</td>
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<td>Annual</td>
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<tr>
<td>EECS 246</td>
<td>Circuits, Signals and Systems II</td>
<td>X</td>
<td></td>
<td>Annual</td>
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<tr>
<td>EECS 309</td>
<td>Electromagnetic Fields I</td>
<td>X</td>
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<td>Annual</td>
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<td>EECS 321</td>
<td>Semiconductor Electronic Devices</td>
<td>X</td>
<td></td>
<td>Annual</td>
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<td>EMAC 270</td>
<td>Introduction to Polymer Science</td>
<td>X</td>
<td></td>
<td>Annual</td>
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<tr>
<td>EMSE 307</td>
<td>Foundry Metallurgy</td>
<td>X</td>
<td></td>
<td>Even Years</td>
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<tr>
<td>EMSE 316</td>
<td>Applications of Ceramic Materials</td>
<td>X</td>
<td></td>
<td>Even Years</td>
</tr>
<tr>
<td>EMSE 360</td>
<td>Transport Phenomena</td>
<td>X</td>
<td></td>
<td>Odd Years</td>
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<td>EMSE 401</td>
<td>Transformations in Materials</td>
<td>X</td>
<td></td>
<td>Even Years</td>
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<tr>
<td>EMSE 403</td>
<td>Modern Ceramic Processing</td>
<td>X</td>
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<tr>
<td>EMSE 404</td>
<td>Diffusion Processes in Solids and Liquids</td>
<td>X</td>
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<td>Odd Years</td>
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<tr>
<td>EMSE 405</td>
<td>Dielectric, Optical, &amp; Magnetic Properties of Materials</td>
<td>X</td>
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<td>Even Years</td>
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<td>EMSE 407</td>
<td>Solidification of Materials</td>
<td>X</td>
<td></td>
<td>Odd Years</td>
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<td>EMSE 409</td>
<td>Deformation Processing of Metals</td>
<td>X</td>
<td></td>
<td>Odd Years</td>
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<td>EMSE 411</td>
<td>Environmental Effects on Materials Behavior</td>
<td>X</td>
<td></td>
<td>Annual</td>
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<tr>
<td>EMSE 417</td>
<td>Properties of Materials at High Temperatures</td>
<td>X</td>
<td></td>
<td>Odd Years</td>
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<tr>
<td>EMSE 418</td>
<td>Oxidation of Materials</td>
<td>X</td>
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<td>EMSE 419</td>
<td>Phase Equilibria &amp; Microstructures of Materials</td>
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<td>EMSE 421</td>
<td>Fracture of Materials</td>
<td>X</td>
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<td>EMSE 426</td>
<td>Semiconductor Thin Film Science &amp; Technology</td>
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<td>Odd Years</td>
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<td>EMSE 427</td>
<td>Dislocations in Solids</td>
<td>X</td>
<td></td>
<td>Odd Years</td>
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<tr>
<td>EMSE 429</td>
<td>Crystallography &amp; Crystal Chemistry</td>
<td>X</td>
<td></td>
<td>Even Years</td>
</tr>
<tr>
<td>PHYS 331</td>
<td>Introduction to Quantum Mechanics 1</td>
<td>X</td>
<td></td>
<td>Annual</td>
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<tr>
<td>PHYS 315</td>
<td>Introduction to Solid State Physics</td>
<td>X</td>
<td></td>
<td>Annual</td>
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<tr>
<td>STAT 312</td>
<td>Statistics for Engineering and Science</td>
<td>X</td>
<td>X</td>
<td>Annual</td>
</tr>
<tr>
<td>STAT 313</td>
<td>Statistics for Experimenters</td>
<td>X</td>
<td>X</td>
<td>Annual</td>
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</tbody>
</table>

DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING
418 Glennan Building (7222)
Phone 216-368-2941; Fax 216-368-6445
Joseph M. Prahl, Chair
e-mail: jmp@case.edu
http://mae1.cwru.edu/mae/Pages/FacultyStaff/Faculty_/Prahl/Prahl.htm

The Department of Mechanical and Aerospace Engineering of the Case School of Engineering offers programs leading to bachelor, masters, and doctoral degrees. It administers the programs leading to the degrees of Bachelor of Science in 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 degree of Bachelor of Science in 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.

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 high quality, high impact research for the benefit of society through the advancement of technology.

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. Accordingly, the undergraduate programs of the Department of Mechanical and Aerospace Engineering seeks to produce graduates who:
(1) are broadly educated in the fundamentals of engineering and in the discipline of Aerospace Engineering or of Mechanical Engineering enabling them to conceive, design and implement processes, products, methods, materials or systems that impact...
and are beneficial to society.

(2) are aware of and respect the economic, environmental, ethical standards and norms that impact their profession and their work.

(3) understand the need for life-long learning and are prepared for continued learning in graduate programs or in other continuing education venues.

(4) are equipped to communicate effectively within their discipline and in inter-disciplinary situations, and to assume leadership roles in their profession and society at large.

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 orthopaedic 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, the employers, and the graduate schools. 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 monthly faculty meetings throughout the academic year. Periodic surveys of both alumni and employers 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 communication.
- 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**

Joseph M. Prahl, Ph.D.  
(Harvard University), P.E.  
Professor, Chair  
Fluid dynamics; heat transfer; tribology.  
Alexis R. Abramson, Ph.D.  
(UC Berkeley)  
Assistant Professor  
Micro/nanoscale heat transfer, 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, interferential transport capillary surface equilibria and dynamics, two-phase flow in porous media, vibrational convection  
R. Balasubramaniam, Ph.D.  
(Case Western Reserve University)
Research Associate Professor, National Center for Space Exploration Research; Microgravity Fluid Mechanics
Dwight T. Davy, Ph.D. (University of Iowa), P.E.
Professor
Musculo-skeletal biomechanics; applied mechanics.
David Hegde, Ph.D.
(Georgia Institute of Technology)
Research Associate Professor, National Center for Space Exploration Research
Combustion, turbulence and acoustics
Christopher Hernandez, Ph.D., (Stanford)
Assistant Professor
Musculo-skeletal biomechanics, solid mechanics and biological control systems
Jaikrishnan R. Kadambi, Ph.D.
(University of Pittsburgh)
Professor
Experimental fluid mechanics; multiphase flows; laser diagnostics; biological fluid mechanics; turbomachinery; heat transfer.
Yasuhiro Kamotani, Ph.D.
(Case Western Reserve University)
Professor
Experimental fluid dynamics; heat transfer; microgravity fluid mechanics.
Mohammad Kassemi, Ph.D. (Akron)
Research Associate Professor, National Center for Space Exploration Research
Computational Fluid Mechanics
Joseph M. Mansour, Ph.D.
(Rensselaer Polytechnic Institute)
Professor
Biomechanics; applied mechanics.
Vedha Nayagam, Ph.D.
(University of Kentucky)
Research Associate Professor, National Center for Space Exploration Research
Low gravity combustion and fluid physics.
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)
Professor
Biologically inspired robotics; agile manufacturing systems; structural dynamics, vibration and control.
Clare M. Rimnac, Ph.D. (Lehigh University)
Wilbert J. Austin Professor of Engineering and Director, Musculoskeletal Mechanics and Materials Laboratories
Biomechanics; fatigue and fracture mechanics.
Christine Sung, Ph.D. (Princeton University)
Associate Professor
Combustion; propulsion; laser diagnostics.
Fumiaki Takahashi, Ph.D. (Keio University)
Research Associate Professor, National Center for Space Exploration Research
Combustion, fire research, 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. T’ien, Ph.D. (Princeton University)
Professor and Chief Scientist for Combustion-National Center for Space Exploration Research
Combustion; propulsion, and microgravity fire research
ASSOCIATED FACULTY
Roberto Ballarini, Ph.D.
(Northwestern University)
Professor of Civil Engineering
Experimental and analytical studies of fatigue and fracture mechanics.
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, M.Sc.
(University of Warwick, U.K.)
Adjunct Assistant Professor
Advanced manufacturing systems; computer integrated manufacturing.
Robert V. Edwards, Ph.D.
(The Johns Hopkins University)
Professor of Chemical Engineering
Laser anemometry; mathematical modeling; data acquisition.
David Fyhrie, Ph.D. (Stanford University)
Adjunct Assistant Professor
H. Ford Hospital-biomechanics.
Christophe Geuzaine
Assistant Professor of Mathematics
Numerical Analysis, Scientific Computing, Computational Electromagnetism
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.
Kenneth Loparo, Ph.D.
(Case Western Reserve University)
Professor of Electrical Engineering and Computer Science
Control; robotics; stability of dynamical systems; vibrations.
David Matthiesen, Ph.D.
(Massachusetts Institute of Technology)
Associate Professor of Materials Science & Engineering
Microgravity crystal growth.
Robert L. Mullen, Ph.D.
(Northwestern University)
Professor and Chair of Civil Engineering
Computational mechanics; finite elements; interface mechanics.
Wyatt S. Newman, Ph.D.
(Massachusetts Institute of Technology)
Professor of Electrical Engineering and Computer Science
Mechatronics; high-speed robot design; force and vision-bases machine control; artificial reflexes for autonomous machines; rapid prototyping; agile manufacturing.
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; physicochemical hydrodynamics.
Eli Reshotko, Ph.D.
(California Institute of Technology)
Kent H. Smith Emeritus Professor of Engineering
Fluid Dynamics; heat transfer, propulsion; power generation.
Aerospace engineering has grown dramatically with the rapid development of the computer in experiments, design and numerical analysis. The wealth of scientific information developed as a result of aerospace activity forms the foundation for the aerospace engineering major. Scientific knowledge is being developed each day for programs to develop reusable launch vehicles (RLV), the International Space Station (ISS), High Speed Transport (HST), Human Exploration and Development of Space (HEDS) and micro-electro-mechanical sensors and control systems for advanced flight. New methods of analysis and design for structural, fluid, and thermodynamic applications are required to meet these challenges. The aerospace engineering major has been developed to address the needs of those students seeking career opportunities in the highly specialized and advancing aerospace industries.

MECHANICAL ENGINEERING

Civilization, as we know it today, depends on the intelligent and humane use of our energy 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 bachelors-masters 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 to participate 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. Alternative to the co-op 5 year program, is the 5 year combined bachelors/masters program in which a student can, by double counting 9 credit hours, complete a bachelor of science degree in anyone of the department’s three degree programs as well as a master of science degree in mechanical and aerospace engineering with a thesis 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. A third alternative is the 5 year TIME program taught in conjunction with the Weatherhead School of Management in which a student completes a BS in Aerospace or Mechanical Engineering and receives a Master of Engineering Management.

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.

- Students electing to take 18 hours of graduate-level courses and complete at least 9 credit hours of M.S. thesis research.
- Students complete 27 credit hours distributed in three ways: 21, 24, or 27 credit hours (seven, eight or 9 courses) of approved graduate course work and 6, 3, or 0 credit hours of project replacing the M.S. thesis.

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 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 closely related engineering disciplines. 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 thesis advisor to meet the objectives of the thesis research topic.

Breadth and Basic Science Courses

A minimum of six courses outside the department must be taken. These can be chosen from other engineering departments and the departments of mathematics and natural science. A minimum of two elective courses must be in mathematics.

Thesis Research

All doctoral programs must include a minimum of 18 credit hours of thesis research, EMAE 701.

Residence and Teaching Requirements

All doctoral programs require a minimum of one year of full-time residence in the program of study, three semesters of teaching experience, and must meet the rules of the School of Graduate Studies and the Case School of Engineering.
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 Reinberger Product and Process Development Laboratory, the Alden Laboratory for Numerically Controlled Machine Instruction and the General Motors 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://biorobots.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 a 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.

**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 environment-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 Spontaneous Raman Spectroscopy, 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 reduced chemistry, soot and NOx formation, microgravity combustion, emission reduction in internal combustion engines, and advanced propulsion systems.

**Laser Flow Diagnostics Laboratory**
A laser diagnostics laboratory is directed toward investigation of complex two-phase flow fields involved in energy-related areas, fluid mechanics of the heart, and slurry flow in pumps and spray characterization. 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 pulsatile flow loop simulating flow through the heart, a clear centrifugal slurry flow pump loop, and a particle laden jet facility simulating flow in fossil fuel flue gas flow conditions. Current research projects include investigation of flow through heart valves, development of simultaneous particle/droplet size and velocity measurement technique using PIV, development of innovative nozzles for sorbent laden flows for removal of toxins from flue gas, solid slurry flow through centrifugal pump impellers.

**The National Center for Space Exploration Research**
NCSER is a non-profit organization, created in 1997 as the National Center for Microgravity Research under the sponsorship of NASA. It was created in March 1997 through a cooperative agreement with Universities Space Research Association (USRA) and Case Western Reserve University. The NCSER is physically located on the campus of CWRU and at NASA GRC where NCSER scientists and engineers are work together with GRC personnel. The role of the NCSER is to:

- Perform critical path research in fluids and combustion to support NASA’s space program and related national initiatives
- Support the development of enabling technologies for space exploration
- Increase awareness of microgravity research and enhance its scientific, technological, educational, and economic impacts

Originally chartered with supporting and developing NASA microgravity experiments on the ‘shuttle’ and ISS, the combined NCSER expertise in fluids and combustion processes in reduced gravity (i.e., microgravity, Lunar and Martian gravity) is second to none. Our current in-house expertise includes fluids management and control in reduced gravity, reduced gravity combustion processes; micro-fluidics, heat transfer and phase change processes; computational multiphase fluid dynamics and heat and mass transfer, computational simulation of biomedical processes in support of the astronaut health-care and autonomous space medicine. NCSER scientists and engineers are currently engaged in leading or supporting NASA’s exploration research in the following areas: fire safety- flammability, suppression and detection, propellant management, thermal control, waste management and fluid processes essential to advanced human support technologies.
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 rotor-mass 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. The program has its origins in the pioneering research in musculoskeletal biomechanics of Dr. Victor Frankel and Dr. Albert Burstein, who began their research activities at the University in the 1960’s. 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. 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. There are also a Soft Tissue-testing lab with several standard and special test machines, an Instrumentation Laboratory, and a Biomechanical Computations and Design lab.

CASE Low Speed
Research Wind Tunnel

The CASE Low Speed Research Wind Tunnel has completed a major rebuilding effort during which flow quality, instrumentation, operability, flexibility, and noise and vibration levels, have been significantly improved. The tunnel provides very low free stream turbulence levels, making it suitable for highly sensitive boundary-layer stability experiments that require excellent flow quality. 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.

Nanoengineering Laboratory

The Nanoengineering Laboratory focuses on research related to various nanotechnology applications with particular emphasis on energy conversion, generation and storage in nanostructured materials. Synthesis of polymer-based nanocomposites is accomplished with tools available in the laboratory. Furthermore, the laboratory houses various pieces of equipment for thermal and electrical characterization of materials, including nanostructures and nanocomposites. A high resolution optical microscope with thin film measurement capabilities is also available. Atomic force microscopy (AFM) equipment is employed for local investigation of coupled mechanical, thermal and electrical characteristics of materials. The laboratory is also equipped with a high end computer workstation for computational simulations of nanoscale phenomena. 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.

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 monitoring 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.
- The Structural Dynamics Laboratory was developed with a grant from NSF and includes facilities for performing vibration and...
modal testing. This equipment includes laser vibrometers, accelerometers, electrodynamic shakers, computers and data acquisition systems.

- Engineering Services Fabrication Center offers complete support to assist projects from design inception to completion of fabrication. Knowledgeable staff are available to assist Faculty, Staff, Students, Researchers, and personnel associated with Case Western Reserve University.

- The Harry A. Metcalf Computational Laboratory offers 16 Dell 2.5GHz Pentium IV computers and 12 Dell 500MHz Pentium III computers, running Windows 2000 Professional attached to a Dell dual 500 MHz Pentium III server, running Windows NT 4.0 Server, via local area network running at 1Gb/s. The HEMCL also offers 29 UTP connections for Laptops running at 10/100 Mb/s. The Metcalf Laboratory provides access to a number of software packages. Some of these include Pro/Engineer 2001; Algor FEA; Visual Fortran 6.0; Matlab 6.5; Microsoft Office XP Standard; Mathematica; MathType; and Microsoft FrontPage 2000. 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 Reinberger Design Studio includes a total of 33 computers consisting of 18 Dell 1GHz Pentium III, 10 Dell 3.4 GHz Pentium IV, and 5 Dell 2.6GHz Pentium IV workstations for Undergraduate Student design use. These machines are connected via a Gigabit local area network to a Dell Dual 500MHz Pentium III server running Windows NT 4.0 and a Dell Dual 800MHz Pentium III server running Windows NT 4.0. The Studio is tied directly to the campus network allowing information to be shared with the HAMCL and other network resources. The Studio is used for the instruction of the SolidWorks 2005 CAD software, MasterCam 9.0 CAM software, Pro/Engineer WildFire 2.0 CAD/CAM/FEA software, and Algor 16.1 FEA software. The RDS also offers a 3D Systems Viper SI2 SLA machine for generating SLA models from Pro/Engineer models.

- The Reinberger Product and Process Development Laboratory is 1600 square feet of laboratory and office space dedicated to computer-aided engineering activities. The computer numerical control (CNC) laboratory includes both two industrial sized machine tools and two desktop machine tools with additional space for lecture and group project activities. The CNC machine tools located in the laboratory are; a HAAS VF3 4 axis-machining center, a HAAS 2 axis lathe, an EMCO PC MILL 50 3 axis mill and an EMCO PC TURN 50 2-axis lathe. A Mitutoyo coordinate measuring machine (CMM) located in its own laboratory space completes the facilities. The CMM enables students to inspect their manufactured components to a very degree of precision. The laboratory is used to support both undergraduate and graduate manufacturing courses (EMAE 390, EMAE 490).

- Supercomputing. The Department of Mechanical and Aerospace Engineering was awarded an 8-node Linux Beowulf Cluster from the Ohio Supercomputing Center (OSC) of Columbus, Ohio. Through the Cluster Ohio Project sponsored by OSC, the CWRU cluster is part of an ongoing project to supply parallel computing in a statewide arena through cluster grants, state-wide software licensing, and cluster construction. The CWRU cluster is one of nine sub-clusters awarded to seven universities in the state of Ohio, with the main cluster residing at OSC. The combined computing of the nine sub-clusters and the main cluster provides a total of 118 nodes of supercomputing power. The Mechanical and Aerospace Engineering Department believes that the use of the CWRU cluster will help enhance Undergraduate and Graduate student learning and research.

- The CWRU cluster is available for use by Undergraduate and Graduate student research. The CWRU Cluster Policy document explains the process of acquiring an account for use of the CWRU cluster for research. Students will need to use an SSH client to access the cluster, once they have received approval for their research using the CWRU cluster, for submittal of jobs. Users of the CWRU cluster that need an introduction to using the cluster can refer to http://oscinfo.osc.edu/computing/beo, or forward questions or problems to mail to, Professor Ed White of the MAE Department at Case (ebw@case.edu) or Doug Johnson of OSC. OSC also provides a Cluster Focus Group that may provide some insight to parallel computing. The MAE Department also has a direct access to all NSF supercomputing centers, primarily to the Pittsburgh Supercomputing Center. Computing-intensive research projects can obtain an account on those supercomputers through their advisers. 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 Transportation
Aerospace mechanics, aircraft aerodynamics (subsonic, supersonic and hypersonic), stability and transition of boundary layers and free shear layers, flow around aerodynamic surfaces under icing conditions, flow in turbomachinery, molecular dynamics simulation of rarefied gas flow, two phase flow, supersonic combustion and control of internal combustion engines.

Combustion
Flame spread, microgravity combustion, fire research, chemical kinetic models and pollutant formation.

Dynamics of Rotating Machinery
Forced and instability vibration of rotor/bearing/seal 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
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 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; neuromuscular control; 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 microsecond 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.

EMAE 152. Thermodynamics II (3)
Thermodynamic properties of liquids, vapors and real gases, non-reactive mixtures, psychometrics and reactive systems; combustion; thermodynamic cycles. Prereq: ENGR 225.

EMAE 170. Introduction to Mechanical Engineering (3)
Introduces beginning engineering student to how things work through an insightful overview of mechanical and aerospace engineering. Focus is on automobiles, airplanes and flight mechanics, turbomachinery and electric power generation, manufacturing methods, heating and air conditioning, rockets and space flight mechanics. Relevance of math, science and engineering fundamentals to well-founded B.S. engineering programs.

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, dynamic equilibrium. Elementary vibrations. Prereq: MATH 122 and PHYS 121. ENGR 200 recommended.

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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: ENGR 225.

EMAE 350. Mechanical Engineering Analysis (3)
Methods of problem formulation and application of frequently used mathematical methods in mechanical engineering. Modeling of discrete and continuous systems, solutions of single and multi-degree
of freedom problems, boundary value problems, transform techniques, approximation techniques. Prereq: MATH 224.

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 developing (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)

EMAE 360. Engineering Design (3)
The various elements of design: formulation, conceptualization, selection, and evaluation for the initiation of new designs and the modification of existing designs. Various design methodologies including optimization methods, search techniques, constrained gradient methods, penalty functions, statistical design methods, risk analysis, probabilities of failure, and computer applications. Prereq: ECIV 310.

EMAE 367. 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: ECIV 310.

EMAE 376. Aerostructures (3)

EMAE 377. 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. Approved SAGES capstone.

EMAE 378. 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. Prereq: EMAE 370.

EMAE 379. 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. Prereq: EMAE 181.

EMAE 381. Flight and Orbital Mechanics (3)
Aircraft performance: take-off and landing, unaccelerated flight, range and endurance, flight trajectories, static stability and control, simple maneuvers. Orbital mechanics: the solar system, elements of celestial mechanics, orbit transfer under impulsive thrust, continuous thrust, orbit transfer, decay of orbits due to drag, elements of lift-off and re-entry. Prereq: ENGR 225. EMAE 359 suggested.

EMAE 382. Propulsion (3)

EMAE 387. Vibration Problems in Engineering (4)

EMAE 390. Computer-Integrated Manufacturing (3)
The course is taught through a series of lectures, class discussions, group projects, 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. Prereq: EMAE 290.

EMAE 396. Special Topics in Mechanical and Aerospace Engineering I (1-18)
(Credit as arranged.) Prereq: Consent of instructor.

EMAE 397. Special Topics in Mechanical and Aerospace Engineering II (1-18)
(Credit as arranged.) Prereq: Consent of instructor.

EMAE 398. Senior Project I (3)
Individual or team design or experimental project under faculty supervision. Requirements include periodic reporting of progress, plus a final oral presentation and written report. Approved SAGES capstone. Prereq: Senior standing, EMAE 360, and consent of instructor.

EMAE 399. Senior Project II (3)
Continuation of EMAE 398.

EMAE 400T. Graduate Teaching I (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, demonstrations) and grading activities. The teaching experiences 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. Prereq: Ph.D. student in Mechanical Engineering.

EMAE 401. Mechanics of Continuous Media (3)
Vector and tensor calculus. Stress and traction, finite strain and deformation tensors. Kinematics of continuous media, general conservation and balance laws. Material symmetry groups and observer transformation. Constitutive relations with applications to solid and fluid mechanics problems.

EMAE 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, receptors and
reflexes 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. Prereq: EMAE 181 or equivalent. Cross-listed as EBME 402.

EMAE 403. Aerophysics (3)
The course introduces the physical and chemical topics of basic importance in modern fluid mechan-
ics, plasma dynamics, and combustion sciences: statistical calculations of thermodynamic properties of gases; quantum mechanical analysis of atomic and molecular structure; transport phenomena; propagation, emission, and absorption of radiation; chemical and physical equilibria; adiabatic flame temperatures of complex reacting systems; and re-
action kinetics.

EMAE 404. Molecular Gasdynamics (3)
This course first discusses the basic kinetic theory model of a gas, including the essential physical ideas and some of the important fundamental results (equilibrium state, entropy, transport coefficients). The major emphasis of the course is on computer simulation methods, especially molecular dynamics and Monte-Carlo methods. A variety of applica-
tions is discussed, including basic fluid flows, low earth orbit flight, gas-surface interaction, and na-
nscale devices.

EMAE 415. Introduction to Musculo-skeletal Biomechanics (3)

EMAE 424. Introduction to Nanotechnology (3)
An exploration of emerging nanotechnology re-
search. Lectures and class discussion on 1) nano-
structures: superlattices, nanowires, nanotubes, quantum dots, nanoparticles, nanocomposites, proteins, bacteria, DNA; 2) nanoscale physical phe-
nomena: mechanical, electrical, chemical, thermal, biological, optical, magnetic; 3) nanofabrication: bottom up and top down methods; 4) character-
ization: microscopy, property measurement tech-
niques; 5) devices/applications: electronics, sensors, actuators, biomedical, energy conversion. Top-
ics will cover interdisciplinary aspects of the field. Cross-listed as EEC 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 Newtonian viscous equations. Kinematics and dynamics of inviscid, incompressible flow including free streamline theory developed using vec-
tor, complex variable, and numerical techniques.

EMAE 454. Advanced Fluid Dynamics II (3)
Continuation of EMAE 453. Low Reynolds num-
ber approximations. Matching techniques: inner and outer expressions. High Reynolds number ap-
proximations: boundary layer theory. Elements of gas dynamics: quasi one-dimensional flow, shock waves, supersonic expansion, potential equation, linearized theory, and similarity rules. Prereq: EMAE 453.

EMAE 457. Combustion (3)
Chemical kinetics and thermodynamics; govern-
ing conservation equations for chemically reacting flows; laminar premixed and diffusion flames; tur-
bulent flames; ignition; extinction and flame stabil-
ization; 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. Prereq: Consent of instructor.

EMAE 459. Advanced Heat Transfer (3)
Analysis of engineering heat transfer from first prin-
ciples including conduction, convection, radiation, and combined heat and mass transfer. Examples of significance and role of analytic solutions, approxi-
mate methods (including integral methods) and numerical methods in the solution of heat transfer problems. Prereq: 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 characterizations. Pre-
req: Consent of instructor.

EMAE 471. Design Methods (3)
An advanced course on design methodologies. Conceptualization, preliminary design, detail de-
sign, and manufacturing. Failure analysis, materials selection, methods of design optimization, and cur-
rent approaches in computer-aided design. Prereq: EMAE 360.

EMAE 477. Biorobotics Team Research (3)
Many exciting research opportunities cross disciplin-
ary 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 undergradu-
ate 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 inter-
views with the faculty. They will research a biologi-
cal 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 de-
vice occur in week 15. Cross-listed as BIOL 467.

EMAE 478. Mechanics of Machinery I (3)
(See EMAE 378.)
EMAE 479. Mechanics of Machinery II (3)
A comprehensive treatment of design analysis methods and computational tools for machine components. Emphasis is on vibration and machin-
ery dynamics.

EMAE 480. Fatigue of Materials (3)
Fundamental and applied aspects of metals, polym-
ers and ceramics. Behavior of materials in stress and strain cycling, methods of computing cyclic stress and strain, cumulative fatigue damage under complex loading. Application of linear elastic fracture mechanics to fatigue crack propagation. Mech-
anisms of fatigue crack initiation and propagation. Case histories and practical approaches to mitigate fatigue and prolong life.

EMAE 481. Advanced Dynamics I (3)
Particle and rigid-body kinematics and dynamics. Inertia tensor, coordinate transformations and ro-
tating reference frames. Application to rotors and gyroscopes. Theory of orbital motion with applica-
tion to earth satellites. Impact dynamics. Lagrange equations with applications to multi-degree of free-

EMAE 486. Stress Waves in Solids (3)
Stress waves in one-dimension, problem formulation for 3-D waves. Reflection and refraction at a plane boundary stress pulses and Raleigh surface waves. Wave guides and dispersion relationships. Solutions of mixed initial and boundary value prob-

EMAE 487. Vibration Problems in Engineer-
ing (3)
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 theoreti-
ical concepts and applications. Prereq: EMAE 181 and MATH 224.

EMAE 489. Robotics I (3)
Orientation and configuration coordinate transfor-
mations, forward and inverse kinematics and Newton-Euler and Lagrange-Euler dynamic analy-
EMAE 490. World-Class Manufacturing (3)
The course is taught through a series of lectures, class discussions, and group projects. The course aim is to provide a solid understanding of the changing technologies and management strategies for companies to maintain competitive advantage in an increasingly global market. Issues such as 'Order Winning Criteria,' 'Lean Manufacturing,' and 'Cellular Manufacturing' will be reviewed and guest speakers will be invited to give an industrial perspective on specific topics of the course. Prereq: EMAE 290, EMAE 390 or permission of instructor.

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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: 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 as 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. Prereq: Ph.D. student in Mechanical Engineering.

EMAE 651. Thesis M.S. (1-18)
EMAE 655. Theories of Hydrodynamic Stability (3)
Stability of parallel flows; general development with application to channel flows and boundary layer flows; magnetohydrodynamic parallel flows; rotating Couette flow; superposed fluids; thermal instability of fluids heated from below; non-linear considerations. Prereq: EMAE 454.

EMAE 657. Experimental Techniques in Fluid and Thermal Engineering Sciences (3)
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)
EMAE 703. Dissertation Fellowship (1-8)

EMAE C100. Co-Op Seminar I for Mechanical Engineering (1)
Professional development activities for students returning from cooperative education assignments. Prereq: COOP 001.

EMAE C200. Co-Op Seminar II for Mechanical Engineering (2)
Professional development activities for students returning from cooperative education assignments. Prereq: COOP 002 and EMAE C100.

BACHELOR OF SCIENCE IN ENGINEERING DEGREE

Major in Aerospace Engineering
Freshman 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)
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 101 Physical Education Activities (0-3-0)
FSCC 100 First Seminar (3-0-3)
Total (15-3-15)

Sophomore Year
Fall
University Seminar (3-0-3)
ENGR 172 Mechanical Manufacturing (3-3-4)
EMAE 181 Dynamics c (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 (17-5-19)

Spring
University Seminar (3-0-3)
ENGR 210 Electronic Circuits a (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)

Junior 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 I (1-3-2)
ECIV 310 Strength of Materials (3-0-3)
ENGL 398N Professional Communication (3-0-3)
Technical Elective (3-0-3)
Total (16-3-17)

Senior Year
Fall
Humanities or Social Science Elective (3-0-3)
EECS 212 Intro to Signal, Sys, and Con I (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
University Seminar (3-0-3)
EMAE 181 Dynamics (3-0-3)
MATH 224 Elementary Differential Equations (3-0-3)
ENGR 210 Electronic Circuits (3-0-3)
Science Elective (3-0-3)
Total (16-0-16)

Sophomore Year
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)
Technical Elective (3-0-3)
Total (14-3-15)

Spring
University Seminar (3-0-3)
EMAE 181 Dynamics (3-0-3)
MATH 224 Elementary Differential Equations (3-0-3)
ENGR 210 Electronic Circuits (3-0-3)
Science Elective (3-0-3)
Total (16-0-16)

Junior Year Class-Lab-Credit Hours
Fall
Humanities or Social Science Elective (3-0-3)
EECS 212 Intro to Signal, Sys, and Con I (3-0-3)
EECS 214 Signal and Systems Lab (0-2-1)
EMAE 355 Design of Fluid and Thermal Elements (3-0-3)
Technical Elective (Dept. Sem.) (3-0-3)
Total (15-7-18)

Spring
Humanities or Social Science Elective (3-0-3)
EMAE 387/487 Vibration Problems in Structures (3-3-4)
FSCC 100 First Seminar (3-0-3)
PHED 101 Physical Education Activities (0-3-0)
Total (17-5-18)

Senior Year
Fall
Humanities or Social Science Elective (3-0-3)
EECS 212 Intro to Signal, Sys, and Con I (3-0-3)
EECS 214 Signal and Systems Lab (0-2-1)
EMAE 355 Design of Fluid and Thermal Elements (3-0-3)
Technical Elective (3-0-3)
Total (15-3-15)

Spring
University Seminar (3-0-3)
EMAE 181 Dynamics (3-0-3)
MATH 224 Elementary Differential Equations (3-0-3)
ENGR 210 Electronic Circuits (3-0-3)
Science Elective (3-0-3)
Total (16-0-16)

Technical Electives by Program
Aerospace engineering
- EMAE 271 Kinematic Analysis & Synthesis
- EMAE 370 Design of Mechanical Elements
- EMAE 152 Thermodynamics II

Mechanical Engineering
- EMAE 152 Thermodynamics II
- EMAE 356 Aerospace Design
- EMAE 359 Aero/Gas Dynamics
- EMAE 376 Aerostructures
- EMAE 381 Flight and Orbital Mechanics
- EMAE 382 Propulsion

Both Programs
- EMAE 372 Relation of Materials to Design
- EMAE 378 Mechanics of Machinery I
- EMAE 387/487 Vibration Problems in Engr.
- Technical Electives

Aerospace
- EMAE 356 Aerospace Design
- EMAE 359 Aero/Gas Dynamics
- EMAE 376 Aerostructures
- EMAE 381 Flight and Orbital Mechanics
- EMAE 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
- EMAE 366 Biologically Inspired Robotics
- EMAE 402 Muscles, Biomechanics and Control of Movement
- EMAE 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**
- EMAE 378/478 Mechanics of Machinery I
- EMAE 387/487 Vibration Problems in Engineering
- EMAE 479 Mechanics of Machinery II
- EMAE 481 Advanced Dynamics I
- EMAE 484 Mechanisms and Motion Synthesis
- Fluid and Thermal Engineering
- EMAE 152 Thermodynamics II
- EMAE 359 Aero/Gas Dynamics
- EMAE 424 Intro to Nanotechnology
- EMAE 453 Advanced Fluid Dynamics I
- EMAE 460 Theory & Design of Fluid Power Machinery

**Fluid and Thermal Sciences**
- EMAE 453 Advanced Fluid Dynamics I
- EMAE 454 Advanced Fluid Dynamics II
- EMAE 455 Advanced Thermodynamics
- EMAE 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
- EMAE 473 Mechanical Behavior of Composite Materials
- EMAE 480 Fatigue of Materials
- Mechanical Design
- EMAE 372 Relations of Materials to Design
- EMAE 471 Design Methods
- EMAE 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
- 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
In addition to in-depth study of one or more major or minor fields, undergraduates in the college participate in SAGES (Seminar Approach to General Education and Scholarship). The SAGES curriculum is designed to foster critical thinking, communication skills, ethical reflection, and active engagement in the life of the mind. The program sequence consists of three small, interdisciplinary seminars taken in the first and second years; a departmental seminar, usually in a student’s major field, in the junior year; and a senior capstone experience.

Since SAGES is the general education curriculum for all Case undergraduates, it provides students in the college with an opportunity to engage in collaborative inquiry with their peers in engineering, nursing, and management.

ALUMNI/SENIOR AUDIT
Molly W. Berger, Assistant Dean
www.case.edu/artsci/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 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.

INTERDISCIPLINARY CENTERS
Baker-Nord Center for the Humanities
Timothy K. Beal, Director
Anne Helmreich, Associate Director
www.case.edu/artsci/bakernord/

The Baker-Nord Center for the Humanities, established in 1996, works to raise the profile of the humanities and performing arts disciplines at Case, both on campus and in the Cleveland community.

In addition to providing a forum for presentation of faculty work, the center facilitates conversation and collaboration among faculty and students, with colleagues in the sciences and social sciences, and through joint programs with other University Circle institutions. It sponsors conferences, colloquia, seminars, lectures, and other special events; fosters collegiality; and provides a home for new research and intellectual ventures in the humanities. The center also offers grants and fellowships to Case faculty and students in the humanities, and to Case faculty in the natural, medical, and social sciences working with issues related to the humanities.

Center for Science and Mathematics Education
www.case.edu/artsci/csm/

The Center for Science and Mathematics Education was established in 1998 to serve as a clearinghouse for the pre-Kindergarten to twelfth-grade education outreach programs in the college and to provide a local base for the national JASON Project, an annual expedition-based science and technology curriculum for middle and high school students. The role of the center has grown, and it now also serves as the administrative home for the Northeast Ohio Regional Science Olympiad and the NSF-funded Cleveland Mathematics and Science Partnership. The center supports more than seventy-five events, competitions, and professional development programs throughout the university. The center serves as a single point of access to these and other resources at the university and acts as a catalyst in the development of new programs.

College Scholars Program
Linda Ehrlich, Co-director
Patricia Princehouse, Co-director
www.case.edu/artsci/scholars/

The College Scholars Program, instituted in 1997, is a three-year academic enhancement program open to undergraduates interested in forming a community of learners dedicated both to pursuing individual intellectual excellence and to 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. The 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 six semesters.
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 the kind of initiative and creative thinking that gives our majors an advantage in later life. American Studies provides excellent preparation for planning careers in a variety of fields, including but not limited to law, journalism, social work, museum studies, teaching, and communications.

**AMERICAN STUDIES STEERING COMMITTEE**

Renee M. Sentilles, Ph.D.
(College of William and Mary)
Associate Professor of American History
American social and cultural history; American Women’s history; Race relations; American West; American South; popular culture.

Henry Adams, Ph.D. (Yale University)
Professor of American Art; Curator of American Art, Cleveland Museum of Art
American Art of the 19th and early 20th centuries

Mary E. Davis, Ph.D (Harvard University)
Associate Professor of Musicology
Music history, 20th Century music, world music, American popular music, and collaborative piano.

Robert Spadoni Ph.D
(University of Chicago)
Assistant Professor of English
Film history, film reception, and the horror film.

John Grabowski, Ph.D.
(Case Western Reserve University)
Krieger-Mueller Associate Professor in Applied History and Director of Research at The Western Reserve Historical Society
Immigration and ethnicity, local (Cleveland) urban history, and public history, particularly the fields of archives and museums.

Daniel Cohen, Ph.D. (Brandeis University)
Associate Professor of History
Early American history, social and cultural history

Daniel Goldmark, Ph.D.
(University of California, Los Angeles)
Assistant Professor of Musicology

**UNDERGRADUATE PROGRAMS**

**Major**
30 credit hours
Required courses (12 hours): AMST 117, HSTY 112, AMST 390, and one of the following courses: ARTH 270, HSTY 381, SOC 349.
Elective Courses (18 hours): Students are to choose 18 hours in consultation with the director of the program.
The major requires four core courses (three in American Studies, one in history) and six courses (18 hours) 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. The student will work out a program of study in consultation with the program director.

**Minor**
A minor consists of five courses: the intro 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.

**General Education Requirements**
The following American Studies courses may be used to satisfy the History, Philosophy, and Religion portion of the college’s General Education Requirements:

**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. Cross-listed as HSTY 117.

**AMST 270. American Art and Culture Before 1900 (3)**
(See ARTH 270.) Cross-listed as ARTH 270.

**AMST 271. American Art and Culture - 20th Century (3)**
(See ARTH 271.) Cross-listed as 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.
Cross-listed as THTR 327.

**AMST 390. Independent Study (1-3)**

**Departmental Honors in American Studies**

 Majors with a cumulative average of 3.85 in American Studies courses are nominated by the faculty for departmental honors. Candidates present to the faculty a term paper or project of outstanding quality as the basis for the award of honors.

*Please note that any course in the CAS curriculum that focuses on the United States and its cultures is eligible to be counted towards the American Studies major, upon agreement with the director of the program.

**DEPARTMENT OF ANTHROPOLOGY**

238 Mather Memorial Building
Phone 216-368-2264; Fax 216-368-5334
Lawrence Greksa, Chair

Anthropology, with its broad comparative approach, is in a strategic position to contribute to the identification and resolution of many of the problems 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, and combined Doctor of Medicine-Doctor of Philosophy, and Master of Arts/Doctor of Philosophy in Anthropology-Master of Public Health, and Master of Science in Nursing-Master of Arts) degrees. 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.

**FACULTY**

**Eileen Anderson-Fye, Ed.D.**
(Harvard University)
Assistant Professor; Associate Director, Schubert Center for Child Development (On leave 2006-07)
Psychological and medical anthropology; culture, gender, and human development; anthropological methods and theory; family and cultural contexts in health care; biocultural stress, biopsychosocial approaches to health care; nutrition; urban health; United States, Africa.

**Melvin A. Goldstein, Ph.D.**
(University of California, Los Angeles)
Professor; Associate Professor of Anthropology; Associate Dean of Arts and Sciences; Director, Center for Child Development
Cultural and medical anthropology; anthropology of disease; cross-cultural aging; family violence; neighborhood; United States, Old Order Amish.

**Charlotte Ikels, Ph.D.**
(University of Hawaii)
Professor
Gerontology; healthcare; urban life; comparative bioethics; Hong Kong, China, United States.

**Jill E. Korbin, Ph.D.**
(University of California, Los Angeles)
Professor; Associate Dean of Arts and Sciences; Director, Childhood Studies; Director, Schubert Center for Child Development
Cultural and medical anthropology; cross-cultural child rearing and family studies; child abuse and neglect; family violence; neighborhood; United States, Old Order Amish.

**Janet McGrath, Ph.D.**
(Northwestern University)
Associate Professor; Director of Graduate Programs; Assistant Professor of International Health, School of Medicine
Biological and biomedical anthropology; anthropology of disease; international health; AIDS, urban health; United States, Africa.

**Jim Shaffer, Ph.D.**
(University of Wisconsin, Madison)
Associate Professor
Archaeology, Middle East; Central Asia; Indus Valley, India.

**Adjunct Faculty**

**Marc Abramik, Ph.D.**
(University College London)
Adjunct Assistant Professor
Katie 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 ethnology.
Adjunct Associate Professor; Associate Professor, (Kent State University)
Scott Simpson, Ph.D.
North American prehistory, Eastern Woodland

Cleveland Museum of Natural History; Curator and Head of Archaeology,
Adjunct Associate Professor; Museum Director,
Brian Redmond, Ph.D. (Indiana University)

Biological anthropology; Plio-Pleistocene hominid evolution; comparative primate anatomy; biomechanics of locomotor system
Ellen S. Lazarus, Ph.D.
(Case Western Reserve University)

Adjunct Associate Professor, MetroHealth Medical Center
Sociocultural and medical anthropology; maternal and child health, gender, ethnicity and social class, medical ethics and education, and urban anthropology; longitudinal reproductive patterns of childhood including birth outcomes, family planning and patient assessment of perinatal healthcare.
Jeffrey Longhofer, Ph.D.
(University of Kansas)

Adjunct Associate Professor
Medical anthropology, mental health, applied anthropology, gender and sexuality, philosophy of social science/theory.
Isabel Parraga, Ph.D.
(Case Western Reserve University)

Adjunct Associate Professor; Associate Professor of Nutrition
Nutritional anthropology; international nutrition; nutrition and growth; maternal and child nutrition; schistosomiasis and growth and nutrition; public health nutrition.

Brian Redmond, Ph.D. (Indiana University)

Adjunct Associate Professor; Museum Director of Science; 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, Department of Anatomy, School of Medicine
Biological Anthropology, Plio-Pleistocene hominid evolution.

Medical Anthropologists in Other Departments
Patricia A. Marshall, Ph.D. (University of Kentucky)

Adjunct Associate Professor
Associate Professor Biomedical Ethics, Center for Biomedical Ethics. Bioethics; HIV/AIDS.
Christian Simon, Ph.D.
(University of California, San Francisco)

Adjunct Assistant Professor; Assistant Professor, Department of Bioethics

Yohannes Haile-Selassie, Ph.D.
(University of California, Berkeley)

Adjunct Assistant Professor
Curator/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

Bruce Latimer, Ph.D.
(Kent State University)

Adjunct Associate Professor; Executive Director,
Curator/Head of Physical Anthropology, (Kent State University)

Yohannes Haile-Selassie, Ph.D.

Other departments

Adjunct Assistant Professor; Assistant Professor, (University of California, San Francisco)

Christian Simon, Ph.D.

General Anthropology Concentration

ANTH 102 and 103

ANTH 319

One course dealing with a geographic area (e.g., ANTH 331, 341, 352, 353, 356 or 357)

Approved anthropology electives: 24 semester hours

Health Science Anthropology Concentration

ANTH 102, 103, and 215

ANTH 319

One course dealing with a geographic area (e.g., ANTH 331, 341, 352, 353, 356, or 357)

At least three courses dealing with health/illness-related topics (e.g., ANTH 301, 304, 306, 309, 318, 351, 359, 365, 369, 371, 376, 393, or 397)

Approved anthropology electives: 12 semester hours

Archaeology Anthropology Concentration

ANTH 102, 103, and 107

ANTH 319

One course dealing with a geographic area (e.g., ANTH 202, 331, 341, 352, 353, 356, or 357)

Three approved archaeology courses: (e.g., ANTH 202, 321, 324, 330, 331, 333, 399, summer fieldwork)

Four approved electives: 12 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, 356, or 357)

At least three courses dealing with physical anthropology (e.g., ANTH 295, 301, 302, 369, 393, 397, ANAT 375, 377, 383)

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CASE WESTERN RESERVE UNIVERSITY
Approved anthropology electives: 15 semester hours

Minor
The department offers four minor emphases in anthropology: a general anthropology emphasis, a health science-oriented anthropology emphasis, an archaeological anthropology 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, 356, or 357)
Two approved electives: 6 semester hours
Health Science-Oriented Anthropology Minor
ANTH 102, 103, and 215
One course dealing with a geographic area (e.g., ANTH 331, 341, 352, 353, 356, or 357)
One course dealing with health-related topics (e.g., ANTH 301, 304, 306, 309, 318, 351, 359, 365, 369, 371, 376, 393, or 397)

Archaeology Minor
ANTH 102, 103, and 107
One course dealing with a geographical area (e.g., ANTH 331, 341, 352, 353, 356, or 357)
One approved archaeology elective: ANTH 202, 321, 330, 331, 333, 399, summer fieldwork

Physical Anthropology Minor
ANTH 102 and 103
One course dealing with a geographical area (e.g., ANTH 331, 341, 352, 353, 356, or 357)
Two approved physical anthropology electives: (e.g., ANTH 295, 301, 302, 306, 369, 393, 397, ANAT 375, 377, 383)

Engineering Core
A social science sequence for the B.S. based on the Engineering Core requires ANTH 102 or 103 and two other courses of which at least one must be a 300-level course.

Departmental Honors
This program is open to qualified majors in anthropology who have completed 15 hours of anthropology with a 3.25 grade point average and who have a 3.0 grade point overall average. 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.

GRADUATE PROGRAM
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 Anthropology department also offers three combined degrees, which are the following:
1. Master of Science in Nursing/Master of Arts degree with the School of Nursing.
2. Doctor of Medicine/Doctor of Philosophy degree with the School of Medicine.
3. M.A./Ph.D./M.P.H. degree with the School of Medicine.

Requirements for the Master of Arts Degree
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 also have 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.

Requirements for Doctor of Philosophy Degree
The Doctor of Philosophy degree program in anthropology includes specializations in medical anthropology, international health, psychological anthropology, cross-cultural aging, urban health, 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 the written Doctor of Philosophy candidacy 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.

DESCRIPTION OF PROGRAMS 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 techno-environmental 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, human adaptation and disease, nutrition, international health, urban health, psychiatric anthropology, 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. A specific plan of study is developed in consultation with their advisor. It requires a minimum of 36 credit hours:
1. 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.
2. Students must complete two seminars (500 level).
3. 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.
4. 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 the written Doctor of Philosophy candidacy 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 PROGRAM

International Health
The international health specialization within the graduate program in Medical Anthropology offers students training in international health research as well as 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, academic, or administrative positions in governmental or private agencies. All Master of Arts 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 Anthropology
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 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 Master of Arts 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 an elective 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 Master of Arts 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 Master of Arts students in cross-cultural aging must complete 27 credit hours, including the Medical Anthropology Program 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.

THE CROSS-CULTURAL GERONTOLOGY 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 this program are qualified to work in research or administrative positions in governmental and private agencies, as well as teach at the college and university levels. All Master of Arts 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 advisor’s approval.

Ph.D. Requirements

All Ph.D. students in cross-cultural aging are required to develop a specific plan of study in consultation with their advisor. It requires a minimum of 36 credit hours:
1. 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.)
2. 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 the written Doctor of Philosophy candidacy 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./Ph.D./M.P.H. Program with the School of Medicine

The joint M.A./Ph.D./M.P.H. 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. Each joint degree student will develop a program of study with their advisors in both Anthropology and Public Health.

Joint M.S. Nursing/M.A. Anthropology Program

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 multi-cultural 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.

Joint Doctor of Medicine/Doctor of Philosophy Program

The objectives of the joint M.D./Ph.D. programs are to train unusually qualified students 1. to conduct research on a broad range of biocultural problems, with emphasis on the relationship between medicine, ecology, subsistence variables, population dynamics, and disease epidemiology; and 2. to identify and analyze sociocultural impediments to the successful introduction of effective functioning, and evaluation of programs of health care in diverse contexts.

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 Application Service in Washington, D.C., but applicants may write to the Admission Office of the School of Medicine for further information about the application procedure. The names of students whose applications have been reviewed favorably by the Department of Anthropology will be forwarded to the Admissions Committee of the School of Medicine with a recommendation that, if accepted by the School of Medicine, these applicants be admitted to the joint-degree program. The Department of Anthropology’s recommendation does not imply automatic admission to that school. The credentials presented by applicants to the program will be considered competitively among all other applicants to the School of Medicine.

Other Specializations

Students interested in graduate degrees in social-cultural or physical anthropology should contact the department about requirements.

UNDERGRADUATE (ANTH)

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,社会组织, 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 188. On Being a Scientist (1)

(See ASTR 188.) Cross-listed as ASTR 188.

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 212. Popular Culture in the United States (3)

This course considers the history, character and constituents of popular culture in the U.S. and the various methods by which it is defined and studied. Key elements of popular culture in the United States are...
considered in their social (ethnic, gender, age) and historical contexts. The course provides an introduction to other more specialized courses in the anthropology of Gender, Popular Music and Science and Medicine. We will consider both themes and images (icons) of Usonian popular culture, their origins and transformations.

ANTH 215. Health, Culture, and Disease: An Introduction to Medical Anthropology (3)
This course is an introduction to the field of Medical Anthropology. Medical Anthropology is concerned with the cross-cultural study of culture, health, and illness. During the course of the semester, our survey will include (1) theoretical orientations and key concepts; (2) the cross-cultural diversity of health beliefs and practices (abroad and at home); and (3) contemporary issues and special populations (e.g., AIDS, homelessness, refugees, women’s health, and children at risk).

ANTH 220. Language Culture and Communication (3)
This course is an introduction to the scientific study of language and communication in the context of culture and social life. The goal of this class is to provide you with a linguistics perspective that is theoretically based and ethnographically constituted. We will examine diverse topics and issues essential to gaining an understanding of the complex interrelationships between language, communication and culture. The topics will include: the nature of language, its structure, the effects of linguistic categories on thought and social behaviors, analyses of talk-in-interactions across a wide range of social settings and cultural contexts, gestures, comportment practices and the use of space, linguistic variation and change, verbal art, language and emotion, the limits of language, institutional language, and issues of language and identity. Students with interest in language and culture as well as those who are new to linguistic anthropology are welcome. No prior training in linguistics is presupposed.

ANTH 225. Evolution (3)
(See PHIL 225.) Cross-listed as 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. Cross-listed as J DST 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. Prereq: 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. Prereq: ANTH 103 or consent of department.

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. Prereq: ANTH 103 or consent of department.

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. Prereq: ANTH 102 or consent of department.

ANTH 306. 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. Prereq: ANTH 102 or consent of department.

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. Human universals and cultural variation, the experience of childhood and recent changes in the American family. Prereq: ANTH 102 or consent of department.

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 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.

ANTH 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 Latino and Native peoples, African-American groups, and specific ethnic groups of Pacific, Mediterranean, European, Asian, and Caribbean origin. Cross-listed as ETHS 314.

ANTH 317. 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. Prereq: ANTH 102 or consent of department.

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. Prereq: ANTH 102 or consent of department.

ANTH 319. Introduction to Statistical Analysis in the Social Sciences (3)
Statistical description (central tendency, variation, correlation, 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 anthropological archaeology. Topics to be discussed include the nature of the archaeological record, research design, techniques of field archaeology, methods of laboratory analysis, museum archaeology, ethnoarchaeology, and cultural interpretation. Prereq: ANTH 107 or consent of department.

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 multidisciplinary perspective, the course will draw on diverse sources, from classical ethnographic writings to popular cultural criticism, literature, films, poetry, and news media.

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. Prereq: ANTH 102 or ANTH 103 or ANTH 105 or consent of department.

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 field manual which will provide detailed information on the course and techniques of field work. Prereq: Permission of department.

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. Prereq: ANTH 102 or ANTH 215 or consent of department.

ANTH 327. Great Lakes Archaeology (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. Prereq: ANTH 107 or consent of the department.

ANTH 327. Great Lakes Archaeology (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. Prereq: ANTH 107 or consent of the department.

ANTH 328. Later Prehistory (3)
This course is an introduction to the archaeology of the late prehistoric periods of the United States and Canada. It covers the Late Prehistoric period of the eastern United States and Canada, the terminal Archaic period, and the Early Woodland period. It is designed to provide an overview of the major developments in the late prehistoric period of the United States and Canada. Prereq: ANTH 102 or ANTH 107 or consent of department.

ANTH 329. 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 urban worlds and social problems. Prereq: ANTH 102 or ANTH 107 or consent of department.

ANTH 330. Special Topics in Prehistory (3)
Special topics or geographical areas of archaeological significance (e.g., the origins of food production, the archaeology of the Mediterranean, the archaeology of North America). Prereq: 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. Prereq: ANTH 102 or ANTH 107 or consent of department.

ANTH 332. 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. Prereq: ANTH 102 or ANTH 215 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. Prereq: ANTH 102 or ANTH 107 or consent of department.

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. Prereq: ANTH 102 or consent of department.

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. Prereq: ANTH 215.

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. Prereq: ANTH 102 or consent of department.

ANTH 341. Cultural Area Studies in Anthropology (3)
Prereq: ANTH 102.

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. Prereq: ANTH 102 or consent of department.

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, adjustment and stress disorders). Contemporary ethnographic survey of ethnic groups at risk both at home and abroad. Prereq: ANTH 102 or consent of department.

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 addi-
tion, 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. Prereq:
ANTH 102 or consent of department.

ANTH 351. Topics in International Health (3)
Special topics of interest in International Health.
Prereq: ANTH 102 or ANTH 215 or consent of
department.

ANTH 352. Japanese Culture and Society (3)
Focuses on contemporary Japanese cultural and so-
cial institutions. Topics include child-rearing, per-
sonality, values, education, gender roles, the dual
economy, and popular culture. Prereq: ANTH 102 or
consent of department.

ANTH 353. Chinese Culture and Society (3)
Focuses on Chinese cultural and social institutions
during the Maoist and post-Maoist eras. Topics in-
clude ideology, economics, politics, religion, fam-
ily life, and popular culture. Prereq: ANTH 102 or
consent of department.

ANTH 354. Mediterranean Culture and
Society (3)
Ethnography of the Mediterranean culture area.
Topics include geography, topography, climate,
rural and urban life styles, economy, social identity
(enscapming gender, ethnic, national, provincial,
tribal and religious identity), religion, ritual rela-
tions, 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. Prereq: ANTH 102 or consent of de-
partment.

ANTH 355. Native American Cultures (3)
Intensive examination of the cultures of selected
Native American peoples, including historical, po-
itical, religious, social organizational, linguistic,
and medical/psychiatric aspects of American Indian
life. Prereq: ANTH 102.

ANTH 359. Introduction to International
Health (3)
Critical health problems and needs in developing
countries. Prevalence of infectious disease, malnu-
trition, chronic disease, injury control. Examines
strategies for improvement of health in less devel-
oped countries. Prereq: ANTH 102.

ANTH 361. Urban Health (3)
This course provides an anthropological perspec-
tive on the most important health problems facing
urban population around the world. Special atten-
tion will be given to an examination of disparities
in health among urban residents based on poverty,
race/ethnicity, gender, and nationality.
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. Prereq: ANTH 107 and permission of department, and prior permission of Department of Archaeology at the Cleveland Museum of Natural History.

ANTH 383. Evolutionary Anatomy (4)
This course will introduce graduate and advanced undergraduate students to primate comparative anatomy and will examine methods of reconstructing physiology and behavior from fossil remains. Prereq: ANTH 103 and BIOL 110. Cross-listed as ANAT 383.

ANTH 388. Globalization, Development & Underdevelopment: Anthropological Persp (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 also focuses on the contributions 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.

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. Prereq: ANTH 102.

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.

ANTH 394. Seminar in Evolutionary Biology (3) (See PHIL 394.) Cross-listed as PHIL 394.

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. Prereq: ANTH/BIOL/GEOL/PHIL 225 and consent. Cross-listed as BIOL 396, GEOL 396, and PHIL 396.

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. Prereq: ANTH 103 or consent of department.

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. Approved SAGES capstone. Prereq: Major in Anthropology, consent of supervising faculty.

ANTH 399. Independent Study (1-6)
Students may propose topics for independent reading and research. Prereq: Consent of department.

ANTH 401. Biological Aging in Humans (3) (See ANTH 301.) Prereq: ANTH 103 or consent of department.

ANTH 402. Darwinian Medicine (3) (See ANTH 302.) Prereq: ANTH 103 or ANTH 105 or consent of department.

ANTH 404. Introduction to the Anthropology of Aging (3) (See ANTH 304.) Prereq: ANTH 102 or consent of department.

ANTH 406. The Anthropology of Childhood and the Family (3) (See ANTH 306.) Prereq: ANTH 102 or consent of department.

ANTH 409. Family Violence and Child Abuse (3) (See ANTH 309.) Prereq: ANTH 102 or consent of department.

ANTH 412. “Where Does it Hurt”: Doctor-Patient Talk (3) (See ANTH 312.)

ANTH 414. Cultures of the United States (3) (See ANTH 314.)

ANTH 417. Asian Medical Systems (3) (See ANTH 317.) Prereq: ANTH 102 or consent of department.

ANTH 418. Death and Dying (3) (See ANTH 318.) Prereq: ANTH 102 or consent of department.

ANTH 422. Living Africa (3) (See ANTH 322.)

ANTH 423. AIDS: Epidemiology, Biology, and Culture (3) (See ANTH 323.) Prereq: ANTH 102 or ANTH 103 or ANTH 105 or consent of department.

ANTH 426. Power, Illness, and Inequality: The Political Economy of Health (3) (See ANTH 326.) Prereq: ANTH 102 or ANTH 215 or consent of department.

ANTH 427. Great Lakes Archaeology (3) (See ANTH 327.) Prereq: ANTH 107 or consent of department.

ANTH 433. Roots of Ancient India: Archaeology of South Asia (3) (See ANTH 333.) Prereq: ANTH 102 or ANTH 107 or consent of department.

ANTH 434. Urban Anthropology (3) (See ANTH 334.) Prereq: ANTH 102 or consent of department.

ANTH 437. Comparative Medical Systems (3) (See ANTH 337.) Prereq: ANTH 215.

ANTH 440. Culture and Emotion (3) (See ANTH 340.) Prereq: ANTH 102 or consent of department.

ANTH 441. Cultural Area Studies in Anthropology (3) (See ANTH 341.) Prereq: ANTH 102.

ANTH 443. Psychoanalytic Anthropology (3) (See ANTH 343.) Prereq: ANTH 102 or consent of department.

ANTH 445. Ethnicity, Gender, and Mental Health (3) (See ANTH 345.) Prereq: ANTH 102 or consent of department.

ANTH 448. Sexuality and Gender (3) (See ANTH 348.) Prereq: ANTH 102 or consent of department.

ANTH 451. Topics in International Health (3) (See ANTH 351.) Prereq: ANTH 102 or ANTH 215 or consent of instructor.
ANTH 475. Human Evolution: The Fossil Evidence (3)  
(See ANTH 375.) Prereq: ANTH 103 and BIOL 110. Cross-listed as ANAT 475.

ANTH 476. Topics in the Anthropology of Health and Medicine (3)  
(See ANTH 376.) Prereq: ANTH 102 or ANTH 103.

ANTH 477. Human Osteology (4)  
(See ANTH 377.) Cross-listed as ANAT 477.

ANTH 479. Topics in Cultural and Social Anthropology (3)  
(See ANTH 379.) Prereq: ANTH 102.

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. Prereq: 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. Prereq: ANTH 480.

ANTH 483. Evolutionary Anatomy (4)  
(See ANTH 383.) Prereq: ANTH 103 and BIOL 110. Cross-listed as ANAT 483.

ANTH 488. Globalization, Development, & Underdevelopment: Anthropological Persp. (3)  
(See ANTH 388.)

ANTH 489. Crossroads: Transformation of Rural Blues into Urban Rock (3)  
(See ANTH 389.) Prereq: ANTH 102.

ANTH 493. Human Ecology: The Biology of Human Adaptability (3)  
(See ANTH 393.) Prereq: ANTH 103 or consent of department.

ANTH 494. Seminar in Evolutionary Biology (3)  
(See ANTH 394.) Cross-listed as PHIL 494.

ANTH 497. Epidemiology and the Evolution of Human Diseases (3)  
(See ANTH 397.) Prereq: ANTH 103 or consent of department.

ANTH 498. Public Policy and Aging (3)  
(See EPBI 408.) Cross-listed as EPBI 408.

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 or consent of department.

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. The course is organized around the following controversies: (1) The Native American Graves Protection and Repatriation Act (NAGPRA); (2) ethnicity and its determination; (3) representing studied populations; (4) politics and fieldwork; (5) the works of Carlos Castaneda; (6) the Mead-Freeman debate; (7) sociobiology and cultural anthropology; (8) Darkness in El Dorado and the Yanomami, and (9) cultural relativism and human rights. Prereq: ANTH 480 and ANTH 481.

ANTH 508. Seminar in Policy and Program Planning and Evaluation (3)  
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 an-
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 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 concepts of self and person, and the relationships of local psychological theory to clinical praxis 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 "Biocultural 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 or consent of department.

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)

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 and have permission of department.

ANTH 701. Dissertation Ph.D. (1-18)
(Credit as arranged.)

ANTH 703. Dissertation Fellowship (1-8)

DEPARTMENT OF ART HISTORY AND ART

Art History
Mather House
Phone 216-368-4118; Fax 216-368-4681
Charles Burroughs, Chair

Art Education/Art Studio
Art Studio Facility, 2215 Adelbert Road
Phone 216-368-2714; Fax 216-368-2715
Tim Shuckerow, Director of Art Education and Art Studio

ART HISTORY AND ART
The Department of Art History and Art offers opportunities to study art history, both Western and Non-Western, to participate in a broad range of studio offerings, to pursue state teacher licensure in art education, and to engage 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 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 Joint 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 the 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 conservators and restorers; 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 committed, knowledgeable, and creative professional 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, which 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 University's art education programs 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 art therapists in hospitals and community centers; as designers of educational programs for industry; and as practicing artists. The program is especially proud of its record in recruiting and placing minority students.

A second major and a minor sequence in pre-architecture are offered for those students expecting to continue architectural studies at the graduate level (or who simply wish to pursue an area of interest). The university offers a variety of introductory and intermediate art studio courses taught by experienced artists/teachers in a newly renovated art building to students interested in developing and nurturing their artistic and creative talents. Qualified undergraduates majoring in art history or art education may also participate in the Integrated Graduate Studies Program (see separate listing in this bulletin).

FACULTY

Art History
Henry Adams, Ph.D. (Yale University)
Professor
American art
Charles Burroughs, Ph.D. (London University)
Elise B. Smith Professor of Liberal Arts and
Chair
Fourteenth to 18th Century Italian art and architecture; Atlantic world architecture and landscapes
David Carrier, Ph.D. (Columbia University)
Champney Family Professor
Methodology of Art History, 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
Jennifer Neils, Ph.D. (Princeton University)
Ruth Coulter Heede Professor
Ancient art and classical archaeology
Edward J. Olizewski, Ph.D.
(University of Minnesota)
Professor
Italian Renaissance and Baroque art
Constantine Petridis, Ph.D.
(Ghent University)
Assistant Professor and Associate Curator, Cleveland Museum of Art
African Art
Catherine B. Scallen, Ph.D.
(Princeton University)
Associate Professor
Northern Renaissance and Baroque art and historiography

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, PhD
Curator of Prints, Cleveland Museum of Art
Prints and drawings
Tom Hinson MA
(Case Western Reserve University)
Curator, Contemporary Art and Photography
Adjunct Professor, Contemporary Art and Photography

Holger A. Klein, PhD
The Robert P. Bergman Curator of Medieval Art, Cleveland Museum of Art
Byzantine and Medieval Art
Heather Lemonedes, PhD
Assistant Curator of Prints and Drawings
Nineteenth Century Artists
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 of Art Education and Art Studio
Supervisor of Art Education
Amelia Joynes M.Ed.
(Cleveland State University)
Supervisor of Art Education Secondary Student Teaching
Sandra Noble, M.A.
(Cleveland State University)
Supervisor of Art Education Elementary Student Teaching

UNDERGRADUATE PROGRAMS

Majors
Art History

ARTH 101. Art History I: Pyramids to Pagodas (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 Mapplethorpe (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 104. Introduction of Asian Art (3)

This course surveys the vast cultural landscapes of Asia, from India to Central Asia, and Southeast Asia, on to China, Korea and then Japan.

This interdisciplinary course—which is designed in a multimedia format—will examine how music has impacted the visual arts from antiquity to the modern era in the western world.

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.

ARTH 220. Jewish Tradition in 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. Cross-listed as JDST 220.

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. Cross-listed as CLSC 226.

ARTH 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. Cross-listed as 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. Cross-listed as CLSC 228.

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 aggrandizement, 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. Cross-listed as AMST 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. Cross-listed as AMST 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.

ARTH 300. Childhood through Art (3)
This course will explore the imagery of children in art from its beginnings in ancient Egyptian sculpture up to the present with photographs by Mapplethorpe and Sally Mann. In order to develop a critical awareness of how children are portrayed and how the viewer is manipulated, students will study specific works of art in the Cleveland Museum of Art as well as examples from contemporary visual culture. Cross-listed as CHST 300.

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.

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.

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 in 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.

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 case sites and other extant materials.

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.

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. Cross-listed as CLSC 328.

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. Cross-listed as CLSC 332.

ARTH 333. Greek and Roman Painting (3)
Greek vase painting, Etruscan tomb painting and Roman wall painting. The development of monumental painting in antiquity. Cross-listed as CLSC 333.

ARTH 334. Art and Classical 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. Cross-listed as CLSC 334.

ARTH 340. Issues in Non-Western Art (3)
Various topics in non-western art. Lectures, discussions, and reports.

ARTH 350. Issues in Medieval Art (3)
Various topics in Medieval art. Lectures, discussions, and reports.

ARTH 351. Late Gothic Art in Italy (3)
Scuplure 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.

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 Bottaccio; Carpaccio and the Bellini in Venice.

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.

ARTH 356. Italian Renaissance and Baroque Sculpture (3)
Italian sculpture from the early 12th century to the later 18th century. The Pisani, Ghibertii, Donatello, Michelangelo, the Mannertis and Bernini.

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 Durer and Pieter Bruegel. The rise of secular subjects and bourgeois patronage is explored.

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.

ARTH 362. Issues in Renaissance Art (3)
Various topics in Renaissance art. Lectures, discussions and reports.

ARTH 365. Issues in Baroque Art (3)
Various topics in baroque art. Lectures, discussions and reports.

ARTH 367. 17th and 18th Century French Art (3)
A survey of the arts of painting, sculpture and architecture in France from 1600 to 1780. Attention will be given to stylistic developments and to social and political contexts, patronage and art theory.

ARTH 374. Impressionism to Symbolism (3)
Major developments in European painting and sculpture during the latter half of the nineteenth century. Post-impressionism synthesis, symbolism, and the arts and crafts movement considered in their socio-cultural contexts. Works of Degas,
Manet, Monet, Klimt, Bocklin, Gauguin, etc.

ARTH 379. Issues in 19th Century Art (3)
Various topics in 19th century art, with class lectures, discussions and reports. Consult department for current topic.

ARTH 380. 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.

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 interrelationships between the visual arts and new developments in literature, philosophy, and science.

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 sciences.

ARTH 383. Gender Issues in Feminist Art (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. Cross-listed as WMST 383.

ARTH 385. 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.

ARTH 392. Issues in 20th/21st Century Art (3)
Various topics in 20th/21st century art, with class lectures, discussions, and reports.

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 theories.

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. Approved SAGES capstone.

ARTH 397. History of Prints and Printmaking (3)
Development of techniques and style and the social function of prints. The great masters: Durer, Rembrandt, Goya, and others. Based on the extensive collections of the Cleveland Museum of Art.

ARTH 398. Independent Study in Art History (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 400. Childhood through Art (3)
(See ARTH 300.)

ARTH 402. Buddhist Art in Asia (3)
(See ARTH 302.)

ARTH 403. History of Far Eastern Art (3)
(See ARTH 303.)

ARTH 404. Art of West Africa (3)
(See ARTH 304.)

ARTH 405. The Art of India (3)
(See ARTH 305.)

ARTH 406. History of Indian Sculpture (3)
(See ARTH 306.)

ARTH 428. Greek Sculpture (3)
(See ARTH 328.)

ARTH 432. Art and Archaeology of Ancient Italy (3)
(See ARTH 332.)

ARTH 433. Greek and Roman Painting (3)
(See ARTH 333.)

ARTH 434. Art and Classical Archaeology of Greece (3)
(See ARTH 334.)

ARTH 440. Issues in Non-Western Art (3)
(See ARTH 340.)

ARTH 450. Issues in Medieval Art (3)
(See ARTH 350.)

ARTH 451. Late Gothic Art in Italy (3)
(See ARTH 351.)

ARTH 452. Italian Art of the 15th Century (3)
(See ARTH 352.)

ARTH 453. Sixteenth Century Italian Art (3)
(See ARTH 353.)

ARTH 456. Italian Renaissance and Baroque Sculpture (3)
(See ARTH 356.)

ARTH 460. Renaissance Art in Northern Europe (3)
(See ARTH 360.)

ARTH 461. Dutch and Flemish 17th Century Painting (3)
(See ARTH 361.)

ARTH 462. Issues in Renaissance Art (3)
(See ARTH 362.)

ARTH 465. Issues in Baroque Art (3)
Various topics in baroque art. Lectures, discussions and reports.

ARTH 467. 17th and 18th Century French Art (3)
(See ARTH 367.)

ARTH 474. Impressionism to Symbolism (3)
(See ARTH 374.)

ARTH 479. Issues in 19th Century Art (3)
(See ARTH 379.)

ARTH 480. Abstract Expressionism and Its Aftermath (3)
(See ARTH 380.)

ARTH 481. Neoclassicism to Realism (3)
(See ARTH 381.)

ARTH 482. Visions of Utopia: 20th Century European Art (3)
(See ARTH 382.)

ARTH 483. Gender Issues in Feminist Art (3)
(See ARTH 383.)

ARTH 485. American Avant-Garde: 1900-1925 (3)
(See ARTH 385.)

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. Prereq: 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)
Prereq: ARTH 490.

ARTH 491B. Visual Arts and Museums: Internship (3)
Second semester of Internship; includes final project devised in consultation with Director of Museum Studies. Prereq: ARTH 490 and ARTH 491A.

ARTH 492. Issues in 20th/21st Century Art (3)
(See ARTH 392.)

ARTH 493. Contemporary Art: Critical Directions (3)
(See ARTH 393.)

ARTH 494A. Directed Readings in Non-
Western Art (1-3)
Directed reading. Prereq: Consent of professor and department chair required before registering.

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)
(See ARTH 397.)

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)

ARTH 570. Seminar: 19th Century Art (3)

ARTH 575. Critical Theory Seminar (3)
In-depth study of controversial revisionist writings which demonstrate the strong impact of structuralist, poststructuralist, semiotic, Marxist, psychoanalytic, film, and gender theories on recent art historical discourse. Discussion of a wide range of current theoretical positions applied to visual and critical analysis of 19th and 20th century art works. Prereq: ARTH 495.

ARTH 576. Seminar in Modern Art (3)

ARTH 584. Seminar: History of Photography (3)
This seminar style course will investigate various topics in the history of photography, making use of objects in area collections whenever possible. In addition to original works of art, the course will stress recent directions in the secondary literature. Students will gain skills in examination of objects, research, critical analysis, and written and verbal communication.

ARTH 601. Research in Art History (1-18)
(Credit as arranged.)

ARTH 610. Cleveland Museum of Art Intern (1)
(See ARTH 490.)

ARTH 651. Thesis M.A. (1-18)

ARTH 701. Dissertation Ph.D. (1-18)
(credit as arranged.)

ARTH 703. Dissertation Fellowship (1-8)
The curriculum in art history 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.

The major in art history, which leads to the Bachelor of Arts degree, requires 36 hours of course work in art history, including:

\[ \cdot \] ARTH 101, Art History I (3)
\[ \cdot \] ARTH 102, Art History II (3)
\[ \cdot \] ARTH 396, Majors Seminar (3)

At least 6 credit hours must be taken at the 200 level. 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.

Pre-Architecture
The pre-architecture major leads to the Bachelor of Arts degree. However, it 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. The pre-architecture program introduces the student to the forms, history, and functions of architecture as well as 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. The instructor, Sally Levine, is a licensed architect with an independent practice in Shaker Heights, Ohio. 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:

\[ \cdot \] ARTH 302, 303, Architecture and City Design I, II (3, 3)
\[ \cdot \] ARTH 101, Art History I (3)
\[ \cdot \] ARTH 102, Art History II (3)
\[ \cdot \] ARTS 106, Creative Drawing I (3)

Fifteen hours of electives must be selected from the following groups:

A. 6 hours from selected art history courses.
B. 6 hours from:

\[ \cdot \] ARTH 101, 201, Design and Color I, II (3, 3)
\[ \cdot \] ARTS 206, Creative Drawing II (3)
\[ \cdot \] ARTS 220, Photography Studio I (3)
\[ \cdot \] THTR 223, 224, Stagecraft I, II (3, 3)

C. 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:

\[ \cdot \] MATH 125, 126, Mathematics I, II (4, 4)
\[ \cdot \] PHYS 115, 116, Introduction to Physics (4, 4) and Laboratory (4, 4)
\[ \cdot \] PHYS 121, General Physics-Mechanics (4)
\[ \cdot \] PHYS 122, General Physics II-Electricity and Magnetism (4) and Laboratory (4, 4)

Art Education
The program in art education, which leads to the Bachelor of Science degree, requires a total of 123 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 PreK-12 Art Specialist Licensure to teach art in the public schools of Ohio and over 40 reciprocat-
ing 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 studio courses at the Cleveland Institute of Art, as follows:

**Academic Courses at**

**Case Western Reserve University**

- ENGL 150 3
- PHED (two semesters-Lifetime Sports Activities) 0
- GER: Mathematics 3
- GER: Natural Sciences 3
- GER: Natural Science or Science and Society 3
- Art History 101, 102 6
- GER: History, Philosophy, Religion 6
- PSCL 101, EDUC 304 6
- EDUC 301 3
- ARTH electives (one must be at 300 level) 6
- ENGL elective (300 level) 3
- GER: Global and Cultural Diversity 3
- One open elective (300 level) 3 indicates courses fulfilling Arts and Sciences

**General Education Requirements**

Art Studio at Cleveland Institute of Art Total of 51 hours of studio possible, taken at the Cleveland Institute of Art

- Computer Basics 101, 201 3
- Design 107, 108, 209 9
- Drawing 117, 118, 217 9
- Painting 121, 122, 210 9
- Sculpture 227 3
- 5 studio electives at 3 hours each 15
- CIA open elective 3
- Retention and Advanced Standing (Undergraduate Level)

Students in art education who expect to meet Ohio’s licensure requirements must apply for advanced standing by the end of their first semester junior year. To apply, students must submit to the art education faculty information about grade point average, written personal goals, three faculty recommendations, self-analysis of program progress up to the point of evaluation, and have an interview with the program director. Art education faculty may (1) accept a student for advanced standing; (2) accept a student with reservation, with a remedial plan; or (3) reject a student and recommend a career change.

To enter student teaching, a 2.5 cumulative University grade point average is required, a 3.0 cumulative G.P.A. average in professional education courses, and a total of 300 contact hours of clinical field-based experience acquired in a variety of settings as required by the State of Ohio. Fingerprinting for a criminal background check by the Ohio Bureau of Criminal Identification is required. For students who have not lived in Ohio consecutively for the past five years, a background check through the Federal Bureau of Investigation is also required.

To be recommended by the university’s director of teacher licensure for State Teacher Licensure, a 3.0 cumulative G.P.A. must be maintained in all professional education courses. An overall G.P.A. of 2.5 must be maintained. The Ohio Department of Education requires passing scores on the Praxis II Principles of Learning and Teaching and Art Content Knowledge exams in addition to the requirements stated above.

Completion of the Bachelor of Science degree exists separately from the assurance that State of Ohio Visual Art Teacher Licensure will be awarded.

Additional information on this program is available in the office of the director of art education.

**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, Art History I (3)
- ARTH 102, Art History II (3)

At least three credit hours must be taken at the 200 level.

**Art Studio**

Requires 18 hours in art studio 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, photography, or ceramics).

**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 and White Photography Studio
- ARTS 365E, Color Studio (3) or ARTS 365K, Creative Photography

An elective, either ARTS 399, Independent Study in Art Studio (3) or ARTH102, Art History II (3)

**Pre-Architecture**

Requires 18 hours including:
- ARTS 302, 303, Architecture and City Design I, II (3, 3)
- ARTH 101, Art History I (3)
- ARTH 102, Art History II (3)
- ARTH 106, Creative Drawing (3)
- One approved elective.

**SEQUENCES**

Sequences for students in the Engineering Core are available in art history and in art studio, in photography, and in pre-architecture. Sequences must include three art history courses, two of which should be at the 100 or 200 level, and selected in consultation with the departmental advisor. Art history sequences may include one three-hour course in art studio. A pre-architecture sequence is offered by art studio, drawn from ARTS 106, 302, 303; ARTH 101, 102.

**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.

**INTEGRATED GRADUATE STUDIES**

Qualified undergraduates majoring in art history or art education also may participate in the Integrated Graduate Studies Program. Interested students should note the general requirements and the admission procedure in this bulletin and may consult the department for further information.

**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 BA major or minor concentration in art history or a related humanities field and a minimum G.P.A. 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):
  1. Non-Western
  2. Ancient
  3. Medieval
  4. Renaissance/Baroque
  5. Modern and American
- A reading knowledge of one foreign language (French, German, or Italian).
- 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):
  1. Non-Western
  2. Ancient
  3. Medieval
  4. Renaissance/Baroque
  5. 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 are already teacher licensed 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 as visual art specialists. Both programs are offered jointly by Case Western Reserve University and the Cleveland Institute of Art.

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 art work. Approval by both the University and the Cleveland Institute of Art is required for admission. Information and application forms are available through the Office of Graduate Admission at Case Western Reserve University and through the department.

Students in this program may follow either of two plans.

**Plan I: 36 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 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: 36 semester hours of course credit:**

(Teacher Licensure Track for holders of the Bachelor of Fine Arts degree or equivalent studio background)

- **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)

**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)
- Studio electives at the Cleveland Institute of Art at the 300-level or above (6)
- Retention and Advanced Standing (Graduate Level)

Students in art education who expect to meet state teacher licensure requirements must apply for advanced standing prior to the semester in which they register for student teaching. To apply, students must submit to the art education faculty information about grade point average, personal goals, and self-analysis of performance in the program up to the point of evaluation. Art education faculty may (1) accept a student for advanced standing; (2) accept a student with reservation, with a remedial plan; or (3) reject a student and recommend a career change.

A 3.0 cumulative grade point average is required to enter student teaching as well as a total of 300 contact hours of clinical field-based experience as required by the State of Ohio. A 3.0 grade point average must be maintained in all professional education courses and an overall G.P.A. of 3.0 is required to be recommended by the university’s Director of Teacher Licensure for State Teacher Licensure.

Completion of the Master of Arts degree exists separately from the assurance that State of Ohio Visual Art Teacher Certification will be awarded. The State of Ohio requires a passing score on the National Teacher Examination, fingerprinting with a criminal background check by the Ohio Bureau of Criminal Identification, in addition to the requirements stated above. All M.A. degree candidates are required to present a documented thesis exhibition in the program’s gallery of their art work prior to graduation.

**UNDERGRADUATE (ARTS)**

**ARTS 101. Design and Color I (3)**

Organizational and structural problems as a basis for the development of style. Studies in line, texture, shape, space, value, color, and two dimension-
ARTS 106. Creative Drawing I (3)
Development of graphic fluency in black and white through direct observation of nature and the model. Drawing as a means of enlarging visual sensitivity using a wide range of media and subject matter. Work from model.

ARTS 201. Design and Color II (3)

ARTS 206. Creative Drawing II (3)
Continuation of ARTS 106. Advanced work in graphic representation. Development of visual acuity and a personal drawing style while working in color. Work from the model. Prereq: ARTS 106.

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)
Basic techniques of weaving, macrame, and textile printing. Use of natural and synthetic fibers. Introduction to batik, quilting, and block printing on fabric.

ARTS 214. Ceramics I (3)
The techniques of hand building. 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.)

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, and special populations. 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. Problems related to small, intimate scale and residential structures. Lectures, field trips, studio experiences. Recommended ARTS 101 or ARTS 106 courses prior to enrollment.

ARTS 303. Architecture and City Design II (3)
The social, spatial, and aesthetic elements of the urban setting of architecture, the organizational components of the city, the path, the node, the edge, and the grid. Problems related to large-scale and public buildings and their relationship to the encompassing visual world. Lectures, field trips, studio experiences. Recommended ARTS 101 or ARTS 106 courses prior to enrollment.

ARTS 304. Architecture and City Design III (3)
A study of historic precedents and the social implications of modern and contemporary architecture including analysis and form interpretation as it relates to building and materials technologies. Practical application and synthesis of architectural knowledge through site visits and research of local and regional architecture. Discussions of historic and contemporary architects, engineers and significant architecture and engineering firms. Prereq: ARTS 302 and ARTS 303.

ARTS 310. Enameling and Jewelry II (3)

ARTS 312. Weaving, Fibers, and Textile II (3)
Continuation of ARTS 212. Development of a selected area of weaving or textiles: off-loom weaving, tapestry, three dimensional work, batik, or fabric printing. Exploration of an area 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: extensive experience in wheel throwing, experimentation with glaze and clay body formulation. Prereq: ARTS 214.

ARTS 316. Painting II (3)

ARTS 320. Photography Studio II (3)
Continuation of ARTS 220. Advanced theory and black and white techniques, historic processes and theory. 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 work. 35mm camera required. Prereq: ARTS 220.

ARTS 325. Creative Photography (3)
Creative photography through photographing and responding to photographs. The question of self-expression and photographic medium explored in the pursuit of understanding images. Prereq: ARTS 220 and ARTS 320 or ARTS 322.

ARTS 350A. Painting (3)
Advanced painting problems determined in consultation with instructor. Prereq: ARTS 216 and ARTS 316.

ARTS 350B. Design and Color (3)
Advanced design problem determined in consultation with instructor. Prereq: ARTS 101 and ARTS 201.

ARTS 350C. Enameling and Jewelry (3)
Advanced enameling and jewelry problems determined in consultation with instructor. Prereq: ARTS 210 and ARTS 310.

ARTS 350D. B&W Photography Studio (3)
Advanced black and white problems determined in consultation with instructor. Prereq: ARTS 220 and ARTS 320.

ARTS 350E. Color Studio (3)
Advanced color studio problems determined in consultation with instructor. Prereq: ARTS 220 and ARTS 322.

ARTS 350F. Creative Drawing (3)
Advanced drawing in black and white and color media. Prereq: ARTS 106 and ARTS 206.

ARTS 350G. Ceramics (3)
Advanced ceramics problems determined in consultation with instructor. Prereq: ARTS 214 and ARTS 314.

ARTS 350H. Weaving, Fibers, and Textiles (3)
Advance textile problems determined in consultation with instructor. Prereq: ARTS 212 and ARTS 312.

ARTS 350A. Student Teaching in Art: Pre-K - 6th Grade (4)

ARTS 350B. Student Teaching in Art: 7th - 12th Grade (4)

ARTS 385. Clinical/Field Based Experience I (1)
Art education students observe and assist art teach-
ers in classes in a variety of public and private educa-
tional 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 depart-
mental observation guidelines are required. Prereq:
ARTS 295 or consent of Art Education director.

ARTS 386. Clinical/Field Based Experience
II (1)
Art education students become sensitized to serv-
ing 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 or consent of Art Education di-
rector.

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 depar-
tmental observation guidelines are required.
Prereq: ARTS 295.

ARTS 391. Art Content, Pedagogy, Methodol-
yogy, and Assessment (3)
Growth and development of image making from
Pre-K through young adult. Principles and prac-
tices 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. Clini-
cal field experiences required. Prereq: ARTS 295.

ARTS 395. Introduction to Multimedia Tech-
nology (3)
Fundamental concepts and skills for using technol-
ogy 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 produc-
tion and presentation, the Internet, information
processing, computer systems and management as
they relate to art education. Prereq: ARTS 101 and
ARTS 201 or ARTS 220 and ARTS 320.

ARTS 399. Independent Study in Art Studio
(1-3)
Prereq: Permit required from Director of Art Studio.

ARTS 400. Current Issues in Art Education (3)
(See ARTS 300.) Research paper required for gradu-
ate students.

ARTS 402. Architecture and City Design I (3)
(See ARTS 302.)

ARTS 403. Architecture and City Design II (3)
(See ARTS 303.)

ARTS 465. Seminar for Art Teachers (4)

For art education majors and teacher licensure
candidates. Principles and practice in school art in-
struction grades Pre-K through 12th grade. Orga-
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 evalua-
tion of teaching materials, lessons, and units. The
seminar includes discussion of professional issues,
ethics, and art advocacy. Approved SAGES cap-
stone. 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)
(See ARTS 366A.) 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)
(See ARTS 366B.) 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, Methodol-
yogy, and Assessment (3)
(See ARTS 393.) Prereq: ARTS 602.

ARTS 494. Teaching Art (3)
Research contrasting theories of art education in re-
lationship to a variety of educational settings in
 elementary and secondary schools. Developing inno-
vative, interdisciplinary, comprehensive curriculum
models for a specific organization. For licensed art
teachers only. Prereq: Permit required from Director
of Art Education.

ARTS 495. Introduction to Multimedia Tech-
nology (3)
(See ARTS 395.)

ARTS 497. Summer Workshop in Art Educa-
tion (3)
A current art education issue is covered in depth.

ARTS 602. Study in Art Education (3)
General history and theories of art education. De-
velopment of personal philosophy as basis for teach-
ing art. Topics in professional standards, creativity,
aesthetic theory, and art criticism. Students must
also produce an art education research paper. Clinici-
Cal/Field experiences are required.

ARTS 605. Final Creative Thesis (1-3)
Students receive individual guidance for an ap-
proved self-designed project from program faculty
members. A public exhibition or presentation is
required. Prereq: Permit required from Director of
Art Education.

Doctor of Philosophy in Art History
The doctorate in Art History is designed to allow
advanced graduate students the oppor-
tunity to specialize in designated areas. Admis-
sion to the program requires an M.A. in art
history or its equivalent, including a reading
knowledge of one approved foreign language
(French, German, or Italian). 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 matricula-
tion for a master’s degree or a thesis if com-
pleted 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 examina-
tion 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 abil-
ity to read two approved languages (other than
English) useful in art historical research. Ger-
man is normally required as one of the two
languages for students concentrating in West-
ern 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 ad-
vanced to candidacy. Within two weeks after
the written examination, the faculty examin-
ating committee will administer the oral exa-
namination. 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 candi-
dates. The program combines the academic re-
quirements of a Ph.D. with practical museum
training and is designed to provide experience
in connoisseurship, conservation, and art edu-
cation, as well as a planned program of aca-
demic course work and independent research.
Admission to the program is made on the basis
of academic record, experience, recommenda-
tions, and personal interviews. A master’s de-
gree 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 equiva-
I lent 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 Joint 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.

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Wyatt S. Newman, Ph.D.
(Massachusetts Institute of Technology)
Professor of Electrical Engineering and Computer Science

UNDERGRADUATE PROGRAM
The program in artificial intelligence offers an undergraduate minor. The core of the minor introduces students to the techniques of artificial intelligence programming and the basic theoretical concepts of artificial intelligence, knowledge representation, and automated reasoning. Within the minor, a student may choose a track pertaining to science and engineering or a track pertaining to artificial intelligence and cognition. Students who take the science and engineering track will have the opportunity to build significant intelligent systems. They will acquire a solid understanding of methods for knowledge representation and automated reasoning. The science and engineering track provides an opportunity for a student to acquire knowledge that is useful in areas such as management and engineering. The artificial intelligence and cognition track will give students the opportunity to explore the relationships between computational processes and the study of mind and language. Studies of the relationships between these areas have led to developments in robotics, mathematical neuroscience, visual processing systems, parallel processing systems, mathematical and experimental psychology, and linguistics.

A minor consists of five courses. Every student who takes the minor in artificial intelligence must take the two courses, ENGR 131 (Elementary Computer Programming) and EECS 391 (Introduction to Artificial Intelligence). Students who take the artificial intelligence minor must also take one of two minor tracks: The Technology Track requires 3 of the following courses:

- BIOL 373 Introduction to Neurobiology
- BIOL 374 Neurobiology of Behavior
- BIOL 477 Dynamics of Adaptive Behavior (cross listed as EECS 477)
- BIOL 478 Computational Neuroscience (cross listed as EECS 478)
- BIOL 479 Seminar in Computational Neuroscience (cross listed as EECS 479)
- EECS 350 Industrial and Production Systems Engineering
- EECS 352 Engineering Economics and Decision Analysis
- EECS 360 Manufacturing, Operations and Automated Systems
- EECS 375 Autonomous Robotics (cross listed as BIOL 375)
- EECS 411 Logic Programming
- EECS 475 Autonomous Robotics (cross listed as BIOL 475)
- EECS 484 Computational Intelligence I: Basic Principles
- EECS 489 Robotics I
- EECS 491 Intelligent Systems I
- EECS 531 Computer Vision for Industrial Applications
- EECS 589 Robotics II
- EECS 591 Intelligent Systems II
- PHIL 201 Introduction to Logic
- PHIL 306 Mathematical Logic
- The Cognitive Science Track requires 3 of the following courses:
  - BIOL 373 Introduction to Neurobiology
  - BIOL 374 Neurobiology of Behavior
  - BIOL 477 Dynamics of Adaptive Behavior (cross listed as EECS 477)
  - BIOL 478 Computational Neuroscience (cross listed as EECS 478)
  - BIOL 479 Seminar in Computational Neuroscience (cross listed as EECS 479)
  - ENGL 301 Linguistic Analysis of Modern English
- PHIL 201 Introduction to Logic
- PHIL 306 Mathematical Logic
- PSCL 101 General Psychology I
- PSCL 352 Physiological Psychology
- PSCL 353 Psychology of Learning
- PSCL 355 Sensation and Perception
- PSCL 357 Cognitive Psychology
- PSCL 370 Human Intelligence
- PSCL 402 Cognition and Information Processing

400- and 500-level courses require the approval of the minor advisor.

ASIAN STUDIES
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ADVISORY COMMITTEE
Elisabeth Köll, Ph.D. (Oxford University)
Associate Professor, History Director, Asian Studies Program

Chinese socioeconomic history, especially late Imperial and Republican China; Chinese busi-
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 brings together faculty with research and teaching interests in the histories and cultures of Asia, and provides students with a curriculum that offers several different approaches to the study of Asia. 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 Religion. A current list of approved courses is available from a Program advisor. Several Asian Studies courses contribute to the completion of the Arts and Sciences General Education Requirements.

The undergraduate program in Asian Studies offers a major, minor, and sequence. 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 for exploring and understanding the importance of Asia in the global community. Extracurricular activities include sponsorship of lectures, films, and the administration of a Website devoted to Asia. The Program also encourages students to study abroad in an Asian country and to utilize local Asian resources at the Cleveland Museum of Art and other area institutions.

**UNDERGRADUATE PROGRAMS**

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.

**ASIA 235. Asian Cinema and Drama (3)**
(See HSTY 134.) Cross-listed as HSTY 284.

**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. Prereq: Permission of program director.

**ASIA 399. Independent Study (1-3)**
Tutorial in Asian studies.

**Major (for B.A.)**
The major in Asian Studies consists of two tracks. Students choose one of the two tracks. Track 1 requires a minimum of 37 credit hours and includes an Asian language requirement. Track 2, which does not require study of an Asian language, can only be taken as a second major. Both tracks require ASIA 133 and ASIA 134, and additional hours chosen from a list of approved courses available from a Program advisor. Students prepare a program of study, indicating specific course selections to meet the requirements for the chosen track. A Program advisor must approve a student’s program of study.

**Track 1 (first major) - 37 semester hours**
**Total**
- 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 Religion (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 total**
- ASIA 133 and ASIA 134 (cross-listed as: HSTY 133 and HSTY 134)
- 6 hours in Anthropology (Asia-related)
- 6 hours in Religion (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

**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. 18 semester hours total
• ASIA 133 or ASIA 134 (cross-listed as: HSTY 133 or HSTY 134)
• 15 additional hours (Asia-related) selected in consultation with a Program advisor
• only one year (8 hours) of Asian language study counts toward the minor

Sequence (Engineering Core)
The requirements for an Asian Studies sequence are satisfied with the completion of ASIA 133 or ASIA 134 and six additional semester hours of Asia-related courses chosen in consultation with a Program advisor. 9 semester hours total
• ASIA 133 or ASIA 134 (cross-listed as: HSTY 133 or HSTY 134)
• 6 additional hours (Asia-related) selected in consultation with a Program advisor

Asian Studies Honors
Asian Studies Honors is a semester-long program for Asian Studies majors, normally taken during the senior year, involving the research and writing of 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 and two further content courses in Asian Studies, and maintenance of GPAs of at least 3.0 overall and 3.2 in Asian Studies courses. A participating student enrolls in ASIA 398: Honors Thesis, and writes a thesis under the direction of a faculty member designated as the thesis director, in association with 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 the research and writing of the thesis. Detailed guidelines and deadlines for the course are available from the director of the Asian Studies Program.

DEPARTMENT OF ASTRONOMY
567 Sears Library Building
Phone 216-368-3728; Fax 216-368-5406
Heather Morrison, Chair
http://astronomy.case.edu

FACILITIES

The Department of Astronomy operates the Kitt Peak Station of the Warner & Swasey Observatory near Tucson, Arizona, home of the Burrell Schmidt telescope. This telescope is used for surveys and imaging with large format CCDs. 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.

FACULTY
R. Earle Luck, Ph.D.
(University of Texas, Austin)
Worcester R. and Cornelia B. Warner Professor
J. Christopher Mihos, Ph.D.
(University of Michigan)
Professor
Heather L. Morrison, Ph. D.
(Australian National University)
Associate Professor and Chair, Director of the Warner and Swasey Observatory

Secondary Faculty
Lawrence M. Krauss, Ph.D.
(Massachusetts Institute of Technology)
Ambrose Swasey Professor and Chair, Department of Physics
John E. Ruhl, Ph.D. (Princeton University)
Professor, Department of Physics
Glenn Starkman, Ph.D.
(Stanford University)
Professor, Department of Physics
Idit Zehavi, Ph.D. (Hebrew University)
Assistant Professor

UNDERGRADUATE (ASTR)
Two degrees in astronomy are offered, the Bachelor of Science degree and the Bachelor of Arts degree. The primary difference between the two degrees is that the B.A. degree allows somewhat more flexibility in choice of courses. Both the B.A. and B.S. degrees provide excellent preparation for graduate studies. There are also two minor programs in astronomy.
A broad and substantial background in physics and mathematics with introductory exposure to astronomy is emphasized in the astronomy curriculum. A faculty actively engaged in research provides first-rate instruction and opportunity for undergraduate involvement in research.
A bachelor’s degree in astronomy is designed to prepare for graduate study in astronomy, but the holder of this undergraduate degree who seeks employment can fill the same jobs as physics and computer science majors.

ASTR 188. On Being a Scientist (1)
This course is intended to convey the excitement of doing science. Classes will focus on the question “What makes a good Scientist?” using weekly discussion of articles chosen from the “Science Times” and journals such as Science and Nature. It will build vital oral communication skills via a discussion of the broader context and implications of the science discussed. The course will be offered as part of WISER, the CWRU Women in Science and Engineering Roundtable, to help build a supportive community of science students to enhance women’s participation and retention in science. Male students are welcome to register. Cross-listed as ANTH 188, BIOL 188, GEOl 188, PHYS 188, PSCL 188, SOCI 188, and WMST 188.

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 306. Astronomical Techniques (3)

ASTR 309. Astrophysics Seminar I (1)
Selected topics in astronomy not covered ordinarily in courses. Presentation of talks by the students.

ASTR 310. Astrophysics Seminar II (1)
Selected topics in astronomy not covered ordinarily in courses. Presentation of talks by students.

ASTR 311. Stellar Physics (3)

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 in a paper in a style suitable for publication in a professional journal as well as an oral report in a public symposium. Approved SAGES capstone. Prereq: ASTR 222 and consent of the department.

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). Prereq: Consent of department.

ASTR 396. Special Topics in Astronomy (1-3)
Open to astronomy majors only.

ASTR 411. Stellar Physics (3)
(See ASTR 311.)

ASTR 423. The Local Universe (3)
(See ASTR 323.)

ASTR 428. Cosmology and the Structure of the Universe (3)
(See ASTR 328.) Cross-listed as PHYS 428.

ASTR 497. Special Topics in Astronomy (1-3)
Prereq: Consent of department.

ASTR 601. Research (1-18)
Original research under the guidance of the staff.

ASTR 651. Thesis M.S. (1-18)
(Credit as arranged.)

ASTR 701. Dissertation Ph.D. (1-18)
(Credit as arranged.)

ASTR 703. Dissertation Fellowship (1-8)

GRADUATE PROGRAMS

The department offers graduate programs leading to the degrees of Master of Science and Doctor of Philosophy in astronomy. Current research provides opportunities in optical observational astronomy and theoretical studies of galaxy formation and evolution. Prospective graduate students must submit scores on the Graduate Record Examination including the advanced physics test. Further information on the department’s graduate programs, and details concerning financial aid, are available through the departmental office and/or website.

DEPARTMENT OF BIOCHEMISTRY

Biochemistry offers undergraduate programs leading to the bachelor of arts degree and bachelor of science degree in biochemistry and graduate programs leading to the master of science, doctor of philosophy, and dual-degree programs as follows: doctor of medicine/doctor of philosophy degree; doctor of medicine/masters of science in biomedical investigation; juris doctor/masters of science in biochemistry.

The department also participates in several interdisciplinary and interdepartmental programs in the School of Medicine and at Case Western Reserve University that provide additional avenues of study. Research interests within the department include a spectrum of modern biochemical topics in six broad areas: enzymology, protein chemistry, structural biology, gene expression, cell biology, and molecular medicine/gene therapy. The department has state-of-the-art equipment and facilities for research in modern biochemistry. More complete information about the undergraduate and graduate programs may be obtained by contacting the departmental office.

DEPARTMENT OF BIOLOGY

DeGrace Hall
Phone 216-368-4804; Fax 216-368-4672
Joseph F. Koonce, Chair

The Department of Biology offers courses leading to the degrees of Bachelor of Science in 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 Gardens, the Cleveland Metroparks Zoo, the Holden Arboretum, the Cleveland Institute of Art and Design, the Cleveland Museum of Art, the Cleveland Museum of Natural History, the Cleveland Botanical Gardens, the Holden Arboretum, and the Cleveland Museum of Natural History significantly extend the range of resources available to biology students. Undergraduate students are encouraged to conduct individual supervised research projects with faculty in the Biology Department and with faculty in cooperating departments. A supervised research project is required of all students in the B.S. program.

CAREER OPPORTUNITIES

The undergraduate programs in biology provide excellent preparation for graduate or professional school programs and for careers in industry and governmental agencies. Students are well prepared for medical, dental, or veteri-
nary schools, or to enter the many specialized graduate programs in the biological sciences. Increasingly, career opportunities in both industry and government are opening up in the developing fields of biotechnology. Elective sequences of courses in areas of biotechnology within the B.A. and B.S. degrees in biology are an excellent preparation for such careers.

**FACULTY**

**Joseph F. Koonce, Ph.D.** (University of Wisconsin, Madison)
*Professor and Chair, Professor of Electrical Engineering and Computer Science Aquatic ecology, systems ecology*

**Radhika Atit, Ph.D.** (University of Cincinnati)
*Assistant Professor*
Developmental biology and genetics; Origin and patterning of skin

**Morris Burke, Ph.D.** (University of New South Wales, Australia)
*Professor*
Muscle physiology, protein chemistry

**Arnold I. Caplan, Ph.D.** (Johns Hopkins University)
*Professor, Professor of Physiology and Biophysics, Professor of General Medical Sciences (Oncology), 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, Professor of Neurosciences, Professor of Biomedical Engineering Neurobiology and animal behavior; cellular dynamics of neuronal computation*

**Christopher A. Cullis, Ph.D.** (University of East Anglia, United Kingdom)
*Professor, Francis Hobart Herrick Professor of Biology*
Plant molecular biology and genetics; modifications of the information content of plant cells

**Nancy Dilullo, Ph.D.** (The Pennsylvania State University College of Medicine)
*Instructor*
Basic mechanisms of immune responses and the impact of those responses on the function of the heart.

**Paul B. Drewa, Ph.D.** (Louisiana State University)
*Assistant Professor*
Ecology; effects of fire and other disturbances on plant populations and community structure

**Richard F. Drushel, Ph.D.** (Case Western Reserve University)
*Instructor and Executive Officer*
Kinematic modeling and neural control; autonomous robotics; vertebrate anatomy and physiology

**Stephen E. Haynesworth, Ph.D.** (Case Western Reserve University)
*Associate Professor, Assistant Professor of Orthopaedics, Assistant Professor of General Medical Sciences (Oncology); Associate Dean, College of Arts & Sciences*
Developmental and aging biology

**Jennifer O. Liang, Ph.D.** (University of Virginia)
*Professor, Professor of Neurosciences Neurobiology and behavior; sensorimotor control of insect flight; animal behavior*

**Robin Snyder, Ph.D.** (University of California, Santa Barbara)
*Professor, Professor of Neurosciences Neurobiology and behavior; physiology*

**Charles E. Rozek, Ph.D.** (Wayne State University)
*Associate Professor, Dean of Graduate Studies Molecular genetics; developmental biology*

**Roy E. Ritzmann, Ph.D.** (University of Virginia)
*Professor, Professor of Neurosciences Neurobiology and behavior; physiology*

**Andrew K. Swanson, Ph.D.** (Simon Fraser University)
*Theoretical ecology and epidemiology*

**Joe B. Keiper, Ph.D.** (Kent State University)
*Adjunct Assistant Professor (Cleveland Museum of Natural History)*
Biodiversity and population ecology of aquatic insects; forensic entomology; wetlands ecology and conservation

**Ana B. Locci, Ph.D.** (Case Western Reserve University)
*Adjunct Assistant Professor*
Aquatic ecology and population biology

**James E. Zull, Ph.D.** (University of Wisconsin, Madison)
*Professor, Professor of Biochemistry, Director, Professor of Cognitive Science*
Human learning, brain function in education

**Secondary Faculty**

**Darin Croft, Ph.D.** (University of Chicago)
*Assistant Professor; Assistant Professor of Anatomy*
Mammalian paleontology; evolution of mammals and mammal communities; evolution and adaptation within the Notoungulata

**Ramani S. Pilla, Ph.D.** (Pennsylvania State University)
*Assistant Professor, Assistant Professor of Statistics*
Bioinformatics; mixture models; neural networks; scientific/statistical computation

**Peter Thomas, Ph.D.** (University of Chicago)
*Assistant Professor, Assistant Professor of Mathematics*
Computational biology; neuroscience; applied mathematics

**Adjunct Faculty**

**David J. Burke, Ph.D.** (Rutgers University)
*Holden Assistant Professor (Holden Arboretum)*
Rhizosphere ecology; plant-microbe interactions; molecular microbial ecology; plant ecology

**John E. Zull, Ph.D.** (Case Western Reserve University)
*Adjunct Assistant Professor (Cleveland Museum of Natural History)*
Biodiversity and population ecology of aquatic insects; forensic entomology; wetlands ecology and conservation

**Ana B. Locci, Ph.D.** (Case Western Reserve University)
*Adjunct Assistant Professor*
Aquatic ecology and population biology

**Kristen E. Zull, Ph.D.** (University of Wisconsin, Madison)
*Professor, Professor of Biochemistry, Director, Professor of Cognitive Science*
Human learning, brain function in education
Forest ecosystem function

Special Faculty
James Bader, M.S.
(Case Western Reserve University)
Lecturer in Biology; Director, Center for Science and Mathematics Education

Aquatic Ecology
Valerie Haywood, Ph.D.
(University of California, Davis)
Lecturer in Biology

Special Faculty
James Bader, M.S.
(Case Western Reserve University)
Lecturer in Biology; Director, Center for Science and Mathematics Education

Aquatic Ecology
Valerie Haywood, Ph.D.
(University of California, Davis)
Lecturer in Biology

Plant developmental biology

UNDERGRADUATE (BIOL)

Students interested in life sciences can take a major or minor in biology.

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 or permission of the department.

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 or Coreq: BIOL 114 and BIOL 116 or permission of department.

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, 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 188. On Being a Scientist (1)
(See ASTR 188.) Cross-listed as ASTR 188.

BIOL 214. Genes and Evolution (4)
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. Laboratory and discussion sessions offered in alternate weeks. Prereq: CHEM 105.

BIOL 215. Cells and Proteins (4)
Second in a series of three courses required of the Biology major. Topics include: biological molecules (focus on proteins, carbohydrates, and lipids); cell structure (focus on plasma membrane, endomembrane system and organelles of energy metabolism); protein synthesis, targeting and trafficking; protein structure-function, including binding of antibodies to antigens, enzymes to substrates, and oxygen to hemoglobin. Transduction of neural and hormonal signals; cellular controls involved in development, cell cycle, and cancer; cellular energetics, respiration and photosynthesis. Laboratory and discussion sessions offered in alternate weeks. Prereq: CHEM 105 and CHEM 106; BIOL 214 or consent.

BIOL 216. Organisms and Ecosystems (4)
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. Laboratory and discussion sessions offered in alternate weeks. Prereq: CHEM 105 and BIOL 214 or consent.

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 cat used 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. Prereq: BIOL 214.

BIOL 225. Evolution (3)
(See PHIL 225.) Cross-listed as 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 viewpoint. 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, uses 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 their coordination at an organismal level. This systems approach will then 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, 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. Cross-listed as 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. Prereq: BIOL 215.

BIOL 302. Human Learning and the Brain (3)
This course focuses on the question, “How does my brain learn and how can its learning best be facilitated?” Each student is required to develop a comprehensive theory about personal learning. These theories will take the form of a major paper which will
be expanded and modified throughout the semester. Readings and class discussions will focus on the following live topics: major structures of the brain and their role in learning, neuronal wiring of the brain and how learning changes it, the emotional brain and its essential role in learning, language and the brain, and the role of images in learning. Students will be expected to incorporate information on these topics into their personal theory of learning. Final grades will be determined by the quality and comprehensiveness of the learning theories which students develop, as well as evidence of student progress and involvement during the semester. Prereq: BIOL 114 or BIOL 214 or PSCL 101.

**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 Rasmol 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. Prereq: 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. Prereq: BIOL 300 or consent. 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. Prereq: BIOL 215 or BIOC 307. Cross-listed as BIOC 308.

**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.

**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. Prereq: BIOL 326 (or concur).

**BIOL 315. Quantitative Biology Laboratory (3)**
Application of personal computers to biological research. Emphasis on the use of structured programming and flow charting. 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. Prereq: BIOL 216.

**BIOL 316. Fundamental Immunology (3)**
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, antigen processing and presentation, cell-cell interactions, cell-mediated immunity, cytokines, and basic molecular biology of B and T lymphocytes. Lectures emphasize experimental findings leading to the concepts of modern immunology. Prereq: BIOL 215.

**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 or consent of department.

**BIOL 326. Genetics (3)**
Transmission genetics, nature of mutation, microbiological 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. 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 to 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. Prereq: BIOL 326 or equivalent.

**BIOL 334. Structural Biology (3)**
(See BIOC 334.) Cross-listed as BIOC 334.

**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 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 or consent of instructor.

BIOL 344. Laboratory for Microbiology (2) 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: BIOL 343 (or concur).

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.

BIOL 351. Principles of Ecology (4) This course will focus on spatial and temporal relationships involving organisms and the environment at individual, population, and community levels. An underlying theme will be Darwinian evolution through natural selection with an emphasis on organism adaptations to biotic and abiotic environments. Case studies and models will illustrate ecological principles, and there will be some emphasis on the applicability of these principles to ecosystem conservation. Laboratory will complement lecture material and involve hypothesis-driven investigations in field and greenhouse settings at Squire Valley Farm. Students taking the graduate level course will prepare a grant proposal in which hypotheses are well-rooted in some aspect of ecological theory. This course satisfies a laboratory requirement for biology majors. Prereq: BIOL 216 or consent.

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 Valley 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 or consent of department.

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 (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. 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 CWRU. Group discussions and writing will be emphasized. This course satisfies a laboratory requirement for biology majors. Prereq: BIOL 114 for non-majors, BIOL 214 for majors.


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. Prereq: BIOL 216, BIOL 362, and consent of department.

BIOL 365. Evolutionary Development: Evolution of Body Plans (3) This discussion-based course offers a detailed introduction to Evolutionary Development 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 by drafting critiques of Intelligent Design. Students will be required to present, read, and discuss primary literature in each module. Prereq: BIOL 216 or BIOL 251 or permission.

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. Approved SAGES Departmental Seminar. Prereq: BIOL 362 or BIOL 365 or BIOL 326 or BIOL 225.

BIOL 368. Topics in Evolutionary Biology (3) (See ANTH 367.) Cross-listed as ANTH 367.

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 contemporary technical literature in the neurosciences. Prereq: BIOL 216.

BIOL 374. Neurobiology of Behavior (3)
In this course students will be shown how a neurobiologist interested in animal behavior studies the linkage between neural circuitry and complex behavior. Several exercises will be used in this endeavor. In addition to traditional lectures providing background on neural systems selected for the insight that they provide to behavioral principles, we will spend approximately half of the formal class periods in reading contemporary papers and discussing their methods and conclusions. Various vertebrate and invertebrate systems will be considered. In addition, several class periods will be spent observing animal behavior in order to get an appreciation of the fantastic things animals do. Finally, students will be required to complete a term project that will be designed to give them a first-hand feel for the processes followed in studying neurobiology of behavior. The exact form of the project will vary from year to year. Prereq: BIOL 216.

BIOL 375. Autonomous Robotics (3)
Introduction to the design, construction and control of autonomous mobile robots. The first half of the course consists of focused exercises on mechanical construction with LEGO, characteristics of sensors, motors and batteries, and control strategies for autonomous robots. In the second half of the course, students design, build and program their own complete robots that participate in a public competition. All work is performed in groups. Biologically-inspired approaches to the design and control of autonomous robots are emphasized throughout. Prereq: Consent of department. Cross-listed as EECS 375.

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 laboratory and one discussion session per week. Prereq: BIOL 216.

BIOL 377. 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. Approved SAGES capstone. Cross-listed as EMAE 377.

BIOL 378. Computational Neuroscience (3)
Computer simulation 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 circuits, as well as to cable theory, passive and active compartmental modeling, numerical integration methods, models of plasticity and learning, models of brain systems, and their relationship to artificial neural networks. Term project required. Two lectures per week.

BIOL 379. Neuroscience of Communication and Communication Disorders (3)
(See COSI 305.) Cross-listed as COSI 305.

BIOL 382. Drugs, Brain, and Behavior (3)
This course is concerned with the mechanisms underlying neurochemical signaling and the impact of drugs on these 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. Prereq: BIOL 215 and BIOL 216 or permission of department.

BIOL 384. Reading and Writing Like an Ecologist (3)
Students usually learn from textbooks, but scientists 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, including papers from both empirical and theoretical 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 discussions, your papers (both drafts) and your work as a reviewer for other students. Approved SAGES departmental seminar. Prereq: BIOL 216.

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 - 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 chairman 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 chairman of the biology department before credit is granted. A public presentation is required. Approved SAGES capstone.

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 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 chairperson's office and approved before credit is granted.

BIOL 394. Seminar in Evolutionary Biology (3)
(See PHIL 394.) Cross-listed as PHIL 394.

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 390. Undergraduate Research in Evolutionary Biology (3) (See ANTH 396.) Cross-listed as ANTH 396.

BIOL 401. 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.

BIOL 402. Principles of Neural Science (3) (See NEUR 402.) Cross-listed as NEUR 402.

BIOL 407. General Biochemistry (4) (See BIOL 407.) Cross-listed as BIOL 407.

BIOL 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 development. Current literature is discussed briefly as an introduction to techniques of genetic engineering. Prereq: BIOL 215 or BIOL 307. Cross-listed as BIOL 408.

BIOL 415. Quantitative Biology Laboratory (3) Application of personal computers to biological research. Emphasis on the use of structured programming and flowcharting. 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. During the last 6 weeks of the course the student will have a final project that consists of data analysis and interpretation. Report required for the final project. One lecture and one lab per week.

BIOL 416. Fundamental Immunology (3) 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, antigen processing and presentation, cell-cell interactions, cell-mediated immunity, cytokines, and basic molecular biology of B and T lymphocytes. Lectures emphasize experimental findings leading to the concepts of modern immunology. A term paper is required. Prereq: BIOL 215. Cross-listed as PATH 416.

BIOL 417. Cytokines: Function, Structure, and Signaling (3) (See PATH 417.) Cross-listed as CLBY 417 and PATH 417.

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, quantitative genetics.

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. Cross-listed as NEUR 427.

BIOL 428. Plant Genomics and Proteomics (3) (See BIOL 328.)

BIOL 431. Statistical Methods I (3) (See EPBI 431.) Cross-listed as EPBI 431.

BIOL 432. Statistical Methods II (3) (See EPBI 432.) Cross-listed as EPBI 432 and MPHP 432.

BIOL 434. Structural Biology (3) (See BIOL 434.) Cross-listed as BIOL 434.

BIOL 436. Advanced Aquatic Biology (3) Physical, chemical, and biological dynamics of lake ecosystems. Factors governing the distribution, abundance, and diversity of freshwater organisms.

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. Prereq: BIOL 215 or consent of instructor.

BIOL 448. Human Anatomy and Physiology (4-5) (See BIOL 348.)

BIOL 451. Principles of Ecology (4) (See BIOL 351.)

BIOL 453. Ecophysiology of Global Change (3) (See BIOL 353.)

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. Prereq: Consent of department.


BIOL 458. Animal Behavior (4) (See BIOL 358.)

BIOL 462. Advanced Principles of Developmental Biology (3) Same as BIOL 362 except the required term paper is an NIH-format research proposal. Prereq: BIOL 216. Cross-listed as ANAT 462.

BIOL 463. Experimental Developmental Biology (3) (See BIOL 363.)

BIOL 467. Biorobotics Team Research (3) (See BIOL 377.) Cross-listed as EMAE 477.

BIOL 468. Topics in Evolutionary Biology (3) (See ANTH 467.) Cross-listed as ANTH 467.


BIOL 474. Neurobiology of Behavior (3) (See BIOL 374.) Cross-listed as NEUR 474.

BIOL 475. Autonomous Robotics (3) Introduction to the design, construction and control of autonomous mobile robots. The first half of the course consists of focused exercises on mechani-
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BIO 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 per week. Prereq: BIOL 216. Cross-listed as EECS 475.

BIO 477. The Dynamics of Adaptive Behavior (3)
(See EECS 477.) Cross-listed as EES 477.

BIO 478. Computational Neuroscience (3)
Computer simulation 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 circuits, as well as to cable theory, passive and active compartmental modeling, numerical integration methods, models of plasticity and learning, models of brain systems, and their relationship to artificial neural networks. Term project required. Two lectures per week. Cross-listed as EES 478.

BIO 479. Seminar in Computational Neuroscience (3)
Readings and discussion in the recent literature on computational neuroscience, adaptive behavior, and other current topics. Cross-listed as EBME 479, EES 479, and NEUR 479.

BIO 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. Cross-listed as PHOL 480.

BIO 482. Drugs, Brain, and Behavior (3)
(See BIO 382.) Cross-listed as NEUR 482.

BIO 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. Prereq: Consent of department.

BIO 492. Contemporary Biology and Biotechnology for Innovation II (3)
Continuation of BIO 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. Prereq: BIO 491 or consent of department.

BIO 494. Seminar in Evolutionary Biology (3)
(See PHIL 494.) Cross-listed as PHIL 494.

BIO 531. Seminar in Experimental Ecology (1-3)
BIO 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. Cross-listed as GEOL 536.

BIO 550C. Seminar: Experimental Biology (1-3)
Prereq: Consent of instructor.

BIO 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.

BIO 559. Advanced Seminar in Developmental Biology (1-3)
Participants prepare and present seminars on subjects of contemporary interest and importance in developmental biology.

BIO 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.

BIO 601. Research (1-9)
BIO 651. Thesis M.S. (1-9)
BIO 701. Dissertation Ph.D. (1-9)

BIO 703. Dissertation Fellowship (1-8)
BIO 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. Prereq: Co-registration Biotech Institute.

BIO 802. Terrestrial and Aquatic Ecology for High School Teachers (2)
A 2-week summer ecology course to take place at the University 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 CWRU 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.

BIO 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 Technics components are used for structures and gear trains. Various mechanical and photodetection sensors provide sensory feedback. A microcontroller board programmed in C is 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. Prereq: Consent of department.

Major Programs
Major programs share a core of courses and provide options for specialization in a va-
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. Individual research projects form a significant part of the curriculum for many undergraduates and are required for students in the B.S. program. Advanced biology majors may register, with permission, for graduate-level courses in the Biology Department and within the School of Medicine. The department offers programs leading to the B.S. and the B.A. Thirty hours of biology are required for the B.A. and 39 hours for the B.S. Students for both the B.A. and B.S. degrees 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.

**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 incorporates a series of correlated laboratories and discussion sessions. The remaining hours include laboratory and elective courses. The laboratory requirement consists of two additional laboratory courses (excluding BIOL 346, 388, and 390). The elective requirement must include one elective from two of the following major areas: cell & 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 two years of chemistry - Principles of Chemistry I, II, and laboratory (CHEM 105, 106, & 113) and Organic Chemistry I, II, and Laboratory I (CHEM 223, 224, & 233 or 323, 324, & 233), one year of calculus (MATH 125, 126) and one year of Introductory Physics I, II (PHYS 115, 116).

**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 offered through Case Western Reserve and John Carroll University (see Education [EDUC and EDJC]) that includes student teaching. Students interested in pursuing this option should consult Professor Richard Drushel.

**Subject Area Requirements** (56-61 credit hours): BIOL 214, 215, 216; one of BIOL 301, 313, or 344; one of BIOL 223, 305, or 336; one of BIOL 308, 326, or 343; one of BIOL 358, 373, 374, or 382; CHEM 105, 106, 113, 223, 224, 233; MATH 125, 126; PHYS 115, 116; one of GEOL 101, 110, 115, or 117.

**B.S. Program in Biology**
The 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. The elective requirement must include one elective from two of the following major areas: cell & molecular biology, organismal biology, or population biology/ecology. In addition, students must complete a course in genetics (BIOL 301, Biotechnology Laboratory: Genes and Genetic Engineering or BIOL 326, Genetics); a quantitative biology laboratory (BIOL 300, Dynamics of Biological Systems, or BIOL 303, Principles of Chemical Biology, or BIOL 315, Quantitative Biology Laboratory); one additional laboratory course (except BIOL 346) and one upper-level advanced lecture course (300- or 400-level). B.S. students must undertake an undergraduate research project, completing BIOL 388 or BIOL 388S, Undergraduate Research; BIOL 390, Advanced Undergraduate Research (continuation of BIOL 388/388S project); and BIOL 395, Undergraduate Research Discussions. At least 11 hours of the selected electives and lab must be at the 300 level or higher. Additional requirements for the B.S. degree consist of: Mathematics: one year of calculus - MATH 125 & 126 (or 121 & 122, but former preferred); MATH 201, Linear Algebra or MATH 304, Discrete Mathematics or an approved mathematics or statistics course; Computer Science: ENGR 131, Computer Programming (or other approved computer programming course); Chemistry: Principles of Chemistry I & II and laboratory (CHEM 105, 106, & 113); Organic Chemistry I & II and laboratory (CHEM 223 (or 323), 224 (or 324), & 233); Physical Chemistry I (CHEM 301); and Physics: Introductory Physics I & II (PHYS 115 & 116).

All biology majors are required to meet with their departmental advisor at least once each semester to discuss their academic program and receive their registration PINs, and must have their drop-add cards signed by their advisors. In addition to formal courses, departmental seminars in recent advances in biology are held every Thursday afternoon at 4:15 p.m.

**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 in the biological sciences. 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; molecular & cell biology; neurobiology and animal behavior; population biology, ecology and environmental science.

**Integrated Graduate Studies Program in Biology**
The Biology Department participates in the Integrated Graduate Studies Programs for both B.A./M.S. and B.S./M.S. degrees. These programs are intended for gifted and highly-motivated students for the B.A. and B.S. degrees whose objective is a degree at the master’s level. By more closely integrating undergraduate and graduate studies, qualified students begin a program of graduate study in their senior year leading to the simultaneous completion of requirements for both the master’s and bachelor’s degrees, each within its specified framework. Students desiring to pursue this dual degree program will normally apply during the sophomore year. Students should contact the department for specific details of the program and application deadlines.

**Minor in Biology**
A minor in biology is available to students. The minor requires a minimum of 16 credit hours in biology. Two tracks are available for the minor in biology. One track consists of any two of the three core courses (BIOL 214, 215, 216) plus electives to total 16 hours of biology courses. An alternative track consists of BIOL 250 and BIOL 251 plus electives to total 16 hours of biology courses. Suitable minor courses are available for students majoring in the humanities and arts, social and behav-
Honors Program in Biology
To receive a bachelor’s degree with honors in biology, the student must meet the following criteria:
1. Maintain a 3.4 grade-point average, with a 3.6 in Biology courses
2. Carry out a year of research at Case
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

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 lifetime 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 Biology Department Office.

Doctor of Philosophy
Students who are planning to enter the doctoral program in biology should obtain information from the department office. 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.

RESEARCH
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 in professional development for careers related to the biological and health sciences.

Our faculty tends to conduct research in three focus areas: (1) Cell and Developmental Biology, (2) Neurobiology and Neuromechanical Systems, and (3) Plant Dynamics and Disturbance Ecology. An integrated systems approach to addressing biological problems is also used in each of these major areas of concentration. The primary function of each of the three focus areas is to provide a unifying framework for a group of faculty to share some common research interest and graduate training. However, the faculty is not required to exclusively conduct research in a focus area of concentration. Instead, the three focus areas aid in developing cross-collaborative initiatives that ultimately lead to the pursuit of program research and training grants.

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.
### Biology (BIOL)

#### Undergraduate Courses

**BACHELOR OF ARTS DEGREE**

**–MAJOR IN BIOLOGY–**

**SUGGESTED SEQUENCE OF COURSES SAGES GER**

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<th>First Year</th>
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<tr>
<td><strong>Fall</strong></td>
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<tr>
<td>SAGES First year 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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<tr>
<td>CHEM 113 Principles of Chemistry Laboratory (2)</td>
<td>BIOL 214 Genes and Evolution (4)</td>
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<td>GER Course (3)</td>
<td>GER course (3)</td>
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<tr>
<td>PHED 101 Physical Education (0)</td>
<td>PHED 102 Physical Education Activities (0)</td>
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<tr>
<td><strong>Fall</strong></td>
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<tr>
<td>BIOL 215 Cells and Proteins (4)</td>
<td>BIOL 216 Organisms and Ecosystems (4)</td>
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<tr>
<td>CHEM 223 (or 323) Introductory Organic Chemistry I (3)</td>
<td>CHEM 224 (or 324) Introductory Organic Chemistry aæ II (3)</td>
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<tr>
<td>CHEM 233 Organic Chemistry Laboratory (2)</td>
<td>ENGR 131 Elementary Computer Programming (3)</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>SAGES University seminar (3)</td>
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<th>Third Year</th>
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<td><strong>Fall</strong></td>
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<td><strong>Spring</strong></td>
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<tr>
<td>CHEM 301 Introductory Physical Chemistry I (3)</td>
<td>BIOL 300 Dynamics of Biological Systems OR BIOL 303 Principles of Chemical Biology OR BIOL 315 Quantitative Biology Lab (2-3)</td>
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<tr>
<td>BIOL 301 Biotechnology Laboratory OR BIOL 326 Genetics (3)</td>
<td>SAGES Departmental seminar (3)</td>
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<tr>
<td>MATH 201 Linear Algebra OR MATH 304 Discrete Mathematics OR Other approved mathematics or statistics (3)</td>
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<tr>
<td>BIOL Elective (3)</td>
<td>GER Course (3)</td>
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<td>Elective or course in selected minor field (3)</td>
<td>Electives or courses in selected minor field (6)</td>
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<th>Forth Year</th>
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<td><strong>Fall</strong></td>
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<td><strong>Spring</strong></td>
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<tr>
<td>BIOL 388 or 388S Undergraduate Research (3)</td>
<td>BIOL 390 Undergraduate Research (3)</td>
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<tr>
<td>BIOL Laboratory (2-3)</td>
<td>BIOL 395 Undergraduate Research Discussions (1)</td>
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<tr>
<td>BIOL Elective (3)</td>
<td>BIOL Elective (3)</td>
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<tr>
<td>Elective and/or course in selected minor field and/or capstone if BIOL 388S is not chosen (6)</td>
<td>Electives or courses in selected minor field (9)</td>
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</table>

- Total hours of BIOL courses required: 39
- Total credit hours required: 122
sional society in the United States for practicing chemists. Both undergraduate and graduate students may become affiliated with the society.

FACULTY

Lawrence M. Sayre, Ph.D.
(University of California, Berkeley)
Frank Hovorka Professor and Chair of the Department of Chemistry
Bioorganic and bioinorganic chemistry; redox coenzyme mechanisms; protein oxidation/ modification; lipid oxidation; neurotoxicology
Alfred B. Anderson, Ph.D.
(Johns Hopkins University)
Professor
Pure and applied theoretical chemistry; surface science, catalysis, electrocatalysis and properties of doped diamond
Mary D. Barkley, Ph.D.
(University of California, San Diego)
Professor
Time-resolved fluorescence spectroscopy; biophysical chemistry; tryptophan fluorescence; HIV reverse transcriptase
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
Robert C. Dunbar, Ph.D.
(Stanford University)
Professor
Gas phase ions and ion-neutral interactions; ion-molecular reaction kinetics, computational chemistry
Philip P. Garner, Ph.D.
(University of Pittsburgh)
Professor
Synthetic organic chemistry
Thomas G. Gray, Ph.D.
(Harvard University)
Assistant Professor
Inorganic and organometallic chemistry, metalloclusters as nanorods, biominalization scaffolds, and luminescence imaging agents
Malcolm E. Kenney, Ph.D.
(Cornell University)
Hurlbut Professor of Chemistry
Photodynamic therapy; porphyrin-like compounds; organosilicon compounds; flue gas desulfurization
Irene Lee, Ph.D.
(Penn State University)
Associate Professor
Biochemistry; enzymology
Anthony J. Pearson, Ph.D.
(University of Aston, Birmingham, England)
Rudolph and Susan Rene Professor of Chemistry
Natural products, organometallics; organic synthesis
John D. Protasiewicz, Ph.D.
(Cornell University)
Professor
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
Daniel A. Scherson, Ph.D.
(University of California, Davis)
Charles F. Mabery Professor of Research in Chemistry
Electrochemistry; electrode kinetics; electrocatalysis; in-situ spectroscopic methods in electrochemistry
M. Cather Simpson, Ph.D.
(University of New Mexico)
Associate Professor
Biophysical chemistry; spectroscopic studies of biologically significant processes
John E. Stuehr, Ph.D.
(Case Western Reserve University)
Professor of Chemistry and Biochemistry; Associate Chair, Chemistry Department
Rapid reactions in solution; metal complexing kinetics; proton transfer kinetics; protein and enzymatic dynamics
Gregory P. Tochtrop, Ph.D.
(Washington University Medical School)
Assistant Professor
Chemical biology, molecular recognition, NMR, diversity oriented synthesis, chemical technology biology
Michael G. Zagorski, Ph.D.
(Case Western Reserve University)
Professor
Organic chemistry; nuclear magnetic resonance; structure of peptides

ASSOCIATED FACULTY

Vernon E. Anderson, Ph.D.
(University of Wisconsin-Madison)
Professor of Biochemistry and Chemistry
Enzyme reactions and mechanisms, isotope ratio mass spectrometry
Paul Carey, Ph.D (University of Sussex, UK)
Professor of Biochemistry and Chemistry
Raman spectroscopy; proteins and protein-ligand interactions
John W. Crabb, Ph.D.
(University of Kansas Medical Center)
Professor of Chemistry; Professor of Molecular Medicine, Cleveland Clinic Lerner College of Medicine of Case Western Reserve University-Proteomics of the visual cycle and age-related ocular diseases
Kwaku T. Dayie, Ph.D. (Harvard University)
Assistant Professor of Biochemistry and Chemistry; Department of Molecular Genetics, Lerner Research Institute, Cleveland Clinic Foundation
Structural biology of RNA and proteins involved in catalysis and gene relations, structure-guided drug discovery, NMR methodology development
John J. Mieyal, Ph.D.
(Case Western Reserve University)
Professor of Pharmacology and Chemistry
Reactive oxygen species and sulfur biochemistry: enzymatic reaction mechanisms involved in intracellular sulfhydryl homeostasis and redox signal transduction in health and diseases, including cancer, cardiovascular and neurological disorders, and diabetes
Stuart J. Rowan, Ph.D.
(University of Glasgow, UK)
Associate Professor of Chemistry and Macromolecular Science and Engineering
Synthetic chemistry, supramolecular chemistry, supramolecular polymerization, polycatenanes, peptide nucleic acids, reversible “dynamic” chemistry, chemical sensors, biomaterials, nanotechnology
Witold K. Surewicz, Ph.D
(University of Lodz, Poland)
Professor of Physiology & Biophysics and Chemistry
Protein aggregation and the pathogenesis of aging-related diseases; prion protein; protein folding and protein-membrane interactions
Christoph Weder, Dr. Sc. Nat
(ETH Zurich, Switzerland)
Associate Professor of Chemistry and Macromolecular Science and Engineering
Design, synthesis, structure-property relationships, and application of novel functional polymers; polymers for advanced optic and electronic applications; stimuli-responsive polymers; supramolecular chemistry

UNDERGRADUATE (CHEM)

CHEM 101. The Wide, Wild World of Chemistry (3)
This is designed to give the non-science major an introduction to chemistry and its role in society. Chemical concepts will be presented in a non-mathematical way focusing on their implication for current scientific inquiry. Topics include forensics, explosives, green chemistry, nuclear energy, batteries, chemistry in the kitchen, and scientific ethics.

CHEM 105. Principles of Chemistry I (3)
Atomic structure; thermochernistry; periodicity, bonding and molecular structure; intermolecular forces; properties of solids; liquids, gases and solutions. Prereq: 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. Prereq: One year of high school chemistry or permission of department.

CHEM 113. Principles of Chemistry Laboratory (2)
A one semester laboratory based on quantitative chemical measurements. Experiments include analysis, synthesis and characterization, thermochemistry and chemical kinetics. Computer analysis of data is a key part of all experiments. Coreq: CHEM 105, CHEM 106, 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. Prereq: CHEM 105 or CHEM 111, CHEM 113. Coreq: 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. Prereq: 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. Prereq: 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. Prereq: CHEM 113 and CHEM 106 or equivalent. Coreq: CHEM 223 or CHEM 323.

CHEM 234. Introductory Organic Chemistry Laboratory II (2)
A continuation of CHEM 233, involving multi-step organic synthesis, peptide synthesis, product purification and analysis using sophisticated analytical techniques such as chromatography and magnetic resonance spectroscopy. Prereq: CHEM 233.

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. Coreq: CHEM 223 or CHEM 323.

CHEM 301. Introductory Physical Chemistry 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-science areas. States and properties of matter. Thermodynamics and its application to chemical and biochemical systems. Chemical equilibrium. Electrochemistry. Prereq: CHEM 106 or equivalent and a year each of physics and calculus, preferably including partial derivatives.

CHEM 302. Introductory Physical Chemistry II (3)

CHEM 303. 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. Prereq: CHEM 106, CHEM 113, and CHEM 114 or CHEM 234.

CHEM 305. Introductory Physical Chemistry Laboratory (3)
A one-semester laboratory course in the principles and quantitative characterization of chemical and biomedical systems. Experiments such as phase equilibria, calorimetry, chemical equilibrium, kinetics, electrochemistry, spectroscopy and the use of computers to analyze data. Prereq: CHEM 304 and CHEM 301 or CHEM 335. Coreq: CHEM 302 or CHEM 336.

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. Prereq: CHEM 301 and CHEM 302 or CHEM 335 and CHEM 336, or equivalent.

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. Prereq: CHEM 301 or CHEM 335 (may be taken concurrently).

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. Prereq: 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. Prereq: CHEM 304 and either CHEM 223 or CHEM 323. Coreq: 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. Prereq: CHEM 106 or equivalent and consent of department.
CHEM 324. Organic Chemistry II (3)
Continuation of CHEM 323. Introduces the chemistry of carbonyl, aromatic and amino functional groups, and develops the concepts of conjugation and resonance, molecular orbital theory and pericyclic reactions. Prereq: 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. Prereq: Two semesters of organic chemistry.

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, 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 oxygen metabolism. Biosynthesis and degradation of fatty acids, amino acids, and proteins. Prereq: CHEM 224 or CHEM 324.

CHEM 329. Chemical Aspects of Living Systems (3)

CHEM 331. Laboratory Methods in Inorganic Chemistry (3)
Synthesis, separation techniques, physical properties, and analysis. Advanced techniques of chemical synthesis, leading the student to the preparation of interesting inorganic and organometallic compounds. Prereq: CHEM 322.

CHEM 332. Laboratory Methods in Physical Chemistry (3)
Advanced techniques of modern physical chemistry measurements, including electrochemical methods (cyclic voltammetry, rotating disk, microelectrodes); spectroscopic techniques (UV-Vis, fluorescence); determination of reaction kinetics. Prereq: CHEM 331. Coreq: CHEM 336.

CHEM 335. Physical Chemistry I (3)
First of a two-semester sequence of physical chemistry for chemistry majors and others with career goals in the physical sciences or engineering. States of matter. Kinetic theory of gases. Transport phenomena. Chemical thermodynamics and its application to chemical systems. Equilibrium. Ionic solutions and electrochemistry. Introduction to chemical kinetics. Prereq: CHEM 106 or equivalent plus a year each of physics and calculus, including partial derivatives.

CHEM 336. Physical Chemistry II (3)

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 department. Arrangements should be made with the faculty member selected. Open to all chemistry majors and other qualified students; required for Honors in Chemistry. A written report is required each semester. Prereq: Consent of department.

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 department. Arrangements should be made by consultation 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. Approved SAGES capstone. Prereq: Consent of department.

CHEM 406. Chemical Kinetics (3)
Theory and characterization of chemical rate processes. Prereq: Two semesters of undergraduate physical chemistry.

CHEM 407. Chemical Thermodynamics (3)
Thermodynamics and statistical thermodynamics and their application to chemical problems. Prereq: 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. Prereq: 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. Prereq: Two semesters of undergraduate physical chemistry.

CHEM 412. Advanced Inorganic Chemistry I (3)
Chemistry of inorganic systems. Spectroscopy, magnetism, and stereochemistry of transition metal compounds. Prereq: One semester of undergraduate inorganic chemistry and two semesters of physical chemistry.

CHEM 413. 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. Prereq: 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 or permission of department.

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. Prereq: Two semesters of organic chemistry.

CHEM 428. Introductory Biochemistry (3)  
(See CHEM 328.)

CHEM 429. Chemical Aspects of Living Systems (3)  
(See CHEM 329.)

CHEM 430. Advanced Methods in Structural Biology I (3)  
(See BIOC 430.) Cross-listed as BIOC 430.

CHEM 435. Synthetic Methods in Organic Chemistry (3)  
Systematic consideration of reactions involving functional group transformations and carbon-carbon bond formations used in modern organic synthesis. Prereq: Two semesters of undergraduate organic chemistry.

CHEM 436. Complex Molecular Synthesis (3)  
An advanced organic chemistry course providing students with an in-depth examination of the art of total synthesis drawing from both classical and recent examples. Prereq: CHEM 435 or consent of department.

CHEM 445. Electrochemistry I (3)  
Electrochemical properties and processes of electrode/electrolyte interfaces. Fundamental background for work in corrosion, electrodeposition, industrial electrolysis, electro-organic synthesis, batteries, fuel cells, and photoelectrochemical energy conversion. Prereq: One undergraduate course in physical chemistry and a working knowledge of thermodynamics.

CHEM 446. Quantum Mechanics I (3)  
Introduction of quantization, measurement and the Schrodinger equation; angular momentum and states of molecules. Perturbation theory, spectroscopy and chemical bonding, Variational theory and calculations of molecular properties. Prereq: Two semesters of undergraduate physical chemistry.

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 470. Macromolecular Synthesis (4)  
Organic chemistry of macromolecules; mechanism of polyreactions; preparation of addition, condensation, and biopolymers, and the chemical reactions of polymers. Prereq: CHEM 224 or CHEM 324 and EMAC 270. Cross-listed as EMAC 470.

CHEM 475. Protein Biophysics (3)  
(See PHOL 475). Cross-listed as PHOL 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. Prereq: Consent of 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 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. Prereq: Two semesters each of undergraduate organic and physical chemistry.

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 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 or permission of department.

CHEM 523. Advanced NMR Spectroscopy in Structural Biology (3)  
(See PHOL 523.) Cross-listed as PHOL 523.

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.)

CHEM 703. Dissertation Fellowship (1-8)  
(Credit as arranged.)

UNDERGRADUATE PROGRAMS  
The Department of Chemistry offers two basic curricula for undergraduate chemistry majors, leading to either a Bachelor of Science degree or a Bachelor of Arts degree. The Chemistry Department should be consulted for current degree information.

Bachelor of Science Program  
The Bachelor of Science degree program is designed for students who plan professional careers in chemistry and leads to certification by the American Chemical Society. The required science, math and other courses for the B.S. curriculum are shown below. The B.S.
curriculum provides a rigorous background in chemistry yet has considerable flexibility in the senior year in the choice of electives. During the senior year, the B.S. major is expected to go a step beyond basic preparation in an area of chemistry of particular interest to him or her. Research is strongly encouraged. As many as nine hours of research (CHEM 397/398) 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); chemical kinetics (CHEM 406); chemical thermodynamics (CHEM 407); quantum mechanics (CHEM 446); or other graduate offerings. Interdisciplinary strengths can be achieved by selecting technical electives to follow designed “tracks” in biological chemistry, environmental chemistry, material science or polymer science.

Bachelor of Arts Program
The B.A. program is intended for students who plan careers in medicine or other health or science-related fields for which a baccalaureate degree in chemistry provides appropriate pre-professional training. B.A. majors may supplement their chemical training by electing additional chemistry courses or may utilize the curriculum flexibility in the Department of Chemistry to develop an interdisciplinary program of their choice. Many B.A. majors participate in undergraduate research within the Department of Chemistry (CHEM 397) or in other science departments including those in the medical school.

Honors Program
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 semester hours of CHEM 397, or, with departmental approval, chemical research done under another course number.
3. A thesis approved by the Undergraduate Committee of the department on the basis of the level of research, the quality of the manuscript, and the chemical content.

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, Principles of Chemistry I, II (3,3), and CHEM 113, Principles of Chemistry Laboratory (2); CHEM 223, 224, Introductory Organic Chemistry I, II (3,3), or CHEM 323, 324, Organic Chemistry I, II (3,3), and CHEM 233, 234, Introductory Organic Chemistry Laboratory I, II (2,2). Other sequences may be followed after consultation with the Department of Chemistry.

Teacher Licensure in Physical Science (Chemistry and Physics)
An option is available within the B.A. Chemistry major for students to become eligible for licensure as teachers of Physical Science (Chemistry and Physics) in secondary schools (Adolescents to Young Adults). Students interested in this option should contact Professor John Stuehr. A total of 57 contact hours in the content area is required for teacher licensure, as well as a 35-hour sequence in professional education (see Education [EDUC & EDJC]) taken here and at John Carroll University, including student teaching.

Subject Area Requirements for Chemistry majors:

* 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.

GRADUATE PROGRAMS

Master of Science Program
The Master of Science degree in chemistry may be obtained by completing a program including the preparation of a master’s thesis or a program involving only course work. Both programs require a minimum of 27 semester credit hours, of which up to 6 semester credit hours may be for the master’s thesis. Course work for the master’s degree may be taken on a part-time basis. Thesis research can be undertaken only by full-time graduate students. Only the master’s degree without thesis can be earned entirely on a part-time basis.
The Chemistry of Life Processes offers the student the opportunity of pursuing a course of study that cuts across traditional disciplines. The three traditional areas of chemistry—inorganic, organic, and physical—are all represented in their biological aspects. Through strong ties with the biomedical community within the University surroundings, faculty who carry out research in biochemical areas have coordinated a program of integrated course work, seminar offerings, and research experience. Although the student receives a Ph.D. degree in chemistry, participants in this program gain a broader, interdisciplinary background that provides distinct advantages when embarking upon a career in teaching/research, industry, or government laboratories.

Case Western Reserve University ranks among the leading universities internationally in its strengths in electrochemistry and has brought these strengths together under one coordinated structure, 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 the general audience of faculty, students, and other chemical scientists in the University and the Cleveland area, and are a vital means to a broad, 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.

**CHILDHOOD STUDIES**

614A Crawford Hall  
Phone 216-368-0540  
Fax 216-368-1196  
Jill E. Korbin, Ph.D., Director

The Childhood Studies Minor 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 includes interests in parenting, child development, ender, the life course, and the place of children in society and culture. The Childhood Studies Minor is situated in the College of Arts and Sciences. Children and childhood are a focus of research and teaching throughout the University, including the School of Medicine, the Mandel School of Applied Social Sciences, the School of Law, the School of Dentistry, and the Frances Payne Bolton School of Nursing. Close connections with the Rainbow Babies and Children’s Hospital and other Cleveland institutions enhance the educational opportunities for students at the university. The Schubert Center for Child Studies sponsors research, lectures, and programs on children and also provides opportunities for student involvement.

**FACULTY**

Jill E. Korbin, Ph.D.  
Associate Dean, College of Arts and Sciences  
Professor of Anthropology  
Director, Childhood Studies Minor  
Director, Schubert Center for Child Studies

Jennifer Neils, Ph.D.  
Ruth Coulter Heede Professor of Art History

Sandra Russ, Ph.D.  
Professor of Psychology

Elizabeth Short, Ph.D.  
Professor of Psychology

**UNDERGRADUATE (CHST)**

CHST 300. Childhood through Art (3)  
(See ARTH 300.) Cross-listed as ARTH 300.

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 and how research informs policy and vice versa. Prereq: One social sciences course.
CHST 302. Experiential Learning in Child Policy (3)
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 or Washington, D.C. to learn firsthand how policy is formed. Prereq: CHST 301 or consent of program director.

CHST 398. Child Policy Externship (3-6)
This course provides students with externships in child policy. Students apply for the externship and are placed with a local child policy agency for the semester. An individualized learning plan will be developed in consultation with the Childhood Studies Program faculty, the child policy agency, and the student. Prereq: CHST 301 or consent.

CHST 399. Independent Study (1-6)
Students propose topics for independent reading and research.

THE MINOR IN CHILDHOOD STUDIES
The undergraduate minor in Childhood Studies is built on a foundation in the social sciences. It also is suited to students with interests in children in the natural sciences, the humanities, and the arts. The minor requires at least 15 hours of course work in at least two different departments. Students may count up to 6 credit hours toward another major. This is possible for more than one major but with a maximum of 6 credit hours per major. The following courses are accepted toward the minor:

ANTH 306 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 changes in the American family. Prerequisite: ANTH 102.

ANTH 309 Family Violence and Child Abuse
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. Prerequisite: ANTH 102.

CHST 300 Childhood Through Art
This course will explore the imagery of children in art from its beginnings in ancient Egyptian sculptures up to the present with photographs by Mapplethorp and Sally Mann. In order to develop a critical awareness of how children are portrayed and how the viewer is manipulated, students will study specific works of art in the Cleveland Museum of Art as well as examples from contemporary visual culture. (Cross Listed as ARTH300.)

CHST 301 Child Policy
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 and how research informs policy and vice versa. Prereq: One social sciences course.

CHST 302 Experiential Learning in Child Policy
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 or Washington, D.C. to learn firsthand how policy is formed. Prereq: CHST 301 or consent of program director.

CHST 398 Child Policy Externship
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 the areas of 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. Prereq: CHST 301 or consent, permit required.

CHST 399 Independent Study

PSCL 344 Developmental Psychopathology
This course will focus on the interplay of biological, psychological, familial, and social determinants of disorders ranging from autism to delinquency and bulimia. Prerequisites: PSCL 230 or PSCL 321.

PSCL 393 Experimental Child Psychology
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. Prerequisite: PSCL 101.

SOCI 320 Delinquency and Juvenile Justice
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. Prerequisite: SOCI 112B

SOCI 361 The Life Course
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. Prerequisite: SOCI 112B

Students may include a maximum of 4 credit hours in practicum experience selected from the following courses:

PSCL 231 Child Psychology Practicum Practicum experience at a day care center.

PSCL 335A - Seminar and Practicum in Preschool and Daycare
Supervised field placement and attendance at staff conferences in various child and adolescent settings. Prerequisite: PSCL 230

PSCL 335C Seminar and Practicum in Hospitalized Children
Supervised field placement and attendance at staff conferences in various child and adolescent settings. Prerequisite: PSCL 230 and Junior or Senior standing.

PSCL 339/SOCI 339 Seminar and Practicum in Adolescence
Work with adolescents from the inner city of Cleveland. Independent studies, one-time course offerings, and additional courses may be included with the approval of Childhood Studies Advisor.

Childhood Studies Committee
Advising and oversight of the Childhood Studies Minor is carried out by the Childhood Studies Committee.
The Department of Classics offers courses in the Greek and Latin languages and literatures, in ancient history, and in various other aspects of the culture and life of ancient Greece and Rome. In general, the purpose of the department is to provide the means by which students may acquaint themselves with the character and achievements of the ancient classical civilization of the Mediterranean world, which was the cultural progenitor of the modern West. A knowledge of classical antiquity constitutes the backbone of the liberal education. It also provides an excellent basis for further professional training of today's student, no matter in what field he or she 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, librarianship, politics, religious, philosophical, literary, or historical studies, careers in the fine arts (visual or performing), museum or archival work.

**FACULTY**

**Martin Helzle, Ph.D.**
(Cambridge University, England)

Professor and Chair
Latin language and literature; Augustan and Silver poetry: palaeography and textual criticism

Rachel Hall Sternberg (Bryn Mawr College)
Assistant Professor
Greek language and literature; Greek social history

Paul A. Iversen, Ph.D.
(Ohio State University)

New Comedy, Greek epigraphy, Hellenistic culture and society

**Associate Faculty**

Charles Burroughs, Ph.D.
(University of London)

Elsie B. Smith Professor of Liberal Arts
Renaissance art and architecture

Jenifer Neils, Ph.D. (Princeton University)

Ruth Coulter Heede Professor

Art History and Art
Greek and Roman art and archaeology

**UNDERGRADUATE PROGRAMS**

**Classics**

CLSC 111. Classical Civilization: Greek (3)
The enduring significance of the Greeks studied through their history, literature, art, and philosophy. Lectures and discussion.

CLSC 112. Classical Civilization: Rome (3)
The enduring significance of the Romans studied through their history, literature, art, and philosophy. Lectures and discussion.

CLSC 201. The Ancient World (3)
Ancient history from the origins of civilization in Mesopotamia to the dissolution of the Roman Empire in the West. Cross-listed as HSTY 200.

CLSC 202. Classical Mythology (3)
The myths of Classical Greece and Rome, their interpretation and influence.

CLSC 203. Heroes, Myth, and Performance in Greek Literature (3)
This course constitutes the first half of a sequence on Classical literature. As such, it examines the major works of Greek literature and seeks to place them within their immediate historical, literary and cultural context. It traces the evolution of heroes to citizens and analyzes oral and live performances while interpreting myth from a literary and sociopolitical standpoint. Constant themes are war and community, wandering, tyranny and democracy, and the literary manifestations of men's and women's roles within the household and the city. Cross-listed as 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. Cross-listed as 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. Cross-listed as HSTY 210.

CLSC 226. Introduction to Greek and Roman Art (3)
(See ARTH 226.) Cross-listed as ARTH 226.

CLSC 227. Ancient Cities and Sanctuaries (3)
(See ARTH 227.) Cross-listed as ARTH 227.

**Greek**

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, Lysias, 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.

GREK 306. Tragedy (3)
Reading and interpretation of selected plays of Aeschylus, Euripides, and Sophocles. Prereq: GREK 202.

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.

GREK 308. Comedy (3)
Origin, ambiance, and development of Greek Old Comedy and persisting characteristics of the genre. Translation of selected plays from Greek into English. Prereq: GREK 202.

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 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. Approved SAGES departmental seminar. Cross-listed as LATN 320.

GREEK 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 permission of department.

GREEK 381. Senior Seminar (3)
(See LATN 381.) Approved SAGES capstone. Cross-listed as LATN 381.

GREEK 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. Prereq: GREK 381 or LATN 381. Cross-listed as LATN 382.

GREEK 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. Prereq: Consent of department.

Hebrew
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. Prereq: HBRW 102 or permission of department.

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 permission 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 permission of department.

HBRW 202. Intermediate Modern Hebrew II (4)
The course objectives are to enhance and strengthen the students' Hebrew language skills, and to develop the ability to express thoughts, ideas and opinions freely, in both verbal and written forms. Prereq: HBRW 201 or permission 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 permission 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 permission 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: Permission of department.

Latin
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. Prereq: 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.

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.

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.

LATN 320. Departmental Seminar: Alexander the Great (3)
(See GREK 320.) Cross-listed as GREK 320.

LATN 351. Latin Didactic Literature (3)
Readings from didactic poetry such as Lucretius and Vergil's Georgics. Parodies like Ovid's Ars Amatoria or prose treaties may also be introduced. Prereq: LATN 202.

LATN 352. History (3)

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.

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.

LATN 356. Elegiac Poetry (3)
Translation and interpretation of selected elegies by Catullus, Tibullus, Propertius, and Ovid. 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 reflect particular interests of students and faculty and timeliness of topics. Prereq: LATN 202.

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. Approved SAGES capstone. Prereq: Any 300-level GREK or LATN course. Cross-listed as GREK 381.

LATN 382. Senior Dissertation (3)  
(See GREK 382.) Cross-listed as GREK 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. Prereq: Consent of department.

Major

The classics major leading to the Bachelor of Arts degree requires 36 hours of departmental offerings. In addition, each student completing the classics major will be strongly advised to choose a related minor selected in consultation with and approved by the departmental advisor. Courses from the Department of Classics (36 hours): Eight courses (24 hours) in either Greek or Latin or a combination of both, provided that at least three courses are included from the most advanced level in one of the languages. Four classics courses, of which at least two must be numbered above 300. Recommended additional courses outside the Department of Classics (12 to 18 hours): We strongly advocate the addition of four to six courses in a closely related field such as anthropology, art history, philosophy, comparative literature, history, theater, and English. A second major or a minor in one of these fields will normally satisfy this recommendation.

Minor

The minor programs in the Department of Classics are designed to acquaint the student with aspects of the ancient civilization of Greece and Rome by means of a coherent sequence of 15 to 18 hours of course work. In order that the knowledge acquired may have the potential for depth and provide access to primary materials, some study of one or both of the classical languages is recommended. The student may choose one of three basic patterns:

Latin Concentration

Nine hours from courses in Latin above the 102 level, plus six hours from:
• CLSC 112 Classical Civilization: Rome (3)  
• CLSC 201 The Ancient World (3)  
• CLSC 304 Ancient Rome: Republican and Empire (3)

Greek Concentration

Twelve hours in the Greek language, plus three hours from:
• CLSC 111 Classical Civilization: Greece (3)  
• CLSC 201 The Ancient World (3)  
• CLSC 301 Ancient Philosophy (3)  
• CLSC 302 Ancient Greece: Archaic, Classical, and Hellenistic Periods (3)

Classics Concentration

(Requires consultation with departmental advisor)
• Any two Latin or any two Greek courses, CLSC 111 or CLSC 112, or CLSC 201. Three courses from: CLSC 226 Introduction to Greek and Roman Art (3)  
• CLSC 228 Theater History I (3)  
• CLSC 301 Ancient Philosophy (3)  
• CLSC 302 Ancient Greece: Archaic, Classical, and Hellenistic Periods (3)  
• CLSC 304 Ancient Rome: Republican and Empire (3)  
• CLSC 305 Selected Topics in Philosophy (3)  
• CLSC 312 Women in the Ancient World  
• CLSC 314 Love Poetry from Sappho to Shakespeare  
• Courses in Greek and Roman art at the 300 level
Any of these minor programs may be varied to suit the needs of the individual student, subject to the availability of other courses, after consultation with the department chair and with the approval of the student's major advisor. A student may, with the consent of his or her major advisor, design and propose a more radically different minor in classics suited to his or her particular needs, with the approval of the department and such other curricular authorities as may be required.

Sequences

(Engineering Core Curriculum)

All sequences should include CLSC 111, 112, and any other CLSC course above the 100 level in either Greek or Roman culture. Students should consult with the chair on the development of an acceptable sequence. The following are sample programs:

Emphasis on Greece

• CLSC 111 Classical Civilization: Greece (3)  
• CLSC 112 Classical Civilization: Rome (3)  
• CLSC 203 Heroes, Myth and Performance in Greek Literature (3) or

• CLSC 302 Ancient Greece: Archaic, Classical, and Hellenistic periods (3)

Emphasis on Rome

• CLSC 111 Classical Civilization: Greece (3)  
• CLSC 112 Classical Civilization: Rome (3)  
• CLSC 204 Classical Literature II (3)  
• CLSC 304 Ancient Rome: Republican and Empire (3)

DEPARTMENTAL HONORS

Departmental honors are given to students who earn the grade of “A” for their senior dissertation in GREK 382 or LATN 382.

DEPARTMENT OF COGNITIVE SCIENCE

605 Crawford Hall  
Phone: 216-368-4753; Fax: 216-368-3821  
Merlin Donald, Chair  
(merlin.donald@case.edu)  
Gail Papay, Department Assistant  
(gail.papay@case.edu)

Cognitive science is the scientific study of the mind in an interdisciplinary framework. This program attempts to cover the major methods, findings, and theories relevant to understanding human cognition, as drawn from natural science, social science, and the humanities. The Case Cognitive Science program is grounded in the fundamental sciences of neurobiology, neuroscience, psychology, biology, and anthropology, with a special additional focus on culture and technology. The educational philosophy behind this program is to give students the best possible opportunity to integrate a wide variety of backgrounds within the framework of studying human higher cognition. Hence the study of a field of culture or technology is not an option in the Case program; it is a requirement. One of the program’s major academic and research themes is creativity and innovation. The cognitive processes underlying human creativity can be subjected to scientific analysis. By studying the neural and cognitive sources of innovation and cultural change, we may be able to advance our understanding of human nature.

The Case program provides basic training in core disciplines, as well as in a range of philosophical, evolutionary, linguistic, and computational issues bearing on cognitive science. It incorporates an unusual openness toward in-
Faculty

James C. Alexander, Ph.D. (Johns Hopkins)
Levi Kerr Professor and Chair, Department of Mathematics (primary); Professor of Cognitive Science
Mathematical modeling of cognition
Patrizia Bonaventura, Ph.D.
(Ohio State University)
Assistant Professor of Communication Sciences (primary) and Cognitive Science
Speech production modeling; speech technology applications, experimental phonetics, linguistics, and acoustic and articulatory analysis of motor speech disorders
Per Aage Brandt, Docteur d’Etat (Sorbonne)
Emile B. de Saussé Professor of Modern Languages and Chair, Department of Modern Languages and Literatures; Professor of Cognitive Science
Cognitive linguistics, poetics, and semiotics; cognitive musicology; philosophy of mind and cognition
Angela Ciccia, Ph.D.
(Case Western Reserve University)
Assistant Professor of Communication Sciences (primary) and Cognitive Science
Neurogenic communication disorders, specifically acquired social information processing, or social cognitive disorders
Fred Collopy, Ph.D. (Wharton School of the University of Pennsylvania)
Professor and Chair of Information Systems, (primary) and Professor of Cognitive Science Design, human-computer interaction, forecasting
Heath A. Demaree, Ph.D. (Virginia Tech)
Associate Professor of Psychology (primary) and Cognitive Science
Neural mechanisms of emotional processing and regulation; the relationship between emotional experience/regulation and cognitive processing
Merlin W. Donald, Ph.D.
(McGill University) Professor and Founding Chair of Cognitive Science
Cognitive neuroscience; human cognitive and cultural evolution; cognitive effects of symbolic technology
Robert L. Greene, Ph.D. (Yale University)
Professor of Psychology (primary) and Cognitive Science
Human learning and memory
Todd Oakley, Ph.D. (University of Maryland)
Associate Professor of English (primary) and Cognitive Science
Linguistics; rhetoric; cognitive linguistics
Fey Parrill, Ph.D. (University of Chicago)
Assistant Professor of Cognitive Science and Robin Junior Professor
Psycholinguistics: speech and gesture production
Yanna Popova, D. Phil (Oxford)
Assistant Professor of Cognitive Science and Climo Junior Professor
Cognitive linguistics and cognitive poetics
Sandra Russ, Ph.D.
(University of Pittsburgh)
Professor of Psychology (primary) and Cognitive Science
Affect and creativity; pretend play and child development; child psychotherapy
Peter Thomas, Ph.D. (University of Chicago)
Assistant Professor of Mathematics (primary), Biology, and Cognitive Science
Mathematical biology and computational neuroscience
Mark Turner, Ph.D.
(University of California at Berkeley)
Institute Professor and Professor of Cognitive Science
Creativity, conceptual blending, linguistics, higher-order human cognition (mathematics, science, art, religion, language, style, institutions, choice, decision)
Sara Weller, Ph.D.
(Loyola University of Chicago)
Assistant Professor of Philosophy (primary) and Cognitive Science
Philosophy of mind, epistemology, and the relationship between neurology and language
Peter Whitehouse, M.D/ Ph.D.
(John Hopkins)
Professor of Neurology (primary) and Cognitive Science
Executive functions; narrative medicine; deep bioethics; dementia; aging-associated cognitive challenges
James Zull, Ph.D. (University of Wisconsin)
Emeritus Professor of Biology and Biochemistry
Applications of Brain Science in Education

Undergraduate (COGS)

COGS 101. Introduction to Cognitive Science I (3)
This course covers the fundamental methods, findings, and theories that attempt to understand the human mind from a scientific standpoint. It provides the student with background knowledge of the deep mental processes by and through which the world is comprehended. These include consciousness, sensation, perception, thought, language, and voluntary action, as well as higher cognitive functions such as blending, metaphor, mimesis, mental imagery, problem-solving, semantic memory; and so on. Since several academic disciplines have contributed in important ways to this field, the approach of the course is cross-disciplinary, including theories whose origins are in areas as diverse as cognitive psychology, philosophy, computing science, engineering, semiotics, and linguistics, among others.

COGS 201. Human Cognition in Evolution and Development (3)
COGS 201 covers mind unfolding in time, including the fundamental methods, findings, and theories of human mental phylo- and onto-genesis. It provides the student with background knowledge about the unfolding of cognitive structures and functions over time, in both the deep temporal perspective of evolution (measured across many lifetimes) and the shorter one of development (measured within single lifetimes). The approach of the course is cross-disciplinary, including approaches that come from anthropology, archaeology, philosophy, computing science, comparative psychology, primatology, and comparative linguistics, among others.

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 327. 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. Cross-listed as MLIT 327.

COGS 363. Philosophy and Social Neuroscience (3)
(See PHIL 363.) Cross-listed as PHIL 363.

COGS 373. Intelligence and Cognition (3)
(See PHIL 373.) Cross-listed as PHIL 373.

COGS 383L. Vocalization and Cognition Lab (1)
(See PHIL 383L.) Cross-listed as PHIL 383L.

Major
In addition to meeting the breadth requirements for the SAGES program and all other general education requirements, Cognitive Science majors must complete a minimum of 30 semester hours in cognitive science and approved related coursework: 15 credit hours in the foundation component and 15 hours of elective coursework.

Required Foundation Courses:
All majors must successfully complete all of the following core courses.
- COGS 101 Introduction to Cognitive Science I (3)
- COGS 102 Introduction to Cognitive Science II (3)
- COGS 201 Human Cognition in Evolution and Development (3)
- COGS 202 Human Cognition from a Cultural Perspective (3)
- PSCL 282 Quantitative Methods in Psychology (3) or equivalent, particularly ANTH 319 or STAT 201

We recommend that majors complete their foundation coursework by the end of their third year.

Electives:
Select any five of the following courses. At least three must be at the 200 or 300 level.
- ANTH 102 Being Human: An Introduction to Social and Cultural Anthropology (3)
- ANTH 103 Introduction to Human Evolution (3)
- ANTH 220 Language, Culture, and Communication (3)
- ANTH 367 Topics in Evolutionary Biology (3) (cross-listed as Biol/Geol/Phil 367)
- ANTH 371 Culture, Behavior and Person (3)
- BIOL 225 Evolution (3) (cross-listed as Phil/Geol/Hstry 225)
- BIOL 302 Human Learning and the Brain (3)
- COGS 327 Gesture in Cognition & Communication (3) (cross-listed as Mlit 327)
- COGS 363 Philosophy and Social Neuroscience (3) (cross-listed as Phil 363)
- COGS 373 Intelligence and Cognition (3) (cross-listed as Phil 373)
- COGS 381 Philosophy and Cognitive Neuroscience (3) (cross-listed as Phil 381)
- COGS 383L Vocalization and Cognition Lab (1) (cross-listed as Phil 383L)
- COSI 228 Introduction to Mass Communication (3)
- COSI 313 Language Development (3)
- ENGL 301 Linguistic Analysis (3)
- ENGL 379 Topics in Language Studies (3)
- HSTY 203 Natural Philosophy (3) (cross-listed as Phil 203)
- PHIL 306 Mathematical Logic and Model Theory (3)
- PHIL 365 Philosophy of Mind (3)
- PSCL 352 Physiological Psychology (3)
- PSCL 353 Psychology of Learning (3)
- PSCL 355 Sensation and Perception (3)
- PSCL 357 Cognitive Psychology (3)
- PSCL 370 Human Intelligence (3)

Minor
A minor in Cognitive Science is currently being developed with an expected availability date of fall 2007.

FACULTY COMMITTEE
Linda Ehrlich, Ph.D (University of Hawaii)
Associate Professor of Japanese and Comparative Literature
Patricia Princehouse, Ph.D. (Harvard University)
Lecturer, Philosophy
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.
The Department of Communication Sciences prepares undergraduate and graduate students to address broad issues of human communication processes and disorders through the application of cutting-edge technology and rigorous clinical training. We provide a comprehensive foundation in normal and disordered human communication and combine it with innovative interdisciplinary experiences that capitalize on the extensive resources of the university and medical community that surround the Department. The Department enjoys a particularly close relationship with Cleveland Hearing and Speech Center, an outstanding independent, non-profit provider of care in speech-language pathology and audiology. The Center is located on campus and the Department is housed within the Center.

**FACULTY**

**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; phonology, phonetics and speech sciences courses.

**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.

**Stacy I. Williams, Ph.D.**
(University of Cincinnati)
Assistant Professor
Assessment & treatment of child speech language disorders, augmentative communication (AAC). Speech language pathology in educational settings, Director of SLP teacher education.

**Lecturers**

Patricia O. Carothers, M.S., CCC-A
(Kent State University)
Lecturer
Fluency Disorders
Kathryn (Kyra) Rothenberg, Ph.D.
(Bowling Green State University)
Lecturer
Health Communication
Tonia Kates Stewart, Ph.D.
(Kent State University)
Lecturer
Health Communication

**Adjunct Faculty**

Barbara Ekelman, Ph.D.
(Case Western Reserve University)
Clinical Instructor, Case Western Reserve University School of Medicine, Department of Pediatrics Speech Language Pathology

Barbara Lewis, Ph.D.
(Case Western Reserve University)
Associate Professor, Case Western Reserve University School of Medicine, Department of Pediatrics Familiality and genetic bases of speech/language disorders

Gail S. Murray, Ph.D.
(Case Western Reserve University)
Associate Professor, Case Western Reserve University School of Medicine, Department of Otolaryngology.

Pediatric audiology; audiologic assessment of special populations; cochlear implants

Laura Brady, M.A., CCC-A
(Kent State University)
Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center

Michelle Burnett, M.A., CCC-SLP
(Michigan State University)
Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center

Margaret Duff, M.A., CCC-SLP
(Case Western Reserve University)
Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center

Laura Brady, M.A., CCC-A
(Kent State University)
Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center

Speech-Language Pathology

Margaret Duff, M.A., CCC-SLP
(Case Western Reserve University)
Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center

Bernard P. Henri, Ph.D.
(Northernwestern University)
Adjunct Professor, primary appointment Cleveland Hearing & Speech Center

Fluency disorders; professional issues in speech-language pathology; health care management

Douglas Hicks, Ph.D. (Vanderbilt University)

Adjunct Professor, primary appointment Cleveland Clinic Foundation

Voice Disorders

Karen Kantzes, M.A., CCC-A
(Ohio State University)
Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center

Kay McNeal, M.S., CCC-SLP
(Purdue University)
Adjunct, primary appointment Cleveland Hearing & Speech Center Speech-Language Pathology

Darlene Moenter, Ph.D.
(Ohio State University)
Adjunct Assistant Professor, primary appointment VA Hospital

Auditory potentials

Jean Nisenboum, M.A. (Miami University)
Adjunct Instructor

Dysphagia, Diagnostics of Speech Language Pathology, and Communication and Aging.

Marilyn S. O’Toole, M.A., CCC-SLP
(Case Western Reserve University)
Adjunct Instructor, primary appointment Euclid City Schools

Speech-Language Pathology

Cara Padin, M.S., CCC-SLP
(Vanderbilt University)
Adjunct Instructor, primary appointment Southwest General Hospital

Speech-Language Pathology

Shirley Prok
Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center

American Sign Language

Richard H. Nodar, Ph.D., F.A.S.H.A.
(Purdue University)
Adjunct Instructor

Auditory evoked potentials; tinnitus; cochlear implants; hearing aids and hearing problems in the aging population

Erica Snelson, M.A., CCC-SLP
(Kent State University)
Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center

Speech-Language Pathology

Brigid Whitford, M.A., CCC-A
(Kent State University)
Adjunct Instructor, primary appointment Cleveland Hearing & Speech Center

Audiology
UNDERGRADUATE (COSI)

COSI 100. Introduction to Human Communication (3)
An overview of human communication processes with an emphasis on skills development. The focus is on the exchange of ideas through oral communication. The role of the individual as a sender/receiver is stressed. Students demonstrate abilities via daily/weekly skill building exercises, oral presentations, rhetorical analysis, and group processes/projects. There is a high degree of student participation and interaction in this course.

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 130. Workshop in Radio Broadcasting (1)
Training in radio broadcasting by participating in the operation of WRUW-FM.

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, adverbial non-manual 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 228. Introduction to Mass Communication (3)
The media of mass communication, particularly in this time of exploding channel availability and information overload, are central factors in the function, maybe even the evolution, of modern society. While most of us are intimately familiar with the products of mass communicators, few understand how media developed, how they function independently and interactively, or what their true effects are. This is a broad survey of mass communication processes.

COSI 236. Public Speaking (3)
Process and lecture course. Develops ability to speak effectively in various contexts. Weekly preparation and delivery of speeches.

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.

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. Prereq: 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 neuropsychology 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. Prereq: Permission of department. Cross-listed as BIOL 379.

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 USSR 204. Students who take USSR 204 may not receive credit for COSI 310. Prereq: COSI 100 or FSCC 100 or equivalent. Cross-listed as USSR 204.

COSI 313. Language Development (3)

COSI 321. 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 advance 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. Prereq: COSI 325.

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, respiratory, 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 328. Media Effects and Literacy (3)
Media play a pivotal role in constructing and delivering various realities. Knowledge of what science has revealed about media influence is a core dimension of media literacy. Media literacy penetrates beyond the rudimentary level of message processing to uncover multiple layers of meaning. This course provides training in the process of selective discrimination, analytical observation, and reasoned assessment of media messages. We will trace the history of effects research, identify philosophical and methodological trends, and compare approaches. Students will synthesize this information and construct their own priorities for understanding media consumption.

COSI 330. Seminar in Radio Broadcasting (3)
One hour of class per week and participation in operation of WRUW-FM. The history of radio, government control and the FCC, public responsibility, program policy, station management with practical broadcast application. Prereq: Two semesters of COSI 130.

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 336. Communication in Professional Contexts (3)
Communication interactions used by profession-
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. Prereq: COSI 456 and COSI 453.

COSI 470. Introduction to Audiology (3)
Disorders of hearing; assessment of hearing, including behavioral and objective measures; intervention strategies; identification programs. Prereq: COSI 325.

COSI 497. Methods of Research (3)
Pure and applied research design for speech language pathologists. Focus on evaluation of research methodology and the formulation of testable research questions.

COSI 557. Acquired Adult Language Disorders (3)
A model relating communication impairment to activities of daily living and quality of life will serve as the study of acquired neurogenic communication disorders in adults. The focus will be on dementia, aphasia, and the communication disorders associated with traumatic brain injury and right hemisphere stroke. Knowledge about the biological basis of neurogenic communication disorders will be applied in discussion on assessment and intervention for these 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 neuropathological 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 disorder 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. Coreq: COSI 321 or COSI 421 and COSI 505.

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 610. 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)
COSI 703. Dissertation Fellowship (1-8)

Major
The major in communication sciences leads to the Bachelor of Arts degree.

The Department offers a broad spectrum of courses in communication sciences and disorders for undergraduate students intending to pursue graduate degrees in speech-language pathology, speech sciences, audiology, behavioral science, or a variety of other health professions. A master's degree is the entry-level degree for clinical practice in speech-language pathology. Students are required to complete 36 hours of course work in normal processes of speech, language and hearing; sign language; psychology; and communication disorders. Throughout the course of study, students have opportunities to observe clinical treatment of persons with communication disorders at the Cleveland Hearing and Speech Center as well as other clinical and medical facilities in the surrounding community. Undergraduate students in communication sciences may take 6 credit hours of graduate course work beyond the 120 hours required for the B.A. degree. These 6 credits can be applied to course requirements for a graduate degree in communication sciences at Case Western Reserve. In addition, students can combine undergraduate and graduate study through the Integrated Graduate Studies Program (see below). Interested students should meet with an advisor for specific course requirements.

Minors
Undergraduate students in other majors may choose a minor in communication sciences. The minor requires a minimum of 15 credit hours. The communication sciences minor focuses on normal processes of speech, language, and hearing, as well as the speech, language and hearing disorders that result from breakdowns in these processes. Interested students should meet with an advisor for specific course requirements.

Departmental Honors
Juniors with a 3.0 overall grade point average and a 3.25 average in the 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 Program
The Integrated Graduate Studies (IGS) 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. Interested students should consult this bulletin and their academic advisor for additional information concerning the IGS program requirements.

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 American Speech-Language-Hearing Association. Upon successful completion of the Masters of Arts degree, students will also meet the academic and clinical practicum requirements for certification by the American Speech-Language-Hearing Association 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 clinical practicum in the area of professional service program and serves as the primary training site for graduate students enrolled in clinical practicum. 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 externship site placements in the greater Cleveland area. Some of these include the Cleveland area HeadStart Programs, Cleveland Heights/University Heights Public Schools, Cleveland Public Schools, Cuyahoga Board of MR/DD, Cleveland Clinic Foundation Children's Hospital, Lakewood Public Schools, Parma Community Hospital, Positive Education Program, Rainbow Babies & Children's Hospital, Shaker Heights Public Schools, Southwest General Hospital, Heather Hill Rehabilitation Hospital, MetroHealth Medical Center, University Hospitals, and the Veterans Administration Medical Center.

Teacher Licensure
Students enrolled in the master's program in communication disorders may also complete the requirements for Ohio Teacher Licensure in speech-language pathology. The Department's Teacher Licensure Program meets the requirements of the Ohio Department of Education and prepares students for employment in a public school setting. (See the departmental advisor for additional details.)

Doctor of Philosophy
The Doctor of Philosophy is awarded to students in recognition of both the mastery, at an advanced level, of a body of knowledge that encompasses the disciplines of communication sciences and speech-language pathology, and the demonstration of the 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 develop expertise in a content area that is the primary focus of their course of study (e.g., communication and aging, medically based speech disorders, child language development and disorders). Each student is encouraged to enhance his or her scholarly preparation by completing course work outside of the primary content area. In addition to course work within the Department, doctoral students may choose course work 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 Dentistry, the Weatherhead School of Management, and the Mandel School of Applied Social Sciences. Additional information about graduate studies and research opportunities within the department is available at the department website www.case.edu/artsci/cosi.

• 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 hours of course work is required. Twelve credit hours in the area of research are required (nine credit hours of statistics and research design; three 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 undertaken 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.
Bo Carlsson, Ph.D. (Stanford University)  
E. Mandel DeWinds Professor of Industrial Economics; Director of Ph.D. Programs and Research,  
David J. Cooper, Ph.D.  
(Princeton University)  
Associate Professor of Economics  
Avi Dor, Ph.D.  
(City University of New York)  
John R. Mannix Blue Cross & Blue Shield Associate Professor of Health Care Economics  
Robin Dubin, Ph.D.  
(Johns Hopkins University)  
Associate Professor of Economics, University Marshal  
Asim Erdilek, Ph.D.  
(Harvard University)  
Professor of Economics  
Susan Helper, Ph.D. (Harvard University)  
Professor of Economics  
James B. Rebitzer, Ph.D.  
(University of Massachusetts)  
Frank Tracy Carlton Professor of Economics, Chair of Economics Department  
Scott Shane, Ph.D.  
(University of Pennsylvania)  
Professor of Economics  
Robert L. Slonim, Ph.D. (Duke University)  
Associate Professor of Economics  
Marcus Stanley, Ph.D. (Harvard University)  
Assistant Professor of Economics  
Mark Votruba, Ph.D. (Princeton University)  
Assistant Professor of Economics  

Secondary Appointment  
Dennis Young, Ph.D. (Stanford University)  
Professor of Nonprofit Management, Mandel School of Applied Social Sciences; Professor of Economics  

UNDERGRADUATE (ECON)  

ECON 102. Principles of Microeconomics (3)  
This course is an introduction to microeconomic theory, providing a foundation for future study in economics. In particular, it addresses how individuals and businesses make 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. The Economic History of the United States (3)  
(See HSTY 255.) Cross-listed as 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 class 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. Pre: 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. Pre: 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 this technique, the consequences of violating these assumptions, and the corrections that can be made. Students will have a chance to formulate and test their own hypotheses using econometric software available for personal computers. PreReq: ECON 102; ECON 103; one semester of statistics.  

ECON 328. Experimental Economics (3)  
This course introduces students to the methods of studying Economics using laboratory experiments and to examine some of the major insights that have been gained through experiments and to examine some of the major insights that have been gained through experimental economics. Students will examine the three related branches of experimental economics: market institutions, game theory, and individual choice problems. The course presents known robust findings from the past 50 years of experimental economics, some of which conform tightly with economic theory while others have led to significant modifications in the way economists view markets and behavior. PreReq: ECON 102.  

ECON 329. Game Theory: The Economics of Thinking Strategically (3)  
The term “game theory” refers to the set of tools economists use to think about strategic interactions among small groups of individuals and firms. The primary purpose of this course is to introduce students to the basic concepts of game theory and its applications. The class will stress the use of game theory as a tool for building models of important economic phenomena. The class will also include a number of experiments designed to illustrate the game theoretic results, and to highlight how reality may depart from the theory. The course will stress the value of thinking strategically and provide students with a framework for thinking strategically in their everyday lives. Rather than approaching each strategic situation they encounter as a unique prob-
lem, students will be taught to recognize patterns in the situations they face and to generalize from specific experiences. 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 341. Money and Banking (3)
(See BAFI 341.) Cross-listed as BAFI 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 “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 microeconomics, 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. Prereq: ECON 102. Cross-listed as BAFI 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 361. 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 364. Competition and Public Policy (3)
This course covers alternative market structures and their performance in terms of profit, prices, and productivity, as well as antitrust laws and regulations and their importance to industrial organization. Prereq: ECON 102.

ECON 367. 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 368. 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. Prereq: ECON 102 and ECON 103. Cross-listed as BAFI 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, multitateral 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; ECON 103.

ECON 377. Economics of Nonprofit Organizations (3)
The purpose of this course is to familiarize students with the private nonprofit sector of the U.S. economy, with economic theory contributing to our understanding of this sector, and with the policy and management issues affecting nonprofit organizations. Topics include understanding the different types of nonprofit organizations; the size, scope and economic significance of the nonprofit sector; the different parts of the economy in which nonprofits operate; economic theories of why nonprofit 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. nonprofit sector compares with the third sector in other coun-
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 395. Public Policy Case Competition (3)
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. Approved SAGES capstone. Prereq: Junior or Senior standing.

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. Approved SAGES capstone. Prereq: Junior standing; minimum GPA of 3.3 in ECON major, 3.0 overall. Coreq: Declared ECON major.

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. Approved SAGES capstone. Prereq: ECON 397. Coreq: Declared ECON major.

ECON 399. Individual Readings and Research (1-6)
Intensive examination of a topic selected by the student. Prereq: ECON 403A. Economics (1)

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, the theory of production and costs, 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. Prereq: ECON 102.

ECON 403A. Economics (1)

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. Prereq: ECON 403 or MBAC 426. Cross-listed as HSMC 421 and MPH 421.

ECON 424. Innovation, Markets, and Organization in the Pharmaceutical Industry (3)
The global pharmaceutical industry is one of the most profitable and fastest growing industries in the world. While the industry is dominated by a few large firms, smaller biotech startups are competing aggressively with new product development and management issues governing the industry. In addition to examining how pharmaceutical companies respond to competitive pressures, we will explore the role of government regulation in the development process and the role of insurance as a demand driver. Topics were chosen to benefit those wishing to gain a general familiarity with a view to consulting, as well as those seeking to enter the industry. Open to undergrads with permission. Cross-listed as BIOS 424, HSMC 424, and MPH 424.

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. Cross-listed as 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
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, MBAC 416 or BAFI 402, ECON 403 or MBAC 426, and QUMM 414 or MBAC 414.

ECON 450. Health Care Economics for the Biosciences (1.5)
(See BIOS 450.) Cross-listed as BIOS 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 or MBAC 426.

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. Cross-listed as ENTP 464.

ECON 474. International Trade (3)
This course deals with the causes and effects of international trade and investment. Its coverage 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 or MBAC 426.

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 or MBAC 426.

ECON 476. Fundamentals of International Business—E.M.B.A. (3)
This course deals with the fundamentals of business activities that cross national boundaries. It focuses on not only exports and imports, but all other issues, such as foreign direct investment, international technology transfer, organizational structure, and financial management, that required a corporate strategy in establishing and maintaining global competitiveness. It covers the basic international business activities within an interdisciplinary framework, drawing from economics, finance, accounting, marketing, organizational behavior, political science, and history. Its aim is not only to enable an understanding of such technical issues as how the effects of tariffs and quotas differ or how foreign exchange rates are determined, but also to provide a systemic view of how government policies and corporate strategies interact in changing the environment of international business. The basic premise of the course is that to formulate successful global corporate strategies, we must comprehend and cope with the political, cultural, and economic environment of international business.

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: MBAC 426 or ECON 403 or equivalent.

ECON 501. Special Problems and Topics (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)
Bachelor of Arts in Economics
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. A major is essential for those wanting to pursue graduate work in economics.

Major (for B.A. degree)
A major in economics consists of 33 hours, with a minimum of 27 hours of economics courses. It leads to the Bachelor of Arts degree.

Degree Requirements
Core Theory
- ECON 102 and 103
• STAT 201 or STAT 207
• ECON 307
• ECON 308 or 309
• ECON 326

Electives
12 ECON credits (at least 6 credits in each of two concentrations)

Senior Capstone
Required, to be chosen from a menu of options and in coordination with your major advisor

Economics Concentrations
Resources and Markets
• ECON 255 - Economic History of the United States
• ECON 332 - Economics of Labor Markets
• ECON 341 - Banking and Finance
• ECON 368 - Environmental Economics

Industrial Organization
• ECON 328 - Experimental Economics
• ECON 329 - Game Theory
• ECON 361 - Managerial Economics
• ECON 369 - Economics of Technological Innovation

Public Economics
• ECON 342 - Public Finance
• ECON 343 - Economics of State and Local Governments
• ECON 345 - Public Choice
• ECON 377 - Economics of Nonprofit Organizations
• 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

Minor (for B.A. or B.S. degree)
A minor in economics consists of 15 hours, as follows:
• ECON 102, ECON 103, and three additional economics courses (9 hours) selected in consultation with the minor advisor, with at least two of the courses in one concentration.

Social Science Sequence (for B.S. based upon Engineering Core Curriculum)
• The sequence requirement is satisfied by taking ECON 102, ECON 103, and one other 200- or 300-level ECON course.

Social Sciences/Social Institutions Requirement (for B.A. or B.S. degree based on Arts and Sciences General Education Requirements)
The three-credit minimum may be satisfied by taking any one of the courses below. The six-credit sequence may be satisfied by taking any two of the courses listed below:
• ECON 102, ECON 103, or ECON 205.

DEPARTMENT OF ENGLISH
106 Guilford House
Phone 216-368-2364; Fax 216-368-4367
William R. Siebenschu, Chair

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 non-profit 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 stepping stone 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.

The department is home to the Society for Critical Exchange, an international community of scholars in literary and cultural theory.

FACULTY
William R. Siebenschu, Chair, Ph.D.
(University of California, Berkeley)
Professor
18th and 19th-century British literature, biography and autobiography
Thomas Sayers Ellis, M.F.A.
(Brown University)
Associate Professor
Creative Writing (poetry); African-American literature
Kimberly Emmons, Ph.D.
(University of Pennsylvania)
Associate Professor
18th Century English literature, history of the book
Mary Grimm, M.A.
(Cleveland State University)
Associate Professor
Creative writing (fiction), contemporary literature
Ted Gup, J.D.
(Case Western Reserve University)
Shirley Wormser Professor of Journalism
American literature; modernism
Heather Meakin, D. Phil.
(University of Oxford)
Assistant Professor
Assistant Professor

Associate Director, Society for Critical Exchange
19th & 20th century British literature, post-colonial literature
William H. Marling, Ph.D.
(University of California, Santa Barbara)
Professor
American literature; modernism
ENGL 148. Introduction to Composition (3)
Practice and training in various modes of writing. Includes regular individual conferences as well as classes. Texts and readings vary from section to section. May be repeated in special instances, but a maximum of three semester hours will count toward a Bachelor's degree. Students placing 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)
Practice and training in expository writing. Although a common quantity of writing is assigned, methods and texts may vary from section to section. A grade of C or better in ENGL 150 fulfills the university composition requirement.

ENGL 180. Writing Tutorial (1-2)
Students who pass ENGL 150 with a grade of D and transfer students who are placed in ENGL 180 on the basis of the ENGL placement test must pass ENGL 180 with a grade of C or higher to meet the ENGL composition requirement of the colleges. Others desiring substantial scheduled tutorial work in composition may report to the Writing Center during the first week of classes to arrange a tutorial appointment. May be repeated in special instances, but no more than three semester hours of ENGL 180 credit will count toward the degree.

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 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. Prereq: ENGL 150 or USFS 100.

ENGL 202. Expository Writing (3)
A workshop-style course for students who wish to refine the skills acquired in ENGL 150. Special attention to style and presentation.

ENGL 203. Introduction to Creative Writing (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. Prereq: ENGL 150 or USFS 100.

ENGL 204. Introduction to Journalism (3)
Print news and feature stories, broadcast writing, advertising copy, and public relations. Considerable writing. Guest speakers from the profession. Prereq: 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. Prereq: 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. Prereq: ENGL 150 or USFS 100.

ENGL 255. Major British Writers (3)
Introduction to literary studies and survey of selected English authors from the Medieval period to the present. Prereq: ENGL 150 or USFS 100.

ENGL 256. Major American Writers (3)
Introduction to literary studies and survey of literature of United States from colonial times to the present. Prereq: ENGL 150 or USFS 100.

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, and art history. It is the required introductory course for students taking the women's studies major. Prereq: ENGL 150 or USFS 100. Cross-listed as WMST 201.

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. Prereq: ENGL 150 or USFS 100.

ENGL 290. Masterpieces of Continental Fiction (3)
Major works of fiction from the 19th century and earlier. Cross-listed as WLIT 290.

ENGL 291. Masterpieces of Modern Fiction (3)
Major works of fiction of the 20th century. Cross-listed as WLIT 291.

ENGL 300. English Literature to 1800 (3)
A survey of major British authors from Chaucer to Milton and Dryden. Prereq: ENGL 150 or USFS 100.

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. Prereq: ENGL 150 or USFS 100.

ENGL 302. English Literature from 1800 to the 20th Century (3)
A survey of major British authors from Wordsworth to the present. Prereq: ENGL 150 or USFS 100.

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 experimen
tation 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 con-
text of examples, classic and contemporary. Prereq:
Any one of the following: ENGL 203 or ENGL
213 or ENGL 214, ENGL 303, ENGL 304. Cross-
listed as 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 per-
sonal essay. Prereq: ENGL 204, ENGL 214, ENGL
203, or ENGL 213.

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 reperto-
rial techniques. Prereq: ENGL 150 or USFS 100
and ENGL 204, or permission of department.

ENGL 308. American Literature (3)
A survey of major American authors from the pu-
ritans to the present. Prereq: ENGL 150 or USFS
100.

ENGL 309. Topics in Journalism (3)
Study and practice of specialized forms of journal-
ism. Maximum of six credits. Prereq: 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. Prereq: ENGL 150 or USFS 100.

ENGL 312. Chaucer (3)
An introduction to the work of Geoffrey Chaucer,
with emphasis on "The Canterbury Tales." Prereq:
ENGL 150 or USFS 100.

ENGL 317. Business and Technical Writing (3)
Professional communication in theory and practice,
including audience analysis, logic and strategy ap-
p lied to the writing of technical reports, proposals,
manuals, progress and feasibility studies, memoran-
da, and letters. Prereq: ENGL 150 or USFS 100.

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. Prereq:
ENGL 150 or USFS 100.

ENGL 323. Milton (3)
Poetry and selected prose, including the careful
study of "Paradise Lost." Prereq: ENGL 150 or
USFS 100.

ENGL 324. Shakespeare: Histories and Tragedies (3)
Close reading of a selection of Shakespeare's trag-
edies 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. Prereq:
ENGL 150 or USFS 100. Cross-listed as THTR
334.

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. Prereq: ENGL
150 or USFS 100. Cross-listed as THTR
335.

ENGL 327. Eighteenth-Century Literature (3)
Survey of a variety of writings from or relevant to
the eighteenth century. Writers discussed may in-
clude Dryden, Behn, Defoe, Pope, Swift, Gay, Field-
ing, Richardson, Burney, Wollstonecraft and others
working in drama, lyric and epic poetry, biography
and autobiography, political and philosophical writ-
ings and prose fiction. Thematic approaches may
include: satire, journalism and literature, the rise of
the novel. Maximum 6 credits. Prereq: ENGL 150
or USFS 100.

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 En-
ish 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. Prereq: ENGL
150 or USFS 100.

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. Prereq: ENGL 150
or USFS 100.

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 philo-
osophical writing. Writers such as the Brontes, Gas-
kell, Dickens, Eliot, Hardy, Tennyson, the Brown-
ings, Arnold, Carlyle, Ruskin, Gosse, Swinburne,
and Hopkins. Maximum 6 credits. Prereq: ENGL
150 or USFS 100.

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, sexual-
ity, or Empire; literature and other arts; Gothic
fiction, decadence. Maximum 6 credits. Prereq:
ENGL 150 or USFS 100.

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, Law-
rence, Mansfield, Shaw, Beckett, Stoppard, Yeats,
Edward or Dylan Thomas, Stevie Smith, Bowen,
Spark. Maximum 6 credits. Prereq: ENGL 150 or
USFS 100.

ENGL 333. Studies in the Twentieth Century (3)
Individual topics in twentieth-century literary cul-
ture. Particular issues and topics may cross national
boundaries and genre lines as well as exploring
political, psychological, and social themes, such as
movements, comparative studies across the arts,
literature and war, literature and occultism. Maxi-
 mum 6 credits. Prereq: ENGL 150 or USFS
100.

ENGL 334. 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. Prereq: ENGL 150 or USFS 100.

ENGL 335. 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. Prereq: ENGL
150 or USFS 100.

ENGL 336. 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. Pre-
req: ENGL 150 or USFS 100.

ENGL 357. 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, po-
American works may also be included. May cover the entire history of the U.S. or shorter periods. Maximum 6 credits. Prereq: ENGL 150 or USFS 100. Cross-listed as WLIT 366G.

**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. Prereq: ENGL 150 or USFS 100.

**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. Prereq: ENGL 150 or USFS 100. Cross-listed as WLIT 368A.

**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. Prereq: ENGL 150 or USFS 100.

**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. Cross-listed as WLIT 368C.

**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. Prereq: ENGL 150 or USFS 100.

**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. Prereq: ENGL 150 or USFS 100.

**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. Prereq: ENGL 150 or USFS 100.

**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. Prereq: 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. Prereq: 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. Prereq: ENGL 150 or USFS 100.

**ENGL 377. 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. Prereq: ENGL 150 or USFS 100.

**ENGL 380. Senior Seminar (3)**

Capstone course required of all English majors in the senior year. Limited to senior English majors. Maximum 6 credits. Approved SAGES capstone. Prereq: ENGL 300 plus either ENGL 302 or 308.

**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," "epistolarity." Maximum 9 credits. Prereq: ENGL 150 or USFS 100.

**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. Prereq: ENGL 150 or USFS 100.

**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. Prereq: ENGL 150 or USFS 100. Cross-listed as WLIT 387.

**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...
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, 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. May also include up to three semester hours of supervised peer tutoring at the University Writing Center.

ENGL 398. Professional Communication for Engineers (2)
A writing course for engineering majors only. Subjects covered include audience adaptation, problem/solution formats, lab reports, journal articles, proposals, feasibility studies, and oral presentations. Corequisite is a particular engineering lab course; students should consult advisors. Prereq: ENGL 150 or USFS 100. Coreq: Concurrent enrollment in appropriate engineering course.

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: ENGL 150 or USFS 100.

ENGL 399. Senior Thesis (3)
Elective research or creative project. Should be used for Honors Projects option. By department approval only. Maximum 6 credits. Prereq: Consent of department.

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.

ENGL 401. Linguistic Analysis (3)
(See ENGL 301.)

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. Prereq: Consent of department.

ENGL 410. History of the English Language (3)
(See ENGL 310.)

ENGL 420. Renaissance Literature (3)
(See ENGL 320.)

ENGL 423. Milton (3)
(See ENGL 323.)

ENGL 424. Shakespeare: Histories and Tragedies (3)
(See ENGL 324.)

ENGL 425. Shakespeare: Comedies and Romances (3)
(See ENGL 325.)

ENGL 428. Studies in the Eighteenth Century (3)
(See ENGL 328.)

ENGL 429. English Literature, 1780-1837 (3)
(See ENGL 329.)

ENGL 431. Studies in the Nineteenth-Century (3)
(See ENGL 331.)

ENGL 432. Twentieth-Century British Literature (3)
(See ENGL 332.)

ENGL 433. Studies in the Twentieth Century (3)
(See ENGL 333.)

ENGL 453. Major Writers (3)
(See ENGL 353.)

ENGL 456. American Literature Before 1865 (3)
(See ENGL 356.)

ENGL 457. American Literature 1865-1914 (3)
(See ENGL 357.)

ENGL 458. American Literature 1914-1960 (3)
(See ENGL 358.)

ENGL 459. Studies in Contemporary American Literature (3)
(See ENGL 359.)

ENGL 463H. African-American Literature (3)
(See ENGL 363H.) Cross-listed as WLIT 463H.

ENGL 465E. The Immigrant Experience (3)
(See ENGL 365E.) Cross-listed as WLIT 465E.

ENGL 465N. Topics in African-American Literature (3)
(See ENGL 365N.) Cross-listed as WLIT 465N.

ENGL 465Q. Post-Colonial Literature (3)
(See ENGL 365Q.) Cross-listed as WLIT 465Q.

ENGL 466G. Minority Literatures (3)
(See ENGL 366G.) Cross-listed as WLIT 466G.

ENGL 467. Introduction to Film (3)
(See ENGL 367.)

ENGL 468A. Film History, Theory, and Criticism (3)
(See ENGL 368A.) Cross-listed as WLIT 468A.

ENGL 468B. History of Film (3)
(See ENGL 368B.)

ENGL 468C. Topics in Film (3)
(See ENGL 368C.) Cross-listed as WLIT 468C.

ENGL 471. Topics in Women’s Studies (3)
(See ENGL 371.)

ENGL 472. Studies in the Novel (3)
(See ENGL 372.)

ENGL 473. Studies in Poetry (3)
(See ENGL 373.)

ENGL 476. Studies in Genre (3)
(See ENGL 376.)

ENGL 479. Topics in Language Studies (3)
(See ENGL 379.)

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)
(See ENGL 385.)

ENGL 486. Studies in Literature and Culture (3)
(See ENGL 386.)

ENGL 487. Literary and Critical Theory (3)
(See ENGL 387.) Cross-listed as 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. Teaching Technical and Professional Communication (3)
Prepares graduate students to teach technical and professional writing in academic and non-academic settings. Prereq: ENGL 500.

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 Diction-

ENGL 651. Thesis M.A. (1-18)

ENGL 701. Dissertation Ph.D. (1-18)
Prereq: Ph.D. candidates only.

ENGL 702. Appointed Dissertation Fellow (9)

ENGL 703. Dissertation Fellowship (1-8)

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 ENGL 300 (English Literature to 1800), either ENGL 302 (English Literature since 1800) or ENGL 308 (American Literature), ENGL 380 (Senior Seminar), and a minimum of 15 additional hours at the 300 level or above which must include one course from an approved list of courses dealing with literature before 1800. Two of the following courses, English 300, 302, & 308, are prerequisites for the senior seminar. To qualify for honors, one follows a track consisting of at least 36 hours above the 100 level, including ENGL 300 (English Literature to 1800), either ENGL 302 (English Literature since 1800) or ENGL 308 (American Literature) ENGL 380, 24 hours of approved electives in literary and cultural studies, and one of the following language courses: FRCH 202, GREEK 202, GRMN 202, JAPN 202, LATN 202, SPAN 202, or equivalent in a language for which 300-level literature courses are available. In addition, of the 24 hours of electives, six must be in literature before the 19th century and 3 must be in theory or methods of analysis. The award of honors requires a minimum GPA of 3.5 in courses taken for the Honors Program. Two of the following courses, English 300, 302, and 308, are prerequisites for the senior seminar in the honors track.

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.

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 (35 credit hours, see Educational Policy [EDUC & EDJC]) that includes student teaching in a local school. 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 Professor Judith Oster, the English advisor, for this program.

Subject Area Requirements (42 credit hours):
- ENGL 150, 200, 202, 204, 256, 390, 380, 393; ENGL 255 or 257K; ENGL 324 or 325; ENGL 301, 379, or COSI 313; two of ENGL 257B, 270, 363H, 365E, 365N, 365Q, 366G; ENGL 368A, 368B, or 368C.
- Recommended Electives: ENGL 203, 213, 214, 303, 304, 310, 317, 392, 480.

Minor

The minor in English consists of at least 15 hours above the 100 level. Students who wish to minor in English arrange their sequence of courses in consultation with the department's minor advisor. Minors are strongly advised to take ENGL 200 (Literature in English) early in the sequence. They also should keep it in mind that the flexibility of the department's requirements often makes it possible to take English as a second major.

Sequences for Case School of Engineering Students

Sequences in English provide students with an examination of major literary texts, close study of a cultural period or genre (including film), increased facility in writing, and a better understanding of the nature and functioning of language. Any sequence of three courses above the 100 level (9 hours) that meets at least two of these goals normally will be acceptable. Students should consult the department's sequence advisor in planning their programs. ENGL 398 and 398N cannot be counted to-
ward a sequence or a minor.

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 within 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 in this publication.

GRADUATE PROGRAM
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. For current information on this and other graduate programs in the department consult the department’s website, http://www.case.edu/artsci/engl

Candidates for graduate work in English should present an undergraduate major in English or a minimum of 18 semester hours of English (or its equivalent) beyond the freshman level. In some cases, students 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 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. A maximum of six semester hours of transfer credit will be accepted from another institution provided it was earned in graduate-level courses and has the approval of the department and the dean of graduate studies. Such courses must have been taken within five years of matriculation at Case Western Reserve University and passed with grades of B or better.

The department welcomes part-time students.
Although not formally a requirement for graduate degrees, 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 courses offered by the department. Other teaching opportunities exist elsewhere in the university and in the Greater Cleveland area.

New and continuing graduate students may apply for graduate student assistantships, which are awarded by the dean on recommendation of the department. Applicants with previous teaching experience are preferred. Graduate assistants without previous teaching experience will be required to take ENGL 400, Seminar in Rhetoric and the Teaching of Writing, before the first semester in which they teach.

Special Master of Arts Programs
Master of Arts in comparative literature (English and French, German or Spanish). A more detailed description of all graduate programs in English is available from the departmental office or the Office of Graduate Admissions.

FACILITIES
Faculty and graduate student offices are in Guilford House, as is a faculty/student lounge and reading room (Guilford 223). Camera, recorders, and monitors are available in Guilford for making and viewing videotapes. The Film Society maintains a state-of-the-art film projection facility in Strosacker Auditorium. Kelvin Smith Library, a part of the University Libraries, houses the collections of printed and audiovisual material. In addition to manuscript and rare-book holdings in the Special Collections Division, the library has strengths in Renaissance literature, 18th- and 19th-century English literature, and American literature. The Library has recently acquired an outstanding collection of approximately 6500 art films on videotape, supported in part by English department endowment funds.

CURRENT AREAS OF RESEARCH
Current topics of faculty research include early modern women’s writing, Shakespeare’s theater, biography and autobiography, cognitive linguistics, authorship and intellectual property, the export of American popular culture, immigrant and cross-cultural literature in the United States; the history of the book; medical and psychological contexts of Victorian literature; the literature of empire; rhetoric and composition, medical rhetoric, developing cinematic technologies & genres, and the aesthetics of modernism.

ENVIRONMENTAL STUDIES PROGRAM
211 Smith Building
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Peter McCall, Director

PROGRAM FACULTY
Peter L. McCall, J.D., Ph.D.
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Joseph F. Koonce, Ph.D.
(University of Wisconsin, Madison)
Professor, Biology
Timothy K. Beal, Ph.D. (Emory University)
Associate Professor, Religion
Mihajilo Mesarovic, Ph.D.
(Serbian Academy of Science)
Cady Staley Professor of Engineering
Carroll W. Pursell, Ph.D.
(University of California, Berkeley)
Adeline Barry Davel Distinguished Professor of History of Technology
Theodore Steinberg, Ph.D.
(Brandeis University)
Professor of History; Professor, School of Law

UNDERGRADUATE (ESTD)

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 387. Multidisciplinary Approach to Environmental Problems (1-3)
This course is designed to illustrate, using a different topic each year, the necessity for a multidisciplinary approach to environmental problems in order to understand and manage environmental problems. Students registering for 1 credit attend weekly seminars; those registering for 2-3 credits do an individual research project in addition.

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. Prereq: ESTD 101.
Environmental studies is an multi-disciplinary program that introduces students to the societal determinants and implications of environmental problems. Emphasis is given to the moral, cultural, and political dimensions of environmental problems and solutions. It brings to bear the issues and methods of the humanities and social sciences as well as the sciences and professions on environmental questions. The program is designed to serve the needs of students seeking a liberal education as well as those who desire a broad intellectual base for more technical training in environmental sciences. Students in environmental studies can pursue a major, a minor, or Engineering Core sequence.

**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 multi-disciplinary perspective offered by the program may 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
- One course from each of the three following areas of emphasis:

**Humanities**

- RLGN 206. Religion and the Environment
- HSTY 378. History of the American Environment

**Social Policy**

- ECON 368. Environmental Economics
- GEOL 303. (POSC 303). Environmental Law

**Science and Engineering**

- ESCI 340. Introduction to Global Issues
- BIOL 350. Introduction to Ecosystem Analysis
- 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. An approved Washington Semester internship may be used to satisfy part or all of the elective requirement. Students should consult with the program director for current information. All student programs must be approved by the director.

**Minor**

The minor in the College of Arts and Sciences (15 credit hours) consists of ESTD 101, one course from two of the three disciplinary groups above, and two of the approved electives, which may include courses from the third unslected disciplinary grouping.

**Sequence**

The sequence in environmental studies in the Case School of Engineering consists of 9 credit hours comprising ESTD 101 and two courses from the above disciplinary list.

**ETHNIC STUDIES PROGRAM**

Guilford House 204
Tel: 216-368-4885
Fax: 216-368-2216
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Gilbert Doho, Director

**Program Faculty**

- Gabriela Copertari, Ph.D. (Georgetown University) Assistant Professor of Spanish (Latin American Literature and Film)
- Gilbert Doho, Ph.D. (University of Paris III, Sorbonne Nouvelle) Associate Professor of French (African Literature and Film)
- Atwood D. Gaines, Ph.D. (University of California, Berkeley), M.P.H (University of California, Berkeley, School of Public Health) Professor of Psychiatry and Professor of Biochemical Ethics; religion, aging; cultural studies of sciences; bioethics; social identity; United States, the Mediterranean
- Kurt Koenigsberger, Ph.D. (Vanderbilt University) Assistant Professor of English (Postcolonial Studies)

Katherine Lavelle, Ph.D. (Northwestern University) Assistant Professor of Political Science (African Politics)
Jacqueline Nanfio, Ph.D. (University of California, Los Angeles) Associate Professor of Spanish (Latin American Studies)
Constantine Petridis, Ph.D. (Ghent University) Assistant Professor of Art History (African Art)
Jonathan Sadowsky, Ph.D. (The John Hopkins University) Associate Professor of History (Africa)
Thomas Sayers Ellis, M.F.A. (Brown University) Associate Professor of English (African American Literature)
Cheryl Toman, Ph.D. (University of Illinois, Urbana-Champaign) Assistant Professor of French (Francophone Studies)
Rhonda Y. Williams, Ph.D. (University of Pennsylvania) Associate Professor of History (African American History and Culture)

**UNDERGRADUATE (ETHS)**

ETHS 235. Theater and Identity: Multicultural Voices in American & World Theater (3) (See THTR 235.) Cross-listed as THTR 235.

ETHS 251. Introduction to the Study of Race and Ethnicity (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 U.S.

ETHS 251A. Oral Performances and Ethnic Identities (3) This course is an in-depth study of African griots, Native American, African-American, East European, and Latina/o-American storytellers, the oral epic, and performance traditions that have helped to shape and anchor the identities of different 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 Douglass, blues and negro-spiritual will be considered as 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. Cross-listed as HSTY 252A.

ETHS 252B. Introduction to Latino/a Studies (3)
Interdisciplinary introduction to the basis for a Latino/a 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 transnation), 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 Latinos/as in the U.S.; the evolution of Latino/a ethnicity and identity; immigration and the formation of Latino/a 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 Latinos/as.

ETHS 253A. Introduction to Modern African History (3)
(See HSTY 135.) Cross-listed as HSTY 135.

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.

ETHS 258. History of Southern Africa (3)
(See HSTY 258.) Cross-listed as HSTY 258.

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. Cross-listed as RLGN 259.

ETHS 260. Slavery and Emancipation (3)
(See HSTY 260.) Cross-listed as HSTY 260.

ETHS 261. African-American History 1865-1945 (3)
(See HSTY 261.) Cross-listed as HSTY 261.

ETHS 268. Colonialism in Africa (3)
(See HSTY 268.) Cross-listed as HSTY 268.

ETHS 295. The Francophone World (3)
(See FRCH 295.) Cross-listed as FRCH 295.

ETHS 314. Cultures of the United States (3)
(See ANTH 314.) Cross-listed as ANTH 314.

ETHS 318. History of Black Women in the U.S. (3)
(See HSTY 318.) Cross-listed as HSTY 318.

ETHS 335. Women in Developing Countries (3)
(See FRCH 335.) Cross-listed as FRCH 335.

ETHS 336. The Struggle for Justice in Latin America (3)
(See HSTY 336.) Cross-listed as HSTY 336.

ETHS 362. Polities of Central Asia (3)
(See POSC 362.) Cross-listed as POSC 362.

ETHS 363H. African-American Literature (3)
(See ENGL 363H.) Cross-listed as ENGL 363H.

ETHS 364. Dictatorship and Democracy in Modern Latin America (3)
(See POSC 364.) Cross-listed as POSC 364.

ETHS 365N. Topics in African-American Literature (3)
(See ENGL 365N.) Cross-listed as ENGL 365N.

ETHS 365Q. Post-Colonial Literature (3)
(See ENGL 365Q.) Cross-listed as ENGL 365Q.

ETHS 366. Government and Politics of Africa (3)
(See POSC 366.) Cross-listed as POSC 366.

ETHS 370K. Nationalism, Ethnicity, and Religion in World Politics (3)
(See POSC 370K.) Cross-listed as POSC 370K.

ETHS 374. Politics of Development in the Global South (3)
(See POSC 374.) Cross-listed as POSC 374

Minor
The goal of the Ethnic Studies program in the College of Arts and Sciences at Case Western Reserve University is to expand and enhance course offerings on ethnicity and race in the United States. The program's objectives are (1) to examine relationships among racial/ethnic groups and the processes of racial/ethnic formation and intersections 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 students a deep knowledge of the cultures of Africa, and Latin America; (5) to help students to 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 will support research pertinent to the field and encourage cultural and academic exchange among scholars and students. This program is part of Case’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.

Requirements: 15 Hours

The Ethnic Studies minor is open to all undergraduate students. It requires a minimum of 15 credit hours. Students are required to take six (6) credits from among Ethnic Studies Core Courses and nine (9) credits in their chosen areas of concentration. Community projects are strongly advised 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 at times will incorporate the Seminar Approach to General Education and Scholarship (SAGES) and 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 Latina/o 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 are designed with the objective of maximizing use of University Circle institutions.

II. Areas of Concentration (9 credits)
Available approved courses

Concentration on African Studies
- ANTH 322: Living Africa (3)

Concentration on African-American Studies
- 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)

Concentration on Latin America and Caribbean Studies
- 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: SPC TPC: 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)

Concentration on Global Ethnic Studies
- ANTH 388: Globalization, Development, and Underdevelopment (3)
- ANTH 314: Cultures of the United States (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 (3)
- COSI 260: Multicultural Aspects of Human Communication (3)
- COSI 328: Media Effects and Literacy (3)
- ETHS 259: Religion and Cultures in Africa (3)
- COSI 260: Multicultural Aspects of Human Communication (3)
- COSI 328: Media Effects and Literacy (3)
- ECON 375: Economics of Developing Countries (3)
- ENGL 365/WLIT 365 Q: Postcolonial Literature (3)
- FRCH/ WLIT 295: The Francophone World (3)
- SOCI 302: Race and Ethnic Minorities in American Society (3)
- HSTY 321: Colonialism, Sex, Race, and Gender (3)
- POSC 362: Politics of Central Asia (3)
- POSC 370K: Nationalism, Ethnicity, and Religion in World Politics (3)
- POSC 374: Politics of Development in the Global South (3)
- SPAN/ WLIT 285: Hispanophone world (3)

EVOLUTIONARY BIOLOGY
238 Mather Memorial Building
Telephone 216 368 2264
Fax 216 368 5334
Cynthia Beall, Chair of Steering Committee

PROGRAM FACULTY
Cynthia Beall, Ph.D.
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.

The Major

The 30 credit interdisciplinary major consists of three foundation courses, one senior seminar, one course in ecology, one in the philosophy/history of science, and four approved electives. In consultation with a major advisor, students will tailor intensive study to suit particular interests within the major. This is a second major in conjunction with a conventional disciplinary major. The courses will be selected from the following list of courses. Up to twelve credits in required and elective courses taken by students for their first major may be applied to their Evolutionary Biology major.

Major Course Outline

- 3 Foundation courses (9 credits)
- 1 Senior Seminar (3 credits)
- 1 Philosophy/History of science (3 credits; additional courses in this section may be selected as approved electives)
- 1 Ecology course (3 credits)
- 4 approved elective courses (12 credits; may be selected from Approved Elective and Philosophy/History of Science lists)
- The Foundation Courses are
  - BIOL 214: Principles of Developmental Biology
  - BIOL 216: Organisms and Ecosystems
  - BIOL 362: Principles of Developmental Biology
  - PHIL 203: Natural Philosophy I
  - PHIL 204: Natural Philosophy II
  - PHIL 303: Topics in Philosophy of Science (Evolution, Creation, and Science; Darwin’s Revolution; Evolutionary Theory and Race)
  - PHIL 309: Philosophical Issues in Genetics
  - The Ecology Options are
    - BIOL 216: Organisms and Ecosystems
    - BIOL 336: Aquatic Biology
    - BIOL 337: Marine Ecology
    - BIOL 370: Ecology

Approved Elective Courses include

- ANTH 103: Introduction to Human Evolution
- ANAT 375: Human Evolution: The Fossil Evidence
- ANAT 377: Human Musculoskeletal Anatomy
- ANAT 383: Evolutionary Anatomy
- ANTH 105: Worldwide Variation in Human Biology
- ANTH 295: Comparative Primate Behavior
- ANTH 302: Darwinian Medicine
- ANTH/BIOL/GEOL/PHIL 367: Topics in Evolutionary Biology
- ANTH/BIOL/GEOL/PHIL 396: Undergraduate Research in Evolutionary Biology
- ANTH 393: Human Ecology: Biology of Human Adaptability
- ANTH 397: Epidemiology and Evolution of Human Disease
- BIOL 223: Vertebrate Biology
- BIOL 305: Herpetology
- BIOL 326: Genetics
- BIOL 343: Microbiology
- BIOL 358: Animal Behavior
- BIOL 362: Principles of Developmental Biology
- BIOL 365: Evo-Devo: Evolution of Body Plans
- GEOL 307/BIOL 307: Evolutionary Biology and Paleobiology of Invertebrates
- GEOL 451: Isotopy Geology
- GEOL 452: Geochronology
- PSCL 350: Behavioral Genetics

FRENCH AND FRANCOPHONE STUDIES

203 Clark Hall
Phone: 216-368-2633; Fax 216-368-0812
Laura E. Hengehold, Director

FRENCH AND FRANCOPHONE STUDIES PROGRAM COMMITTEE AND ADVISORS

Laura E. Hengehold, Ph.D.
(Loyola University)
Director of French Studies, Associate Professor of Philosophy
Political and social philosophy; philosophy of feminism; contemporary continental philosophy; Foucault
Gibert Doho, Ph.D.
(Université de Sorbonne Nouvelle, Paris III)
Associate professor of French
Twentieth-century French drama, Francophone Studies; African performing arts, cinema
Marie Lathers, Ph.D. (Brown University)
Elizabeth M. and William C. Treuhaft
Professor of French
Women and the visual arts; Nineteenth-century French literature and the arts; gender, science, and technology; feminist theory; space studies
Miriam R. Levin, Ph.D.
(University of Massachusetts)
Associate Professor of History
Industrial culture; European technology; French cultural history
Cheryl Toman, Ph.D.
(University of Illinois, Urbana)
Assistant Professor of French
African and Middle Eastern Francophone literature, especially Cameroon; women’s writing; immigrant communities in France

THE FRENCH AND FRANCOPHONE STUDIES PROGRAM

Designed to develop cross-cultural awareness and to foster international understanding in a global world, the French and Francophone Studies (FFS) Program adds an exciting new dimension to the traditional liberal arts curriculum. The French and Francophone Studies major differs from the traditional French major in two respects: by its interdisciplinary nature and by its greater flexibility to accommodate students’ own areas of interest. The FFS major answers the needs of students with a strong interest in cultural issues in general and in French Francophone history and society in particular. By allowing students to take coursework in English, the FFS major allows them to profit from the many courses on campus in various departments that focus on France and the Francophone world.

The FFS Program is an interdisciplinary, integrated program that understands the term “French” in its broadest sense, in an effort to represent the diversity characteristic of the field of French studies today as reflected in a variety of cultures of Francophone expression: Canada, the Caribbean, North and West Africa, the Middle East, and Southeast Asia. Reaching beyond disciplinary and national boundaries, the program encourages students to study in several disciplines, choosing from a large selection of courses in the humanities, the arts, and the social sciences. The program takes advantage of the varied resources the university has to offer in order to provide a meaningful course of study and an outstanding preparation for various graduate and professional schools or for careers in international business and finance, law, journalism, diplomatic service, non-profit and other international organizations, health, teaching, or the arts.

FRENCH AND FRANCOPHONE STUDIES MAJOR

Each student prepares a program of study in close consultation with a faculty advisor drawn from the Advisory Committee membership. Students should also discuss their choice of a minor or a second major with their advisor. The major in French studies requires a minimum of 33 credit hours in the following areas:

I. Foundations in Language (8)
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.

II. Foundations in Culture (9)
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.

III. Elective Related Courses in French and Other Disciplines (15-21)
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 FFS 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)

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

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) (also WLIT 387)
- ENGL 387 Literary and Critical Theory (also WLIT 387)

World Literature
- WLIT 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)
• 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 Impostors in Early Modern Europe
• HSTY 315 Heresy and Dissidence in the Middle Ages (also RLGN 315)
• HSTY 321 Colonialism, Sex, Race, and Gender (French content)
• HSTY 332 European Diplomacy in the Age of Nationalism: 1789-1945
• HSTY 348 Political and Social Thought in the Machine Age (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 Political and Social Thought in the Machine Age (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)
• Religion
• RLGN 315 Heresy and Dissidence in the Middle Ages (also HSTY 315)
• 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)

Language Requirement
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 History and Culture).

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) will be offered in odd-numbered years. A spring break service-learning excursion to Montreal is FRCH 208.

Teacher Licensure Option
Students participating in the teacher licensure program complete a 45-47 semester 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 Education [EDUC & EDJC] for overview and course requirements) begins with a sequence taken on campus, followed by 23 semester hours at John Carroll University, culminating in the student teaching requirements.

Subject Area Requirements (select from):

*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).

Minor (15-17 Credits) and Sequence Requirements
For the minor, 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.

The sequence in French studies consists of one of the following courses: FRCH 316, FRCH 318, FRCH 319, or HSTY 310; and two additional 300-level courses.

Department of Geological Sciences
112 A.W. Smith Building
Phone 216-368-3690; Fax 216-368-3691
Gerald Matisoff, Chair

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, en-
gineering construction works, and other environmental concerns. The Department also houses Environmental Studies, which is offered only as a second major. Environmental Studies is a multidisciplinary program that introduces students to the societal determinants and implications of environmental problems. Emphasis is given to the moral, cultural, and political dimensions of environmental problems and solutions. It brings to bear the issues and methods of the humanities and social sciences as well as the sciences and professions on environmental questions. The program is designed to serve the needs of students seeking a liberal education as well as of those who desire a broad intellectual base for more technical training in environmental sciences. Students in Environmental Studies can pursue a major, a minor, or Case core sequence.

The faculty focus their research in four areas: surficial processes, planetary materials, geochemistry, and sedimentary basin analysis. The Department of Geological Sciences 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 (Ph.D.).

**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.** (Yale University)
Professor; Director, Environmental Studies Program
Benthic ecology, paleoecology

**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

**Beverly Z. Saylor, Ph.D.**
(Massachusetts Institute of Technology)
George B. Mayer Associate Professor of Urban and Environmental Studies

**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, paleoclimatology

**Joseph T. Hannibal, Ph.D.**
(Kent State University)
Adjunct Assistant Professor; Cleveland Museum of Natural History
Invertebrate paleontology

**Michael Ketterer, Ph.D.**
(University of Colorado)
Adjunct Assistant Professor; Northern Arizona University
Analytical chemistry

**David Saja, Ph.D.** (University of Pennsylvania, Philadelphia, PA.)
Adjunct Assistant Professor
Cleveland Museum of Natural History, Mineralogy

**Richard C. Schmidt, Ph.D.**
(McGill University, Canada)
Adjunct Professor
Economic geology

**UNDERGRADUATE (GEOL)**

**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 Oceangography (3)**
The sciences of oceanography. Physical, chemical, biologic, 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. Prereq: GEOL 110.

**GEOL 188. On Being a Scientist (1)**
(See ASTR 188.) Cross-listed as ASTR 188.

**GEOL 196. Energy and Society (3)**
(See PHYS 196.) Cross-listed as PHYS 196.

**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)**
(See PHIL 225.) Cross-listed as PHIL 225.

**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 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. Prereq: GEOL 110 and GEOL 119.

GEOL 307. Evolutionary Biology and Paleobiology of Invertebrates (3) 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 deformatonal styles in various tectonic settings and the dynamics of the Earth's interior. Prereq: 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. Prereq: GEOL 119 or permission of instructor.

GEOL 321. 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.

GEOL 330. 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.


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. Prereq: 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. Prereq: 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.

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.

GEOL 360. Summer Field Camp (6) Six-week course in geologic field methods and mapping. Not offered at CWRU; must be taken at another college or university. Credits will be transferred.

GEOL 367. Topics in Evolutionary Biology (3) (See ANTH 367.) Cross-listed as ANTH 367.

GEOL 390. Introduction to Geological Research (2) 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.

GEOL 391. Senior Project (3) 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 second in a three-course (GEOL 390, 391, 392) senior project sequence. Approved SAGES capstone. Prereq: GEOL 390.

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 and oral presentation as demonstrated by practice examples. This course is the third in a three-course (GEOL 390, 391, 392) senior project sequence. Approved SAGES capstone. Prereq: GEOL 391.

GEOL 394. Seminar in Evolutionary Biology (3) (See PHIL 394.) Cross-listed as PHIL 394.

GEOL 396. Undergraduate Research in Evolutionary Biology (3) (See ANTH 396.) Cross-listed as ANTH 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. Prereq: GEOL 110 and GEOL 119.

GEOL 415. Structural Geology and Geodynamics (3) (See GEOL 315.)

GEOL 421. Hydrogeology (3) (See GEOL 321.)

GEOL 425. Geotectonics (3) Interpretation of the major crustal features of the earth in terms of plate tectonics and associated phenomena.

namic 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 balance; 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 450. Geochemistry (3)
(See GEOL 350.)

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. Prereq: Consent of department.

GEOL 467. Topics in Evolutionary Biology (3)
(See ANTH 467.) Cross-listed as ANTH 467.

GEOL 494. Seminar in Evolutionary Biology (3)
(See PHIL 494.) Cross-listed as 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. Cross-listed as BIOL 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.)

GEOL 703. Dissertation Fellowship (1-8)

Major Programs
Students in the 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 program stress practical experience and field work 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.

Environmental Geology Major
The minimum requirements set by the department include 8 hours each of chemistry and calculus, plus BIOL 110, ESTD 101, PHYS 115, and STAT 201, plus GEOL 110, 119, 210, 220, 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, consonant 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 in Geological Sciences
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 will be furnished upon request by the departmental office and the Office of Admission of the School of Graduate Studies.

Facilities
The department is housed in the Albert W. Smith Building. Research facilities include thin sectioning and mineral separation facilities; laboratories for chemical analysis of water including an ion chromatograph, colorimetric spectrometer, electrochemistry, 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; and two dou-
ble collecting gas source mass spectrometers and extraction equipment for stable isotope studies; 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, submicron 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.

**GEOLOGICAL SCIENCES (GEOL)**

**Undergraduate Courses**

German Studies Program
Max Kade Center for German Studies
113 Clark Hall
Phone 216-368-6202
Guilford House 305

**GERMAN STUDIES PROGRAM COMMITTEE**

Jutta Ittner
Associate Professor of German and Director,
Max Kade Center for German Studies

Laura Hengehold
Assistant Professor of Philosophy

Kenneth Ledford
Associate Professor of History

Vincent E. McHale
Professor of Political Science

Kelly McMann
Assistant Professor of Political Science

Susanne Vees-Gulani
Assistant Professor of Comparative Literature

**THE GERMAN STUDIES PROGRAM**

The German Studies program offers the freedom to develop an interdisciplinary program of courses to meet the particular needs and interests of each student. The program builds the foundation for graduate work in many academic fields that call for a thorough knowledge of German language, culture, and history. After all, German is the language of some of the greatest and most influential minds of world history—of Luther, Bach, Beethoven, Brahms, Mozart, Kant, Hegel, Goethe, Freud, Marx, Arendt, and Einstein—and also of the Austrian Adolf Hitler, who initiated the most tragic episode in two thousand years of German history.

**Majoring in German Studies**

The major in German Studies concentrates on the study of the German cultural tradition in history, philosophy, the fine arts, music, film studies, politics, and culture, with a German-language requirement.

Double-majoring: The major in German Studies is particularly suited to students wishing to combine interests in German language and culture with intensive work in another discipline. It often reflects and/or augments the student’s other elected major.

While the English language may dominate world commerce, knowledge of German and German culture provides students with a competitive advantage. Germany is Europe’s strongest economic, political, and military power and the core of the European Union. The Euro already rivals the dollar as the world’s leading currency, and it is predicted that Europe will be a primary player in the new century. With over 100 million native speakers, German is the European language to know; it is the native language of all Germans, Austrians, and of most Swiss. Moreover, it is quickly becoming the language of commerce throughout Eastern Europe. German companies such as Bertelsmann, Siemens, Bayer, and Daimler-Chrysler are among the largest international conglomerates today.

Unique to the German Studies Program at Case is The Munich Experience, an immersion summer program that allows students to spend four weeks in Munich and experience the most popular city in Germany, its vibrant culture, and its breathtaking surroundings—three weeks of which they live with a family. After graduating from Case, many German and German Studies majors (most of whom have a second major in another field) return to Germany to study or work. Our majors have returned to Germany on Fulbright scholarships, internships administered by the Carl-Duisberg-Gesellschaft, or as interns for the German parliament.

**Requirements For the**

**Major In German Studies**

Thirty hours from the list of approved German Studies courses. Required courses: German 303 and German Studies 398 (Senior Colloquium). 24 additional hours of 300-level courses in German and of approved German Studies courses, no more than 9 of which may be in any one department.

**Sample Concentrations For The German Studies Major**

History and philosophy; German literature and theater history; political science and history; art history, music history, and religion etc. Within program requirements, students are free to shape the major as they wish based on their own intellectual interests.

**Requirements For A Minor in German Studies**

At least German 303 or 311; four additional 300-level courses from the approved list of German Studies courses from any two departments or a thematic course of study (12 hours) approved in advance by the director of the German Studies Program.

**Approved German Studies Courses**

For an updated list of approved courses see the director of the German Studies Program. Complete course descriptions are given under the appropriate departmental listings in this General Bulletin.

**Art History Courses (Prerequisite: None)**

For an updated list of courses consult the program director.

• ARTH 374 Impressionism to Symbolism
• ARTH 381 Neoclassicism through Realism
• ARTH 399 Independent Studies

**World Literature Courses (Prerequisite: None)**

For an updated list of World Literature courses consult the program director.

**Economics Courses (Prerequisite: ECON 102; 103)**

For an updated list of courses consult the program director.

• ECON 335 Comparative Economic Systems
• ECON 399 Independent Studies
• English Courses
Music History Courses
(Prerequisite: MUSC 221 is prerequisite for MUSC 222; consent of instructor required for all 300-level courses)

For an updated list of courses consult the program director.
- MUSC 221 Intro to Music: The Listening Experience I [if student has no significant musical background]
- MUSC 222 Intro to Music: The Listening Experience II
- MUSC 322 History of Western Music II
- MUSC 326 Symphonic Literature
- MUSC 327 Vocal Literature
- MUSC 399 Independent Studies

Philosophy Courses
(Prerequisite: PHIL 101)
- For an updated list of courses consult the program director.
- PHIL 355 Nineteenth and Twentieth-Century Philosophy
- PHIL 399 Independent Studies

Political Science Courses (Prerequisite: None)
- POSC 260 Introduction to Comparative Politics
- POSC 367 Western Political Systems
- POSC 399 Independent Studies

Religion Courses (Prerequisite: None)
For an updated list of courses consult the program director.
- RLGN 254 The Holocaust
- RLGN 314/414 Jews and Christians in Germany
- RLGN 331/431 German-Jewish Thought & History
- RLGN 374 (same as HSTY 309)
- RLGN 399 Independent Studies

Theater History Courses
(Prerequisite: None)
For an updated list of courses consult the program director.
- THTR 228 Theater History I
- THTR 229 Theater History II
- THTR 399 Independent Studies in Theater Arts

**GERONTOLOGICAL STUDIES**
226 Mather Memorial
Phone 216-368-2700; Fax 216-368-2676
Dale Dannfer, Co-Director
Gary Deimling, Co-Director

The Gerontological Studies program is a multi-disciplinary 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 gerontological 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 will provide 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.

**CURRENT AREAS OF RESEARCH**
Faculty members associated with the program are engaged in a variety of funded research projects which 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 FACULTY**
Robert Binstock, Ph.D. (Harvard University)  
Henry R. Luce Professor, School of Medicine  
Public policy and aging; Health care policy  
Dale Dannefer, Ph.D. (Rutgers University)  
Selah Chamberlain Professor of Sociology and Chair, Department of Sociology  
Sociology of the life course and aging; theory; work & family; research methods  
Gary T. Deimling, Ph.D.  
(Bowling Green State University)  
Professor, Sociology  
Sociological of aging; medical sociology; family sociology  
Grover C. Gilmore, Ph.D.  
(Johns Hopkins University)  
Professor, Psychology  
Perceptual development and aging; visual information processing; memory; psychophysics  
Brian Gran, Ph.D.  
(Northwestern University)  
Assistant Professor, Sociology  
Sociology of law; political sociology; comparative sociology; health care policy  
Gunhild Hagestad, Ph.D.  
(University of Hawaii)  
Visiting Professor, Sociology  
Sociology of aging; coping and stress in late life; institutionalization  
T.J. McCallum, Ph.D.  
(University of Southern California)  
Assistant Professor, Psychology  
Chronic stress in older adults; ethnicity and caregiving; religious coping; end-of-life issues  
Diana Lynn Morris, Ph.D., R.N., F.A.A.N.  
(Case Western Reserve University)  
Associate Professor, Nursing  
Aging and Mental Health; caregiver well-being; minority elder health  
May Step, Ph.D. (Kent State University)  
Instructor, Communication Sciences  
Emotion and affect in human communication processes  
May L. Wykle, Ph.D., R.N., F.A.A.N.  
(Case Western Reserve University)  
Florence Cellar Professor and Dean, School of Nursing; Director, University Center on Aging and Health  
Health and mental health; caregiving in minority populations

UNDERGRADUATE (GERO)

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  
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 the director of the gerontological studies program 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  
• 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.

Sequence  
A sequence in gerontological studies consists of 9 credit hours in three courses chosen from among the following courses: ANTH 304, COSI 345, PSCL 369, SOCI 369 and SOCI 496.

GRADUATE CERTIFICATE PROGRAM IN GERONTOLOGY  
University Center on Aging and Health  
1420 Frances Payne Bolton  
School of Nursing  
Phone 216-368-2692; Fax 216-368-6389  
May L. Wykle, Director

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 University 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 hour courses in gerontology within the student's discipline, one of which can be an independent study.
2. One three credit hour course in gerontology or independent study outside the student's discipline.
3. A three credit hour seminar in gerontology offered by the center.

For further information, contact the University Center on Aging and Health at the address listed above. Any changes in the requirements must be approved by the center director.

DEPARTMENT OF HISTORY
Jonathan Sadowsky, Chair
106 Mather House
Phone 216-368-2380; Fax 216-368-4681

The Department of History offers comprehensive undergraduate and graduate programs with particular emphasis 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, journalism, and such public history activities as archival administration, historical museum administration, restoration and preservation of historic sites, and writing.

FACULTY
Jonathan Sadowsky, Ph.D.
(Johns Hopkins University)
Dr. Theodore J. Castelle Associate Professor of Medical History and Chair;
Secondary Appointment, School of Medicine
Medical history; African history; comparative history

Molly W. Berger, Ph.D.
(Case Western Reserve University)
Instructor
History of technology; U.S. cultural history; nineteenth and twentieth centuries

Daniel Cohen, Ph.D. (Brandeis University)
Associate Professor
Colonial America, U.S. cultural history

John Grabowski, Ph.D.
(Case Western Reserve University)
Krieger-Mueller Associate Professor in Applied History

David C. Hammack, Ph.D.
(Columbia University)

Hisam C. Haydn Professor
American social and urban history; economic history

Elisabeth Koll, D.Phil. (Oxford University)
Associate Professor
East Asian history; Chinese economic history

Kenneth F. Ledford, Ph.D.
(Johns Hopkins University), J.D.
(University of North Carolina)
Associate Professor; Secondary Appointment, School of Law

Miriam R. Levin, Ph.D.
(University of Massachusetts)
Associate Professor
Industrial culture; European technology; French cultural history

Marixa Lasso, Ph.D. (University of Florida)
Assistant Professor
Latin American and Caribbean history

Alan Rocke, Ph.D.
(University of Wisconsin, Madison)
Henry Eldridge Bourne Professor

History of science; science, technology, and society

Renée Sentilles, Ph.D.
(College of William and Mary)
Associate Professor
American women's history; U.S. cultural history; American studies

Theodore L. Steinberg, Ph.D.
(Brandeis University)
Adeline Barry Davee Professor; Secondary Appointment, School of Law

U.S. environmental and legal history

Gillian L. Weiss, Ph.D. (Stanford University)
Assistant Professor
Early modern France; comparative slaveries

Rhonda Williams, Ph.D.
(University of Pennsylvania)
Associate Professor
African-American history; U.S. social history

Adjunct Faculty
James M. Edmonson, Ph.D.
(University of Delaware)
Adjunct Associate Professor and Director, Dittrick Medical History Center

History of technology; history of medicine; museum studies

Nicholas King, Ph.D. (Harvard University)
Assistant Professor of Bioethics;
Secondary appointment in History

Peter Whitehouse, M.D., Ph.D.
(Johns Hopkins University)
Professor of Neurology;
Secondary appointment in History

UNDERGRADUATE (HSTY)

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 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.

HSTY 117. Introduction to American Studies (3)
(See AMST 117.) Cross-listed as AMST 117.

HSTY 133. Introduction to Chinese History
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. Cross-listed as ASIA 134.

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, nationalism, and the dilemmas of independent African states. Cross-listed as ETHS 253A.

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.

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.

HSTY 196. Energy and Society (3)
(See PHYS 196.) Cross-listed as PHYS 196.

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. Cross-listed as CLSC 201.

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 (3)
(See PHIL 204.) Cross-listed as 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.

HSTY 207. Natural Philosophy II (3)
(See PHIL 204.) Cross-listed as 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. Cross-listed as CLSC 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 laborers 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?

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 destituation, 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 eighth 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
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 pererginations 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. Cross-listed as JSTD 218.

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. History of Modern Britain (3)
Survey of English history, 1700-present, with some attention also to Wales, Scotland, and Ireland, as well as the effects of the British Empire "at home." Themes include political change, the industrial revolution, nineteenth-century global power and twentieth-century decline, and the roles of gender, class, race, and region in British social and cultural history.

HSTY 223. The Rise and Decline of the British Empire (3)
This course traces the history of the British empire, the geographically largest and perhaps politically most powerful empire of the modern world. Begins with the eighteenth century and the loss of most of the British colonies in the Americas, traces through the height of the Empire in the late 19th century, and then follows its decline and the process of decolonization in the 20th century. Examines the British Empire in its military, political, economic, social, cultural, gendered, and ideological facets.

HSTY 224. 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, treatises 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 reformation; witchcraft and popular culture; science and medicine; Enlightenment and Revolution.

HSTY 225. Evolution (3)
(See PHIL 225.) Cross-listed as PHIL 225.

HSTY 230. Colonialism and Nationalism - The Indian Context (3)
Examines British rule in India between 1700 and 1947, focusing on the colonial policies, processes, and the national movement which led to Indian independence in 1947.

HSTY 231. India Since Independence (3)
The course focuses on the series of changes that contributed to building a new nation after Indian independence—in terms of caste system, issues of untouchability, arranged marriages, the agrarian struggle, women's movements, and the Kashmir dilemma.

HSTY 232. Women in India (3)
Examines the changing position of women in India, as portrayed in Vedic customs, in British India, and in contemporary modern India. Cross-listed as WMST 232.

HSTY 240. The Body in History (3)
This course examines the changing experiences of human bodies in history. It shows how science and culture have shaped diverse human experiences which often appear immutable, including sexuality, eating, race, and sickness.

HSTY 243. The Age of Prozac: Social and Cultural Aspects of Depression (3)
Although often experienced as an intensely individual, private, and painfully isolated affliction, depression has profound social and cultural dimensions. This course will neglect neither biological (neurochemical or genetic) perspectives, nor personal or psychological aspects, but will emphasize perspectives derived from history, anthropology, and sociology. While there may be tangential attention to bi-polar disorder (“manic depression”), the emphasis will be on unipolar depression. The course will conclude with an in-depth exploration of the rise of pharmaceutical treatments.

HSTY 250. Issues and Methods in History (3)
A methodological introduction to historical research. Students use a variety of approaches to interpret and study historical problems. Specific topics and instructors normally vary from year to year.

HSTY 252A. Introduction to African–American Studies (3)
(See ETHS 252A.) Cross-listed as ETHS 252A.

HSTY 253. Technology 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)
(See RLGN 254.) Cross-listed as 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 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. Cross-listed as ECON 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 relations of politics to society.

HSTY 257. Immigrants in America (3)
Immigration to America has constantly reshaped the way the nation views itself. This course examines the overall history of immigration to the United States, but places that movement within a global context. It also pays particular attention to the roles that policy and technology have played in controlling or defining immigration to America.

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 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. Cross-listed as ETHS 258.

HSTY 260. 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. Cross-listed as ETHS 260.

HSTY 261. African-American History 1865-1945 (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 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. Cross-listed 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.

HSTY 265. 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 comparative and interdisciplinary, examining the liberal, small-state, contexts of England and the United States, and the contrasting strong-state contexts of France, Germany, and Russia, applying theory from sociology, anthropology, and gender studies.

HSTY 266. The Engineer in America (3)

History, culture, politics, ethical considerations, and gender issues of the engineering profession in the United States.

HSTY 268. 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. Cross-listed as ETHS 268.

HSTY 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, and art history. It is the required introductory course for students taking the women's studies major. Cross-listed as WMST 201.

HSTY 272. Sports in America: From Play to Profit (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 sport as a major defining characteristic of America life and society.

HSTY 282. Modern China (3)

Beginning with the Opium Wars, we review the historical development of intellectual discourse, public reaction, and political protest in late Imperial 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 centuries. 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.

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. Cross-listed as ASIA 284.

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.

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 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. Cross-listed as CLSC 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. Cross-listed as 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 crises 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. Cross-listed as CLSC 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 Historical Society's headquarters in University Circle. Prereq: Consent of department.

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. Cross-listed as 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.

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 atone, Catholic Counter-Reformation, and the transformation of France from 1789 to 1815; impact of revolutionary ideas on other European and non-European societies.

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 development of intolerance in medieval society and the problems of doing history from hostile sources will also be explored. Cross-listed as 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 experiences, and expressive culture. The course will use a variety of materials, including autobiography, literature, music, and film. Cross-listed as ETHS 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 Christan cultures against which these movements were directed, as well as the culture of the Latin East and other consequences of these crusades. Cross-listed as RLGN 319.

HSTY 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. Cross-listed as WMST 322.

HSTY 325. U.S. Politics, Culture, and Society: 1787-1865 (3)
Explores politics, culture, and society in the United States between the War for Independence and the Civil War. Topics include the transformation of political ideology, the political process, capitalist development in cities, factories, and the countryside, and changing dynamics of class, race, and gender in both the North and South.

HSTY 332. European Diplomacy in the Age of Nationalism: 1789-1945 (3)
Examines the development of the international system in Europe between the French Revolution of 1789 and the end of the European era in 1945. It explains why and how the closed European state system at the beginning of the nineteenth century evolved into an international transcontinental system by the early twentieth century.

HSTY 334. History of 19th Century Germany (3)
Examines the political, social, economic, and cultural history of Germany from the late eighteenth century to 1914. Explores the intellectual and social 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 revolution, the republican experiment of Weimar, the National Socialist dictatorship under Hitler and the divided Germany suspended between the superpowers, to the newly unified democratic Federal 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 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. Cross-listed as ETHS 336.

HSTY 348. Political and Social Thought in the Machine Age (3)
Examines the responses of economist writers, philosophers, cultural critics, and public policy makers to changes in Western society wrought by industrialization, by focusing on their concerns with technological change. Cross-listed as 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 Americans' 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.

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.)

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 conversion 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, homicide (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.

HSTY 362. American Social and Cultural History since 1865 (3)
History of the nationalization of new economic, political, social, scientific, and aesthetic ideas and their embodiment in the development of professions, social movements, and cultural institutions.

HSTY 364. City, Town, and Suburban American History (3)
Nearly all Americans now live in the big cities, suburbs, and nearby towns of large metropolitan regions; one hundred years ago most Americans lived in the countryside. This course explores the rise of cities and metropolitan regions as the settings for American life. It considers the timing of the urban and suburban movements, explanations for urbanization and suburbanization, and the changing character of city, suburban, and small town life. The course pays special attention to the consequences of urban and metropolitan growth for economic opportunity, for metropolitan government, for social life and conflict, and for cultural expression and cultural change.

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. Cross-listed as POCS 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 is 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. Prereq: HSTY 353/453 or HSTY 354/454 or consent of the department.

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 fission and fusion, the role of warheads and delivery vehicles; history, domestic policies, and international relations concerning nuclear weapons; and arms control treaties and their verification. Cross-listed as POCS 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 so-
cial and physical construction of urban space, the built environment, life and culture in the city, and social movements and grassroots struggles. Cross-listed as POSC 381 and SOCI 381.

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 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. Cross-listed as POSC 368.

HSTY 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. Approved SAGES capstone. Prereq: Consent of department. Cross-listed as PHIL 390.

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.

HSTY 394. Seminar in Evolutionary Biology (3)
(See PHIL 394.) Cross-listed as PHIL 394.

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.

HSTY 397. Undergraduate Tutorial (1-3)
Individual instruction with members of the history faculty. Prereq: 12 hours of History.

HSTY 398. Senior Research Seminar (3)
Training in the nature and methods of historical writing and research. Approved SAGES capstone. Prereq: Majors only, Senior standing.

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 (3)
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)
(See HSTY 204.)

HSTY 406. History Museums: Theory and Reality (3)
(See HSTY 306.)

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)
(See HSTY 311.)

HSTY 422. Feminist Theory, Women's History, Gender History (3)
(See HSTY 322.) Cross-listed as WMST 422.

HSTY 440. Science and Society Through Literature (3)
(See PHTM 440.) Cross-listed as PHRM 440.

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)
(See HSTY 353.)

HSTY 454. Women in American History II (3)
(See HSTY 354.)

HSTY 461. Crime and Popular Culture in Early America (3)
(See HSTY 361.)

HSTY 470. History and Cultural Studies (3)
This course explores the uses of cultural and critical theory by historians, in particular relevant developments in anthropology, literary criticism, and philosophy. Topics include collective memory, the social construction of knowledge, theories of narrativity, the concept of post-modernity, and the historical formations of class, race, gender, and nation.

HSTY 473. Advanced Topics in American Women's History (3)
(See HSTY 373.)

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. Prereq: Consent of department for undergrads.

HSTY 480. Public Policy and Aging (3)
(See EPBI 408.) Cross-listed as EPBI 408.

HSTY 481. City as Classroom (3)
(See HSTY 381.) Cross-listed as POSC 481 and SOCI 481.

HSTY 491. Food in History (3)
(See HSTY 391.)

HSTY 494. Seminar in Evolutionary Biology
A. 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, agreed upon in consultation with the departmental advisor.

B. 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 Education -- EDUC and EDJC) that includes student teaching. Students interested in pursuing this option should confer with the department's undergraduate advisor. Subject Area Requirements (39 credit 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 200; 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.)

**Minors and Sequences**

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. A 9-hour sequence is also available to all students in the Case School of Engineering. It includes HSTY 112 or 113 (history core courses), plus two additional courses chosen in consultation with the departmental advisor; the courses must form a coherent field of historical inquiry.

**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.

**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. in History/J.D. double-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 aptitude test or a comparable standardized test, and three letters of recommendation. The department recommends, but does not require, an undergraduate major in history. 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), and can be completed in as few as three semesters. For the joint J.D./M.A. program, students must be admitted to both the history graduate and law schools, and they can complete their degrees 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). 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 18 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 18 hours of course work before taking their qualifying exams.

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 Ph.D. program must submit scores on the GRE aptitude test 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, and 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 completed 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.

Environment, and Medicine
The program in the History of Science, Technology, Environment and Medicine 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. in the History of Science, Technology, Environment and Medicine 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, 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 18 hours of course work beyond the M.A., 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 in a field other than U.S. history.

FACILITIES FOR HISTORICAL RESEARCH AT THE UNIVERSITY
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 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.
outlines, research, and drafts. Open only to seniors majoring in international studies. Prereq: Consent of colloquium coordinator.

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 philosophy of science, physical science, or biological and medically related science.

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.

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. 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.

INTERNATIONAL STUDIES
111 Mather House
Phone 216-368-2425; Fax 216-368-4681
Vincent E. McHale, Director
vem@po.case.edu

International studies is a multi-disciplinary program leading to the B.A. degree. Study in the program provides students with the ability to read beyond the head lines, 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 study of a society other than their own. They will learn to think critically about contending and complementary methods and theories, developing an appreciation or both traditional disciplinary approaches and newer cross-disciplinary approaches. Students also will acquire skills that will allow 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, in computer-based global analysis, or in negotiation.

It is strongly recommended that all international studies students participate in at least one of several off-campus programs which will facilitate the international perspective: junior year abroad, summer internships in Washington, D.C., or professional practicum-type work experiences in Cleveland which involve an international context. It also is 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.

INTERNATIONAL STUDIES STEERING COMMITTEE
Vincent E. McHale, Ph.D. (Pennsylvania State University) Professor Political Science; Director, International Studies Program Comparative politics; Europe; political sociology; methodology
Bo A.Carlsson, Ph.D. (Stanford University) William E. Unmatted Professor of Economics Managerial economics; industrial economics
Elisabeth Koll, D.Phil. (Oxford University) Associate Professor of History; East Asian history; Chinese economic history; recent China
Kenneth F. Ledford, Ph.D. (Johns Hopkins University), J.D. (University of North Carolina) Associate Professor of History; Secondary appointment, School of Law; Modern German history; European social history and European legal history
Kelly M. McMann, Ph.D. (University of Michigan) Assistant Professor of Political Science Comparative Politics; Central Asia; Russia and former East Bloc; democratization
Mihajlo D. Mesarovic, Ph.D. (Serbian Academy of Science) Cady Staley Professor of Systems Engineering Large-scale systems theory; multilevel systems; world and regional modeling

Undergraduate Program
The major in international studies requires a minimum of 33 credit hours taken 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, which must be approved by a faculty advisor drawn from the steering committee membership. Students also should discuss the choice of their minor or a second major with their advisor. Among the courses chosen should be 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.

1. Multi-disciplinary foundations (required courses, 12 credit hours): An introduction to four major disciplinary understandings of society and culture, principles of economics, change over time, and interactions among nations, simultaneously exposing students to a variety of world societies and issues. International studies majors will be expected to have completed the multi-disciplinary foundations courses at the University 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 credit hours): Two courses that concentrate on a single geographic or culture area. Examples include: Africa, North America, East Asia, Europe, Latin America, and the Middle East.

3. Topical Focus (6 credit hours): A related pair of courses to constitute a discrete perspective on global issues and to foster an appreciation for complexity through study of particular world 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 credit 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 credit hours): The integration of prior topical and area foci in a colloquium (INTL 398) taken in the fall semester of the senior year, involving the writing of a substantial research paper. Selection of the topic and the research and writing are under supervision of a faculty tutor. Peer evaluation will be attained 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 completing a language course at the 300 level or above, or by demonstrating to the Department of Modern Languages and Literatures a nonnative language competency equivalent to the completion of a 300-level or above course, or by the completion of four semesters in a single language.

**APPROVED COURSES**

The International Studies Steering Committee currently recognizes over 150 courses from which the student 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, or the discretion of the faculty advisor. Courses also may be selected from within existing area studies programs:

- American Studies Program
- Asian Studies Program
- French Studies Program
- German Studies Program
- Japanese Studies Program

**JAPANESE STUDIES**

201 Guilford House
Phone: 216-368-6188; Fax 216-368-2216
Linda Ehrlich, Director

**JAPANESE STUDIES PROGRAM COMMITTEE**

Takao Hagiwara, Ph.D.
(University of British Columbia)
Associate Professor
Comparative literature; classical and modern Japanese literature, especially prose and poetry; pre-modern Japanese sensibilities and (post) modernism; Japanese language.

Michael Cunningham, Ph.D.
(University of Chicago)
Adjunct Professor of Art History, Chief Curator
of Asian Art at Cleveland Museum of Art

**OTHER PROGRAM ADVISORS**

William Deal, Ph.D. (Harvard University)
Associate Professor of the History of Religion
Religions of China and Japan; Asian civilizations.
Charlotte Ikels, Ph.D.
(University of Hawaii)
Professor (Anthropology)
Gerontology; health care; urban life; comparative bioethics; Hong Kong, China, United States.
Elizabeth Kull, Ph.D. (Oxford University)
Assistant Professor of Modern Chinese History
Chinese socio-economic history, especially late Imperial and Republican China; business history; modern Japanese socio-economic history; history of industrialization and technological development in East Asia; the history of the railway in China.

Michael Cunningham, Ph.D.
(University of Chicago)
Adjunct Professor of Art History, Chief Curator
of Asian Art at Cleveland Museum of Art

**JAPANESE ART.**

Leonard H. Lynn, Ph.D.
(University of Michigan)
Professor of Management Policy

Technology policy; Technology management; US-Japan comparative research; Technological innovation.

**THE JAPANESE STUDIES PROGRAM**

Today’s students find themselves in a world of increasingly multi-ethnic, multi-religious, multi-cultural 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, the make-up of Japanese culture can be described as multicultural, and thus Japanese culture is highly interdisciplinary in itself. Following this thread, the Japanese Studies program aims at fostering 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 student’s linguistic and cultural development, the Japanese Studies program strongly encourages study abroad in Japan for a year.
semester, or a summer program. Our program offers both a Major and a Minor in Japanese Studies. Students can take 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 the 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.

Degree Requirements and Course Offerings

The B.A. major in Japanese Studies requires a minimum of 33 credit hours in the following areas:

For students beginning the major at the 200 level:
- JAPN 201 and 202 – Intermediate Japanese I, II
- JAPN 301 and 302 – Advanced Japanese I, II
- JAPN 350/450 – Contemporary Japanese Texts
- JAPN 351/451 – Japanese in Cultural Context
- JAPN 397 and 398 – Honors Thesis (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.)

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 the student’s major research paper for JAPN 398 Senior Colloquium. 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. Each student’s program of study is supervised by a faculty advisor.

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 Highlights

Departmental honors – Exceptional papers written for the senior colloquium may qualify for departmental 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.

JUDAIC STUDIES

110 Mather House
Phone: 216-368-2741; Fax: 216-368-4681
Prof. Peter J. Haas, Director

JUDAIC STUDIES PROGRAM COMMITTEE

William Deal
Associate Professor of Religion

Ellen Landau
Professor of Humanities and Art History

Miriam Levin
Associate Professor of History

Judith Neulander
Lecturer in Folklore and Mythology

Judith Oster
Professor of English

Gillian Weiss
Assistant Professor of History

Joseph White
Professor of Political Science

Omri Yavin
Lecturer in Modern Hebrew

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.

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 used in the Social Sciences and Humanities. Through the use of these methods, the students will examine the diverse issues and questions that are driving the current field of Judaic Studies and come to conclusions about the state of the question. There will be some “field” experience including a visit to a synagogue and to a Jewish museum. Required for the Minor in Judaic Studies.

JDST 218. Jews in Early Modern Europe (3)

(See HSTY 218.) Cross-listed as HSTY 218.

JDST 220. Jewish Tradition in 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. Cross-listed as ARTH 220.

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 Hollywood’s Golden Age, to the technological dazzle of the present day. Notes views of the Jews as stereotypical “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 semester, students will understand how film is shaped by, and how it actively shapes, our constructions of American Selves vs. Ethnic Others.

JDST 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. Cross-listed as ANTH 233 and RLGN 233.

**J DST 280. Religion and Politics in the Middle East (3)**
(See RLGN 280.) Cross-listed as RLGN 280.

**J DST 392. Independent Study (1-3)**
Up to three semester hours of independent study may be taken in a single semester. Prereq: Prior approval of faculty member directing the project.

**Minor**
The minor consists of 5 or 6 courses, according to the following scheme, to be taken in consultation with the program director. Only one course may be in the Department of Religion. If the Rosenthal Visiting Professor’s course is cross-listed in RLGN, this will count as the one course:
A. Introduction to Judaic Studies (J DST 201);
B. 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:**
- ENGL 365E Immigrant Experience
- ENGL 366G American Jewish Literature or Blacks and Jews in American Literature
- HBRW 201 Intermediate Modern Hebrew I
- HBRW 202 Intermediate Modern Hebrew II
- HBRW 301 Advanced Hebrew I
- HBRW 302 Advanced Hebrew II
- HSTY/J DST 218 Jews in Early Modern

**Europe**
- HSTY 254 The Holocaust
- HSTY 257 Immigrants in America
- J DST 220 Jewish Traditional Art & Architecture
- J DST 228 The Jewish Image in Popular Film
- J DST 233 Intro to Jewish Folklore
- J DST 392 Independent Research in

**Judaic Studies**
- 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
- RLGN 350 Jewish Ethics
- SOCI 302 Race and Ethnic Minorities
- SOCI 355 Sociology of Religion

C. Two semesters of Hebrew (HBRW 101 and HBRW 102). Students who place out of both semesters of Hebrew must take a third course under “C” above.

**DEPARTMENT OF MATHEMATICS**
220 Yost Hall
Phone 216-368-2880; Fax 216-368-5163
James C. Alexander, Chair

The Department of Mathematics offers a variety of programs leading to both undergraduate and graduate degrees in core and applied mathematics. 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 Science in Applied Mathematics with a master’s degree from Mathematics or another department in five years. The department, in cooperation with John Carroll University, offers a program for individuals interested in pre-college teaching. It also offers a specialized program with the Physics Department. Areas of interest of the faculty include geometry, analysis, dynamical systems, stochastic systems, numerical analysis/scientific computing, mathematics biology, epidemiology, mathematical applications to medicine, and other areas.

Mathematics plays a central role in the physical, biological, economic, and social sciences. Because of this, employment opportunities are always strong for individuals with degrees in mathematics, and there are excellent career opportunities. A bachelor’s degree in mathematics offers a strong background for graduate school in many areas (including, e.g., computer science, medicine, law, in addition to mathematics and science), or a position in the private sector. A master’s degree (in mathematics or an undergraduate mathematics degree combined with a masters in an allied area) is an excellent basis for employment in the private sector in a technical field. A Ph.D. degree is usually necessary for college teaching and research. Students, both undergraduate and graduate, have opportunities to personally interact with faculty and other students, and research and other activities are available. In addition, undergraduates can obtain experience in teaching via the Department’s supplemental instruction program.

**FACULTY**

- **James C. Alexander, Ph.D.** (Johns Hopkins University)
  Levi Kerr Professor and Chair
  Dynamics, applied mathematics
  Christopher Butler, M.S.
  (Case Western Reserve University)
  Instructor
  Teaching of mathematics

- **Daniela Calvetti, Ph.D.** (University of North Carolina)
  Professor
  Inverse problems
  Christophe Geuzaine, Ph.D.
  (University of Liege, Belgium)
  Assistant Professor
  Numerical analysis, scientific computing, computational electromagnetism
  David Gurarie, Ph.D. (Hebrew University, Jerusalem, Israel)
  Professor
  Mathematical physics; differential equations; geophysical modeling; harmonic analysis
  Steven H. Izen, Ph.D.
  (Massachusetts Institute of Technology)
  Professor
  Mathematics of imaging; image reconstruction
  Peter Kotelnitsky, Ph.D. (Universitat Bremen)
  Professor
  Probability theory, stochastic processes, particle systems
  Joel Langer, Ph.D.
  (University of California, Santa Cruz)
  Professor
  Differential geometry; calculus of variations
  Dong Hoon Lee, Ph.D. (Tulane University)
  Professor
  Lie groups and algebraic groups
  Marshall J. Leitman, Ph.D.
  (Brown University)
  Professor
  Integral equations; continuum physics
  David A. Singer, Ph.D.
  (University of Pennsylvania)
  Professor
  Riemannian geometry; differential topology
  Stanislaw J. Szarek, Ph.D. (Mathematical Institute, Polish Academy of Science)
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)

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 307. May not be taken for credit by mathematics majors. Only one of MATH 201 or MATH 307 may be taken for credit. Prereq: MATH 122 or MATH 126.

MATH 223. Calculus for Science and Engineering III (3)

MATH 224. Elementary Differential Equations (3)

MATH 227. Calculus III (3)

MATH 228. Differential Equations (3)
Elementary ordinary differential equations: first order equations; linear systems; applications; numerical methods of solution. Prereq: MATH 227.

MATH 234. Differential Equations and Dynamical Systems (3)
An introductory course in discrete and continuous dynamics (difference and differential equations). One dimensional differential equations: dynamics; linear equations, separable equations; numerical methods. Systems of differential equations in two dimensions: dynamics of autonomous systems, numerical methods, solution of constant coefficient linear systems, with and without forcing. Laplace transforms and convolution. Discrete dynamics; introduction to chaos, numerical methods as difference equations. Linear difference equations in one and two dimensions, z-transform, convolution. Prereq: MATH 223.

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. Problem Solving Seminar (1)
A seminar devoted to methods of solving problems in various areas of mathematics. Content varies. Students may take this course for credit up to four times.

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.

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. Prereq: MATH 122 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.

MATH 308. Introduction to Abstract Algebra II (3)

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. Prereq: MATH 229.

MATH 322. Fundamentals of Analysis II (3)

MATH 324. Introduction to Complex Analysis (3)

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. Prereq: MATH 324 or consent of department.

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. Prereq: MATH 223 or consent.

MATH 330. Scientific Computing: Fundamentals and Applications (3)
An introductory survey to Scientific Computing, from principles to applications. Topics include accuracy and efficiency, conditioning and stability, numerical solution of linear and nonlinear systems, optimization, interpolation, quadrature rules, numerical solutions of ODEs and PDEs. Coreq: MATH 224.

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.

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/EECS 343 and MATH 410 cannot both be taken for credit. Prereq: MATH 304 and EECS 340. Cross-listed as EECS 343.

MATH 351. Senior Project for the Mathematics and Physics Program (3)
A two-semester course (3 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. Approved SAGES capstone. Prereq: Department approval.

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 polynomial (bracket, X, Jones, Alexander, HOMFLY), crossing numbers of alternating knots and amphi-chirality. 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.

MATH 380. Introduction to Probability (3)

MATH 381. Introduction to Mathematical Methods in Finance (3)

MATH 399. Special Topics (3)
Special Topics in Mathematics

MATH 400. Mathematics Teaching Practicum (1)
Practicum for teaching college mathematics. Includes preparation of syllabi, exams, lectures. Grading, alternative teaching styles, use of technology, interpersonal relations and motivation. Handling common problems and conflicts.

MATH 401. Abstract Algebra I (3)
Basic properties of groups, rings, modules and fields. Isomorphism theorems for groups; Sylow theorem; nil potency and solvability of groups; Jordan-Holder 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.

MATH 402. Abstract Algebra II (3)
A continuation of MATH 401. Prereq: MATH 401.

MATH 406. Mathematical Logic and Model Theory (3)
A study of formal logical systems and their models. Propositional logic and quantification. First order
MATH 408. Introduction to Cryptology (3)
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. Prereq: MATH 303.

MATH 461. Introduction to Topology (3)

MATH 462. Algebraic Topology (3)
The fundamental group and covering spaces; van Kampen's theorem. Higher homotopy groups; long-exact sequence of a pair. Homotopy theory; chain complexes; short and long exact sequences; Mayer-Vietoris sequence. Homology of surfaces and complexes; applications. Prereq: MATH 461.

MATH 465. Differential Geometry (3)
Manifolds and differential 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 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.

MATH 471. Advanced Engineering Mathematics (3)

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 NMR; survey of applications. Prereq: PHYS 431 and MATH 345 or MATH 471.

MATH 481. Introduction to Mathematical Methods in Finance (3)
(See MATH 381.)

MATH 491. Probability I (3)

MATH 492. Probability II (3)

MATH 495. Combinatorics (3)

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)
Selected topics in Functional Analysis. Prereq: MATH 424 and MATH 425.

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)

MATH 701. Dissertation (Ph.D.) (1-18)

MATH 703. Dissertation Fellowship (1-8)
A Bachelor of Arts degree in mathematics, a Bachelor of Science in mathematics, Bachelor of Science in mathematics and physics, and a Bachelor of Science in applied mathematics degrees 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.

Degree Requirements
Bachelor of Arts Degree in Mathematics
(1) Mathematics Requirements
The B.A. degree in Mathematics 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) at least one of MATH 324, 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).

Teaching Certification
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 program should contact the director of teacher licensure for further information about eligibility and requirements.

Bachelor of Science in Mathematics Degree
(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) at least one of MATH 324, 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). (BIOL 314, BIOL 111, CHEM 113, GEOL 119, PHYS 203 are appropriate.)

Bachelor of Science in Mathematics and Physics

Students with strong interests in both Mathematics and Physics may be interested in the joint Bachelor of Science degree in Mathematics and Physics, which is described under the Department of Physics in this Bulletin.

Bachelor of Science in Applied Mathematics Degree

The B.S. degree in Applied Mathematics requires at least 50 hours of mathematics and related subjects, in addition to a professional core that is specific to the area of application in which the student is interested. A student in this degree program must design a program of study (called a “track”) 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.

18 credit hours (normally six courses) of technical electives as follows:

(i) Four approved courses, specific to the area of application in which the student is interested. (Lists of pre-approved courses for the four B.S./M.S. tracks are listed below.)
(ii) Two other courses of MATH at the 300 level or higher.

(2) Professional Core Requirements

The professional core requires 12 credit hours of course work specific to the area of application.

(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). (BIOL 314, BIOL 111, CHEM 113, GEOL 119, PHYS 203 are appropriate.)

Computing and Information Sciences Track

Technical Electives: Four of the following courses, of which at least two must be MATH courses. At least one numerical analysis course must be chosen. MATH 410, MATH/ECES 343, MATH 413/OPRE 514, MATH 431, PHIL 306, ECES 454, or another course with approval of the Department (note: at this writing, both new MATH and ECES courses are in development and some of these courses may be appropriate).

Professional Core: ECES 281, ECES 233, ECES 337, ECES 338.

Operations Research Track

Technical Electives: Four of the following courses, at least two of which must be MATH courses. MATH 431, MATH 423, MATH 491, MATH 492, MATH 495, MATH 487, MATH 489, STAT 403, STAT 406, STAT 408, STAT 484.

Professional Core: MATH 380, OPRE 428, OPRE 411, and one of MATH 413, 487, 489 or another approved 400-level course.

Systems Engineering - Control Theory Track

Technical Electives: Four of the following MATH courses. 401, 402, 410, 413, 415, 423, 428, 431, 435, 436, 445, 465, 491

Professional Core: ESCI 212, ESCI 304, ESCI 313, ESCI 306.

Systems Engineering - Systems Track

Technical Electives: Four of the following MATH courses. 401, 410, 413, 423, 431, 435, 445, 447, 469, 491, 495.

Professional Core: MATH 380, ESCI 315, ESCI 416, ESCI 251.

Non-Major Undergraduate Programs

Minor in Mathematics-All Undergraduates

A minor in mathematics is available to all University 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 from 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).

High School Teaching Licensure

This program is described in the description of the mathematics B.A. degree given above.

GRADUATE PROGRAMS

The department offers programs leading to the Master of Science and Doctor of Philosophy degrees. At the master’s level there are two degrees: the degree of Master of Science in Mathematics and the degree of Master of Science in Applied Mathematics.

Doctor of Philosophy and Master of Science in Mathematics

The Ph.D. program is designed for students who intend to pursue a career in either pure or applied mathematics. The candidate must pass qualifying examinations in approved subjects; demonstrate a reading knowledge of an approved foreign language; and must present a doctoral dissertation representing significant original research. Candidates for the M.S. degree must complete 27 semester hours of approved courses and successfully pass a comprehensive examination. Throughout the student’s graduate career in the department, a faculty advisor will closely supervise his or her work.

Requirements for the M.S. in Applied Mathematics (except as modified for the Master’s in Entrepreneurial Mathematics, see below).

Each student, upon admission, will be assigned a committee of three members with a designated chairman, which will normally include a member from another department. This committee, with the approval of the departmental graduate committee, must approve the selection of courses the student take, and will administer the student’s final oral examination for the MS.

1. Course hour requirements

Each M.S. student must take at least 27 hours of credit work of which at least 18 hours must be at the 400 level or higher. This credit work must occur in the following three disjoint groups:

- At least 15 hours in mathematics and applied mathematics, offered by the department.
- At least 6 hours of courses outside the mathematics and applied mathematics, programs.
- Six hours of thesis work (see 3) below.

2. Breadth requirement

The courses taken within the department must include three hours of course work in each of at least three of the following six topics. The courses listed in parentheses are suitable courses on the given topic.

1. Analysis (Math 471 or Math 423.)
2. Probability. (Math 491.)
3. Numerical analysis. (Math 431.)
4. Differential equations. (Math 435.)
5. Optimization (Math 433 or 427.)
6. Partial Differential equations (Math 445.)
7. Inverse Problems (Math 440 or 439.)

The following courses are also suitable for graduate students in Applied Mathematics. This list is not intended to be exhaustive.

- Math 413 Graph Theory
- Math 425 Complex Analysis
- Math 432 Numerical Solutions of Differential Equations
- Math 433 Numerical Solutions of nonlinear systems and optimization
- Math 440 Computational Inverse Problems
- Math 447 Integral Equations
- Math 448 Applied Partial Differential Equations
- Math 452 Continuum Mechanics
- Math 469 Calculus of Variations
- Math 475 Mathematics of Imaging
- Math 495 Combinatorics
- 3. Thesis and final examination

A candidate for the MS in Applied Mathematics must write an expository or original thesis, the work for which will count as six hours graduate credit.

Toward the end of his or her work, the candidate must also pass an oral examination for the MS degree. The candidate will be questioned during this examination about the thesis and subjects related to the thesis.

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, which 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 and growing ventures.

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.

RESEARCH AND TEACHING

The Department of Mathematics at Case Western Reserve University is an active center
for mathematical research. Faculty conducts research in algebra, applied mathematics, numerical analysis, inverse problems, analysis, geometry and topology, and probability.

<table>
<thead>
<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>Physics I, Mechanics</td>
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<td>Physics II Electricity &amp; Magnetism</td>
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<td>Quantum II</td>
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<td>Arts &amp; Sci SAGES breadth requirements</td>
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<td>Total</td>
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</table>

The Bachelor of Science Degree 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.

*Course usually taken in this year, offered only in F = fall, S = spring
**An advanced physics course to be selected from the following list: PHYS 315, 316, 326, 328, 336, 365.
***The ‘MP group’ of four courses corresponds to two physics courses and two mathematics courses. The physics courses would be chosen from P250, P349, and P350. 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, it may be possible to choose a course from outside of the mathematics and physics departments as a substitute in the MP 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 credits or 4 credit courses to fulfill the chemistry/science requirement

DEPARTMENT OF MODERN LANGUAGES AND LITERATURES

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Phone 216-368-3071; Fax 216-368-2216
Per Aage Brandt, Chair

- Arabic
- Chinese
- French
- German
- Hebrew
- Italian
- Japanese
- Russian
- Spanish

FACULTY

Per Aage Brandt, Docteur d’Etat
(Sorbonne, Paris)
Founder of the Center for Semiotics at the University of Aarhus, Denmark. Emile B. de Saussure Professor of Modern Languages & Literatures, Professor in Cognitive Sciences and Chair, Modern Languages and Literatures

Romance Philology, General and Romance Linguistics, Comparative Literature; specialized in structural linguistics and structural semantics, cognitive semiotics, and cognitive poetics.

Florin Berindeanu, Ph.D.
(University of Georgia)
Visiting Assistant Professor of World Literature and Italian

Ancient, Medieval, and Renaissance literature; mysticism and negative theology; Italian literature and language.

Antonio Candau, Ph.D.
(University of Massachusetts, Amherst)
Associate Professor of Spanish

Nineteenth- and twentieth-century Peninsular Spanish literature; José María Merino, Luis Mateo Díez, Juan Goytisolo. and author Clarín; autobiography.

Christine Cano, Ph.D.
(Yale University)
Associate Professor of French

Nineteenth- and twentieth-century French literature and culture

Denise Caterinacci, M.A.
(Kent State University)
Instructor in Italian.

Italian language and culture; language peda-
psychology; the role of motivation in language learning.
M. Gabriela Copertari, Ph.D. 
Georgetown University
Associate Professor of Spanish
Latin American literature and film, especially Argentina; women's writing; the modernista novel.
Margaretmary Daley, Ph.D. (Yale University)
Associate Professor of German
Eighteenth- and nineteenth-century German literature; German women writers; women's studies; feminist literary criticism.
Gilbert Doho, Docteur d'Etat 
(University of the Sorbonne Nouvelle)
Associate Professor of Japanese
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 of Japanese
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 of Japanese
Japanese literature, especially modern prose and poetry; classical and modern Japanese literature; pre-modern Japanese sensibilities and (post) modernism.
Jutta Ittner, Dr. Phil. 
(University of Hamburg)
Associate Professor of German
Twentieth-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 and French
Women and the visual arts; nineteenth—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 in Chinese
Chinese language and culture; social theory.
Jacqueline C. Nanfio, Ph.D. 
(University of California, Los Angeles)
Associate Professor of Spanish
Colonial and nineteenth-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)
Assistant Professor of French
African and Middle Eastern Francophone literature, especially Cameroon; women's writing; immigrant communities in France.
Susanne Veess-Gulan, Ph.D. 
(University of Illinois, Urbana-Champaign)
Assistant Professor of Comparative Literature
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)
Associate Professor of German
German literature, emphasis on twentieth-century German literature; German theater; technology-enhanced language teaching; teaching pedagogy; business German; theatricality.
Tatiana Zilotina, Ph.D. 
(University of Virginia)
Instructor in Russian
Russian literature, especially poetry; the poetry of Marina Tsvetaeva; women writers; Russian culture.

Lecturers and Adjunct Faculty
Yoram Daon, MBA
(Keller Graduate School of Management)
Lecturer in Hebrew
Elena Fernández, M.A. 
(Cleveland State University)
Lecturer in Spanish
Margaret M. Fitzgerald, M.A. 
(Ohio State University)
Lecturer in Japanese
Fabienne Pizot- Haymore, M.A. 
(Université Paul Valéry, Montpellier III)
Lecturer in French
Ramez Isambouli, M.A. 
(Case Western Reserve University)
Lecturer in Arabic
Maryse Lafitte, M.A, Capes, DEA 
(Sorbonne, Paris)
Lecturer in French

Carlos Lafuente-Rodriguez, M.A. 
(Bowling Green State University)
Lecturer in Spanish
Lorenzo Sanchez-Elez Rodriguez, M.A. 
(University of Alcala de Henares, Madrid)
Lecturer in Spanish
Joshua Sabih, M.A., 
(University of Copenhagen)
Lecturer in Arabic.
Yoshiko Kishi, M.A. 
(New York University)
Lecturer in Japanese
Enno Lohmeyer, Ph.D. 
(University of Kansas)
Lecturer in German

PROGRAMS
The Department of Modern Languages and Literatures offers courses of study leading to the Bachelor of Arts with a major or minor in Arabic, French, German, Japanese Studies, and Spanish. In addition, course work or a minor is available in Chinese, Hebrew, Italian and Russian. 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. At the graduate level, the Master of Arts degree may also be earned as detailed below. Career opportunities exist in college and university teaching, translation and interpretation, diplomatic and other government service, business, international non-profit agencies, and the arts, and are often enhanced by a double major.

Arabic
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 info 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. Prereq: ARAB 101 or consent of department.

**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 Arab life and culture. Prereq: ARAB 102 or equivalent.

**Chinese**

**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. Prereq: CHIN 102 or consent of department.

**CHIN 102. Elementary Chinese II (4)**
Continuation of CHIN 101. Prereq: 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. Prereq: CHIN 102 or equivalent, or consent of department.

**CHIN 202. Intermediate Chinese II (4)**
Continuation of CHIN 201. Students must use course material offered by the On-Line Language Learning Center in addition to class meetings. Prereq: CHIN 201 or consent of instructor.

**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. Prereq: CHIN 202 or equivalent.

**CHIN 302. Advanced Chinese II (4)**
Continuation of CHIN 301. Prereq: CHIN 302.

**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. Prereq: CHIN 202 or equivalent.

**CHIN 399. Independent Study (1-3)**
Directed study for those students who have progressed beyond available course offerings. Prereq: Permission of department.

**French**

**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. Prereq: FRCH 102 or equivalent.

**FRCH 102. Elementary French II (4)**

**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. Prereq: FRCH 202 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. Prereq: 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. Permit required. 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. Cross-listed as ETHS 295 and WLIT 295.

**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. Prereq: FRCH 202 for those enrolled in FRCH 308. Cross-listed as WLIT 308.

**FRCH 310. Advanced Composition and Reading (3)**
An initiation to the literature of Francophone expression 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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: FRCH 202 or equivalent.

**FRCH 315. Business French (3)**
Business French is an upper-level course with a focus on the 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. Prereq: CHIN 202 or equivalent.
of Francophone countries as they enhance the linguistic skills used in professional communication. Prereq: 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 presented in the media. Prereq: FRCH 202 or equivalent.

FRCH 317. French Cinema (3)
An exploration of modern France, its images and values as presented in French films. French press reviews are used for discussion. A unique linguistic and cultural immersion. Prereq: FRCH 202 or equivalent.

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. Prereq: FRCH 202 or equivalent.

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. Prereq: FRCH 202 or equivalent.

FRCH 320. Introduction to French Literature (3)
Major literary movements, principal writers and outstanding works of French literature. Prereq: FRCH 202 or equivalent.

FRCH 331. Seventeenth-Century French Literature (3)
The Age of Classicism, from Descartes to Mme de Lafayette. Emphasis on Baroque literature and Classical drama. Authors, works, and topics may vary. One 300-level French course suggested prerequisite. Prereq: FRCH 320; may be taken concurrently.

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, Pondichery), and poverty and women in Vietnam, Laos, and Cambodia. Guest speakers and special projects are important elements of the course. Taught in English. Cross-listed as ETHS 335, WLIT 335, and WMST 335.

FRCH 341. Eighteenth-Century French Literature (3)
Le siecle des Lumières in representative texts of the Enlightenment and pre-Romanticism. Authors, works, and topics may vary. Prereq: FRCH 320; may be taken concurrently.

FRCH 351. Nineteenth-Century French Literature (3)
Romanticism, realismo, and naturalismo in the novel and the drama. Authors, works, and topics may vary. Prereq: FRCH 320; may be taken concurrently.

FRCH 356. 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 may vary. Prereq: FRCH 320; may be taken concurrently.

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. Prereq: FRCH 320; may be taken concurrently.

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 fairy tale) or novella. Prereq: FRCH 320; may be taken concurrently.

FRCH 375. Francophone Literature (3)
An examination of Francophone literature focused on the problematics of identity within the colonial and post-colonial context. Writers and works may vary. Prereq: FRCH 320; may be taken concurrently.

FRCH 376. Women Writers (3)
Examination of literary texts by French women writers; emphasizes women's important contributions to French literature. Critical essays are also studied to address women's relation to literature and to evaluate its importance from historical and theoretical perspectives. Prereq: FRCH 320; may be taken concurrently.

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. Prereq: FRCH 320; may be taken concurrently.

FRCH 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. Cross-listed as WLIT 395.

FRCH 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 French. Limited to senior majors. Permit required. Prereq: Consent of department.

FRCH 398. Honors Thesis II (3)
Continuation of FRCH 397. Limited to senior majors. Permit required. Prereq: FRCH 397 and consent of department.

FRCH 399. Independent Study (1-3)
For majors and advanced students under special circumstances. Prereq: Consent of department.

FRCH 408. The Paris Experience (3)
(See FRCH 308.) Graduate students have additional course requirements than those of undergraduates. Prereq: Graduate standing. Cross-listed as WLIT 408.

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, Pondichery), and poverty and women in Vietnam, Laos, and Cambodia. Guest speakers and special projects are important elements of the course. Taught in English. Cross-listed as WLIT 435.

FRCH 441. Eighteenth-Century French Literature (3)
(See FRCH 341.)

FRCH 451. Nineteenth-Century French Literature (3)
(See FRCH 351.)

FRCH 461. Twentieth-Century French Literature (3)
(See FRCH 361.)

FRCH 471. Topics in French Poetry (3)
Nineteenth- and twentieth-century poetry. Topics include French romanticism, symbolism, and surrealism. Prereq: FRCH 320; may be taken concurrently.

FRCH 472. Topics in French Drama (3)
(See FRCH 372.)

FRCH 473. The Novel and the Novella (3)
(See FRCH 373.)

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: FRCH 320; can be taken concurrently.

FRCH 475. Francophone Literature (3)
(See FRCH 375.)

FRCH 476. Women Writers (3)
(See FRCH 376.)

FRCH 477. Special Topics (3)
(See FRCH 377.)

FRCH 495. French Literature in Translation (3)
(See FRCH 395.) Coreq: Graduate standing. Cross-listed as WLT 495.

FRCH 590. Seminar: Topics in Modern Literature and Culture (3)
French literature and culture since the Revolution of 1789. Topics vary depending on student and instructor interests; may include realism and naturalism, Proust, contemporary film, or French philosophy. Maximum 9 credits. Prereq: Graduate standing.

FRCH 595. Independent Research (1-3)
Graded independent work on a literary topic arranged individually with the instructor. Prereq: Graduate standing.

FRCH 601. Independent Study (1-18)
For individual students or larger groups with special interests. Prereq: Consent of department.

German
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. Prereq: GRMN 101 or equivalent.

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. Prereq: GRMN 201 or equivalent. Coreq: GRMN 202.

GRMN 303. German Culture and Civilization (3)
Examines aspects of contemporary Germany, including political and social systems and cultural life through study of texts, films, and other media. Prereq: GRMN 202.

GRMN 308. The Munich Experience: Spring Course/Summer Study Advanced 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. Prereq: GRMN 202 or equivalent.

GRMN 310. Advanced Composition and Reading (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 and also to produce increasingly sophisticated expository compositions in German. Read contemporary newspaper and magazine articles; practice composition skills by composing objective summaries, reviews, preciss, letters, e-mail, short creative texts, and other miscellaneous written forms. Readings increase progressively in length and vary in genre. Includes instruction on use of English- and German-language research tools, German-German dictionaries, and study guides. Concludes with a short, sophisticated literary work, such as Fontaine’s Effi Briest or Mann’s “Death in Venice.” Satisfies prerequisite for upper-level Germanic seminars or may be taken simultaneously with an upper-level course (321 or higher); taught in German. Prereq: GRMN 202 or equivalent.

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. Prereq: GRMN 202 or equivalent.

GRMN 312. German Proficiency Through Drama (3)
Focus on reading, enacting, and discussing of authentic dramatic texts. 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. Although we will pay attention to the cultural and theatrical milieu from which each play arose, we will focus on the dramatic text as literature and as a text written for performance. Elements of drama, such as dialogue, character and dramatic structure, as well as the genres of tragedy, comedy, and tragi-comedy are introduced. Prereq: GRMN 202 or equivalent.

GRMN 313. Introduction to German Literature (3)
Introduction to German literature and the cultural issues it addresses. Prereq: GRMN 202 or equivalent.

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 GRMN 300-level 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 GRMN 300-level 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. Cross-listed as WLIT 365.

GRMN 367. German Classicism/Romanticism (3)

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 (3)
Special topics in German literature, literary criticism, and culture. Prereq: GRMN 202 or equivalent.

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: Consent of department.

GRMN 398. Honors Thesis II (3)
Continuation of GRMN 397. Limited to senior majors. Permit required. Prereq: GRMN 397 and consent of department.

GRMN 399. Independent Study in German (1-3)
For majors and advanced students under special circumstances. Permit required. Prereq: Consent of department.

Hebrew
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 permission 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 permission of department.

HBRW 202. Intermediate Modern Hebrew II (4)
The course objectives are to enhance and strengthen the students’ Hebrew language skills, and to develop the ability to express thoughts, ideas and opinions freely, in both verbal and written forms. Prereq: HBRW 201 or permission 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 permission 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 permission 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: Permission of department.

Italian
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.

ITAL 102. Elementary Italian II (4)
Continuation of ITAL 101; attendance in the language laboratory is required in addition to scheduled class meetings. Prereq: ITAL 101.

ITAL 201. Review and Progress in Italian (4)
Focus on improving linguistic skills acquired in elementary Italian and on mastering short narratives. Review of Italian grammar and usage while studying written forms. Language laboratory attendance required in addition to scheduled class meetings. Prereq: ITAL 201 or equivalent.

ITAL 202. Read and Discuss Italian Texts (4)
Solely 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 201 or equivalent.

ITAL 311. Conversation in Italian (3)
Solely 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 201 or equivalent.

ITAL 399. Independent Study (1-3)
For students under special circumstances. Prereq: Consent of department.

Japanese
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)
Continuation of JAPN 101. Emphasizes aural comprehension, speaking, reading, and writing. Stu-
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. Prereq: JAPN 101 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. Prereq: JAPN 201 or equivalent or consent of department.

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 and Banana Yoshimoto, among others. The course introduces students to essential aspects of modern Japanese popular culture and sensibility. Cross-listed as WLIT 225.

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. Cross-listed as 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. Cross-listed as 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. Prereq: 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. Prereq: JAPN 301 or equivalent or consent of department.

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. Cross-listed as WLIT 345.

JAPN 350. Contemporary Japanese Texts (3)
Stress on development of sophisticated communication skills in Japanese. Reading and discussion of various texts in the original, such as comics (manga), video scripts, essays, news scripts, and literary works. Enhancement of writing and aural/oral proficiency through presentations, listening drills, viewing of videos, and classroom discussion. Prereq: JAPN 302 or permission.

JAPN 351. Japanese in Cultural Context (3)
Exploration and analysis of selected Japanese writers and the critical and popular media around them. Focus on continued development of skills from JAPN 350 and on representative examples of various genres; drama, fiction, autobiographical prose, interview, poetry, and journalistic writing. Prereq: JAPN 350/450 or permission.

JAPN 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 English or Japanese. Limited to senior majors. Permit required. Prereq: Consent of department.

JAPN 398. Honors Thesis II (3)
Continuation of JAPN 397. Limited to senior majors. Permit required. Prereq: JAPN 397 and consent of department.

JAPN 399. Independent Study (1-3)
Directed study for students who have progressed beyond available course offerings. Prereq: Permission of department.

JAPN 450. Contemporary Japanese Texts (3)
Stress on development of sophisticated communication skills in Japanese. Reading and discussion of various texts in the original, such as comics (manga), video scripts, essays, news scripts, and literary works. Enhancement of writing and aural/oral proficiency through presentations, listening drills, viewing of videos, and classroom discussion. Prereq: JAPN 302 or permission.

JAPN 451. Japanese in Cultural Context (3)
Exploration and analysis of selected Japanese writers and the critical and popular media around them. Focus on continued development of skills from JAPN 350 and on representative examples of various genres; drama, fiction, autobiographical prose, interview, poetry, and journalistic writing. Prereq: JAPN 350/450 or permission.

Spanish
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. Prereq: SPAN 101.

SPAN 201. Intermediate Spanish I (4)
Intensive review of grammar and usage through readings, discussions, and other activities. Prereq: 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 Hispanic countries. Prereq: 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 widely diverse populations of the world over the past centuries. Counts towards Spanish major as related course. No knowledge of Spanish required. Cross-listed as 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, conversation practice, and study of relevant cultural issues. The focus of the culture 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. Prereq: 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 curriculum 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. Prerequisite: 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. Prerequisite: 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. Prerequisite: 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. Prerequisite: 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. Prerequisite: SPAN 202.

SPAN 316. Studies in Civilization (3)
Major historical, intellectual, and artistic influences that have shaped the evolution of Spanish civilization. Prerequisite: 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. Prerequisite: 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. Prerequisite: SPAN 202.

SPAN 320. Introduction to Readings in Spanish Literature (3)
Introduction to major literary movements and outstanding works of Spanish literature. Prerequisite: SPAN 202.

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. Prerequisite: 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. Prerequisite: 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. Prerequisite: 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. Prerequisite: SPAN 320.

SPAN 336. Chicana/o Literature (3)
An introduction to Chicana/o literature written after 1945. Literary history, clarification of linguistic terminology, and an examination of the cultural components of each work. Readings, discussions, and lectures in Spanish. Prerequisite: SPAN 320.

SPAN 339. Latin American Poetic Revolt (3)
Introduction to the 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. Prerequisite: SPAN 320.

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. Prerequisite: 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. Prerequisite: SPAN 320.

SPAN 343. The New Drama in Latin America (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. Prerequisite: SPAN 320.

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. Prerequisite: 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. Prerequisite: 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. Prerequisite: 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, Ultraiism 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. 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 re-formulate 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.

SPAN 357. 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 358. Latin American 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. Cross-listed as WLIT 385.

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. Permit required. Prereq: Consent of department.

SPAN 398. Honors Thesis II (3)
Continuation of SPAN 397. Limited to senior majors. Permit required. Prereq: SPAN 397 and consent of department.

SPAN 399. Independent Study (1-3)
Prereq: Permission of department.

SPAN 426. The Fantastic in Latin American Prose (3)
(See SPAN 326.)

SPAN 445. Hispanic Autobiographical Writing (3)
(See SPAN 345.)

SPAN 451. Hispanic Turn of the Century Literature (3)
(See SPAN 351.)

SPAN 453. Transatlantic Vanguard (3)
(See SPAN 353.)

SPAN 485. Hispanic Literature in Translation (3)
(See SPAN 385.) Prereq: Graduate standing. Cross-listed as WLIT 485

Russian
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 sentence 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. Prereq: RUSN 102.

RUSN 202. Introduction to Contemporary Civilization (4)
Continuation of RUSN 201; introduces contemporary Russian culture through readings and discussion. Prereq: 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. Prereq: 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. Prereq: RUSN 202.

RUSN 320. Introduction to Russian Literature (3)
Introduction to major literary movements, principal writers, and outstanding works of Russian literary arts. Prereq: 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. Cross-listed as WLIT 375.

RUSN 399. Independent Study (1-3)
Prereq: Permission of department.

Teacher Licensure Option
A program leading to Teacher Licensure in French (K–12) is also available. Students participating in the teacher licensure program complete a 45- to 47-semester-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 Education [EDUC and EDJC] for overview and course requirements) begins with a sequence taken on campus, followed by 23 semester hours at John Carroll University, culminating in the student teaching requirements.

Subject Area Requirements (select from):
**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).

DEPARTMENTAL GOALS AND PROGRAMS
The Department of Modern Languages and
Literatures at Case is committed to helping students become informed and liberally educated citizens of the world. Through the acquisition of language skills and cultural awareness we prepare students for careers that have an international dimension. To that end, we strongly encourage our students to spend their junior year abroad to immerse themselves in a foreign culture and perfect their language skills. We also run our own study abroad programs, “The Munich Experience,” two French programs — “The Paris Experience” and “The Montreal Experience” — as well as “The Buenos Aires Experience” and “Advanced Spanish in Spain.” (We plan to add summer programs in Italy, China and Cameroon in 2007.)

We offer the M.A. in selected languages, and we prepare students for graduate study in a range of disciplines. The faculty members of the department do research in many different areas of language, literature, culture, and film. Our scholarship supports our teaching and the service goals of the department.

We work closely with other departments and interdisciplinary programs at Case 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 Studies, and World Literature (all described in this Bulletin). Students also gain practical experience in different cultural and language environments through service learning in the Spanish, French, and Russian communities of Cleveland.

Our plans for the immediate future include seminar activities addressing all nine language sections and focusing on methodological topics such as text analysis and cognitive poetics; narratology and semiotics; general grammar and phonetics; cultural and media analysis. Graduate studies will be especially targeted by these new initiatives.

PLACEMENT PROCEDURE

Students with prior experience in French, German, and or Spanish, however gained (e.g. in high school with or without AP courses, at another institution, via study abroad, etc.), 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.

UNDERGRADUATE PROGRAMS

Major in French, German, Japanese Studies, and Spanish (30-32 hours)

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 their 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.

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 DMLL offerings which are closely related to French, German, Japanese, and Spanish cultures as well as those DMLL courses cross-listed with World Literature.

Minors in Modern Languages

- (CHIN, FRCH, GRMN, HBRW, ITAL, JAPN, RUSN, SPAN): 15-19 hours
- For students placed at the introductory level (no previous knowledge of the language): 101, 102, 201, 202 and one 300-level course.
- For students placed at 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.

Undergraduate Honors in Modern Languages and Literatures

The Departmental Honors Program is for especially talented and dedicated majors. Requirements for Honors in Modern Languages and Literatures are: 1) a grade point average of at least 3.5 in the major; 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 must be read and approved by two readers and will be accepted for honors only if it achieves a grade of B or better. It is written in the target language except in the case of Japanese Studies, which may permit papers in English. Students who qualify receive their degree “with Honors in Modern Languages and Literatures.” A registration form for students electing Honors in Modern Languages and Literatures is available in the departmental office.

Integrated Graduate Studies Program

The Department of Modern Languages and Literatures participates in the Integrated Graduate Studies Program, which makes it possible to complete both a B.A. and an M.A. in French within 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.

GRADUATE PROGRAMS

The department offers the Master of Arts degree in French and, with English and Classics, the Master of Arts degree in World Literature.

Engineering Core Requirements

Three courses in sequence beginning on the 100 level in any language; or, 201, 202, and one 300-level course in the same language; or, 202 and two, 300-level courses in the same language; or, three, 300-level courses in the same language.

DEPARTMENT OF MUSIC

Haydn Hall
Phone 216-368-2400; Fax 216-368-6557
Georgia J. Cowart, Chair
Robert E. Dunn, Music Education
Christine D. Smith Dorey, Department Representative

The Department of Music is committed to creating the best possible educational opportunities and professional programs in music. The department’s aim is to offer superior programs that balance humanistic knowledge of music with excellence in performance. Individual professional interests are encouraged and promoted. To foster this aim, the Department of Music has established major degree programs in music and music education and has collaborated with the Cleveland Institute of Music in
a Joint Music Program.

**FACULTY**

**Georgia J. Cowart, Ph.D.**
(Rutgers University)

**Associate Professor and Chair**
17th and 18th centuries; music, the arts, and politics

**William I. Bauer, Ph.D.**
(Kent State University)

**Associate Professor**
Music Teacher Education; research; technology

**L. Peter Bennett, D Phil**
(Oxford University)

**Assistant Professor**
17th century French music; early music performance

**Gary M. Ciepluch, Ph.D.**
(University of Wisconsin, Madison)

**Associate Professor**
Director of bands; conducting; Music Teacher Education

**Mary E. Davis, Ph.D.** (Harvard University)

**Associate Professor**
20th century; music and fashion; world music

**Ross W. Duffin, D.M.A.**
(Stanford University)

**Fynette H. Kulas Professor**
Medieval; Renaissance; Baroque; performance practices; Collegium Musicum

**Robert E. Dunn, Ph.D.**
(Northwestern University)

**Associate Professor; Director of Music Education**
Music Teacher Education; general and choral music

**Daniel Goldmark, Ph.D.** (UCLA)

**Assistant Professor**
American popular music; film music; history of the music industry

**Stephen E. Hefling, Ph.D.** (Yale University)

**Professor**
18th and 19th centuries; chamber music; analysis

**Kathleen A. Horvath, Ph.D.**
(Ohio State University)

**Assistant 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**

**Christine D. Smith Dorey, Ph.D.**
(University of Kentucky)

**Paul Ferguson, M.M.** (University of Akron)

**Instructor**
Bruce Egre

**Associate Faculty**
Cleveland Institute of Music Academic Faculty

**Offering Courses for University Students**

**Alan Bise**
Margaret Brouwer
David Brown
Jo Anne Caputo
Eric Charnofsky
Jeanette Davis
David Gilson
Mark George
Marshall Griffith
Dean Guy
Steven Kohn
Richard Nelson
Lisa Rainsong
Nadia Tarnawsky

**Artist Faculty of the Cleveland Institute of Music**
(Consult the current CIM catalog)

**DEGREE OFFERINGS AND AREAS OF CONCENTRATION**

**Areas of Degree Offerings:**

**Music education (Bachelor of Science, Master of Arts, Master of Arts for Teacher License, Doctor of Philosophy)**

**Early music performance practices (Master of Arts, Doctor of Philosophy, Doctor of Musical Arts)**

**Music (Bachelor of Arts within the context of liberal arts; see subsequent list of concentrations)**

**Music history (Master of Arts)**

**Musicology (Doctor of Philosophy)**

**Concentrations within the Bachelor of Science:**

**Music Education**

**Concentrations within the Bachelor of Arts in Music:**

- Music history
- Music theory
- Early music performance practices
- Performance
- General musicianship (particularly suitable for students interested in music as part of a double major or dual degree)
- Audio recording technology

Students interested in these programs should apply to Case Western Reserve University and audition for the Department of Music with the understanding that many courses in music performance, music theory, and related studies will be taken at the Cleveland Institute of Music.

**CIM JOINT MUSIC PROGRAM**
The Cleveland Institute of Music and Case Western Reserve University participate in an integrated music program at both the undergraduate and the graduate levels. Students at either institution have the benefit of pursuing studies at both schools, thus enjoying the intimacy and intense specialization of a professional conservatory, together with access to the resources of a major university. Both institutions share a campus setting in University Circle. Severance Hall (home of the Cleveland Orchestra), the Cleveland Museum of Art, the Cleveland Music School Settlement, and several other cultural organizations are within a short walking distance of both schools. The Cleveland Institute of Music concentrates on the education of students whose professional interests include the following:

- Performance (Bachelor of Music, Master of Music, and Doctor of Musical Arts)
- Composition (Bachelor of Music, Master of Music, and Doctor of Musical Arts)
- Eurhythmics (Bachelor of Music)
- Music theory (Bachelor of Music)
- Audio recording (Bachelor of Music)
- Piano accompanying (Master of Music, Doctor of Musical Arts)
- Suzuki Pedagogy (Master of Music)
- Students who are interested in these majors in the context of intensive conservatory training should matriculate at the Cleveland Institute of Music with the understanding that courses in music history, music education, and the liberal arts will be taken at the University. Contact the Admissions Officer, Cleveland Institute of Music, 11021 East Boulevard, Cleveland,
Ohio 44106, for a description of programs and the appropriate admissions materials.

Departmental Specialties
The Department of Music is distinctive in offering special areas of concentration to the student on both the undergraduate and the graduate level.

Early Music Performance Practices
One such area of special interest 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.

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. In both the undergraduate and graduate programs, the faculty emphasize practical and philosophical foundations regarding music in education. The nationally recognized music education faculty specialize in research in music education, the pedagogy of teaching and learning, music technology, string pedagogy, and wind conducting and repertoire. The faculty are active in their respective professional organizations and as clinicians, conductors, lecturers, and authors.

UNDERGRADUATE PROGRAMS
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 each semester to participate in one or more of the University musical organizations and to attend recital class. Performance juries and other requirements are detailed in the Undergraduate Music Handbook.

MUAP 011. Recital Class (0)

MUAP 101. Principal Performance Area I (1.5-3)
Limited to music and music education majors.

MUAP 102. Principal Performance Area II (1.5-3)
Limited to music and music education majors.

MUAP 111. Secondary Performance Area I (1.5-3)
Open to all university students.

MUAP 112. Secondary Performance Area II (1.5-3)
Open to all university students.

MUAP 201. Principal Performance Area III (1.5-3)
Limited to music and music education majors.

MUAP 202. Principal Performance Area IV (1.5-3)
Limited to music and music education majors.

MUAP 211. Secondary Performance Area III (1.5-3)
Open to all university students.

MUAP 212. Secondary Performance Area IV (1.5-3)
Open to all university students.

MUAP 301. Principal Performance Area V (1.5-3)
Limited to music and music education majors.

MUAP 302. Principal Performance Area VI (1.5-3)
Limited to music and music education majors.

MUAP 303. Principal Performance Area VII (1.5-3)
Limited to music and music education majors.

MUAP 304. Principal Performance Area VIII (1.5-3)
Limited to music and music education majors.

MUAP 311. Secondary Performance Area V (1.5-3)
Open to all university students.

MUAP 312. Secondary Performance Area VI (1.5-3)
Open to all university students.

MUAP 313. Secondary Performance Area VII (1.5-3)
Open to all university students.

MUAP 314. Secondary Performance Area VIII (1.5-3)
Open to all university students.

MUAP 501. Principal Performance Area IX (1.5-3)
Limited to music and music education majors.

MUAP 502. Principle Performance Area X (1.5-3)
Limited to music and music education majors.

MUAP 511. Secondary Performance Area IX (1.5-3)
Open to all university students.

MUAP 512. Secondary Performance Area X (1.5-3)
Open to all university students.

MUAP 602. Principal Performance Area XI (1.5-3)
Limited to D.M.A. Students.

MUAR 151B. Case Audio Internship I (1)
Development of recording engineering skills through professional level work in the Harkness audio service. Prereq: Open only to audio recording majors.

MUAR 152B. Case Audio Internship II (1)
Prereq: MUAR 151B.

MUAR 153B. Case Audio Internship III (1)
Prereq: MUAR 152B.

MUAR 154B. Case Audio Internship IV (1)
Prereq: MUAR 153B.

MUAR 200. Audio Recording I (2)
A study of basic recording principles and systems and techniques of recording and editing. Prereq: Audio recording majors only.

MUAR 201. Audio Recording II (2)
Further study of basic recording principles and systems with an introduction to digital recording. Prereq: MUAR 200.

MUAR 251B. Case Audio Recording Internship I (0)
Professional level work in the Case Western Reserve University Harkness audio service.

MUAR 252B. Case Audio Recording Internship II (0)

MUAR 253B. Case Audio Recording Internship III (0)

MUAR 254B. Case Audio Recording Internship IV (0)

MUAR 300. Advanced Recording Techniques I (2)
A study of advanced microphone, recording, and monitoring systems and techniques with an emphasis on two track digital recordings of classical music and critical listening. Prereq: MUAR 201.

MUAR 301. Advanced Recording Techniques II (2)
Further study of advanced microphone, recording, and monitoring systems and techniques, with an emphasis on two track digital recordings of large
Students will originate, design, organize, and complete a project that will demonstrate and document proficiency with his/her accumulated audio recording technology skills. This project must include evidence of critical thinking, clear planning, and establishment of reasonable goals with an appropriate plan of action. There is a significant written component that requires regular submission of drafts, progress reports, evidence of project advancement, and a final written document. There must also be a public presentation of the project in a venue approved by the department. Approved SAGES Capstone.

MUDE 320. Eurhythmics Pedagogy I (2)
A practical study of computer assisted electronic music composition covering traditional concepts of analog and digital synthesis, MIDI sequencing, sampling techniques, and video soundtrack production. Prereq: MUDE 322.

MUDE 321. Eurhythmics Pedagogy II (2)
A practical study of computer assisted electronic music composition covering traditional concepts of analog and digital synthesis, MIDI sequencing, sampling techniques and video soundtrack production. Prereq: MUDE 320.

MUDE 322. Eurhythmics Pedagogy III (2)
A practical study of computer assisted electronic music composition covering traditional concepts of analog and digital synthesis, MIDI sequencing, sampling techniques and video soundtrack production. Prereq: MUDE 322.

MUDE 323. Eurhythmics Pedagogy IV (2)
(See MUDE 322.) Prereq: MUDE 322.

MUCP 300. Basic Skills and Pedagogy: Voice (1)
Designed for music education majors to provide the fundamentals of teaching methods for various instruments. Prereq: Music education majors. Non-music majors accepted with consent of department.

MUCP 301. Orchestration I (2)
A study in the fundamentals of teaching methods for various instruments. Prereq: Music education majors. Non-music majors accepted with consent of department.

MUCP 302. Orchestration II (2)
A practical study of computer assisted electronic music composition covering traditional concepts of analog and digital synthesis, MIDI sequencing, sampling techniques and video soundtrack production. Prereq: MUDE 320.

MUCP 303. Orchestration III (2)
(See MUCP 310.) Prereq: MUCP 310.

MUCP 304. Orchestration IV (2)
(See MUCP 310.) Prereq: MUCP 310.

MUCP 305. Orchestration V (2)
(See MUCP 310.) Prereq: MUCP 310.

MUCP 306. Orchestration VI (2)
(See MUCP 310.) Prereq: MUCP 310.

MUCP 307. Orchestration VII (2)
(See MUCP 310.) Prereq: MUCP 310.

MUCP 308. Orchestration VIII (2)
(See MUCP 310.) Prereq: MUCP 310.

MUCP 309. Undergraduate Independent Studies (1-3)
Each student develops a topic of interest to be explored with a faculty member.

MUCP 751. Composition Document-D.M.A. (3)

MUDE 101. Eurhythmics I (0)
Physical expression of rhythm in which large bodily movements form the reference for rhythmic analysis. Study of pulse, meter, patterns, crossrhythms, improvisation, rhythmic canons, and bodily coordination emphasizing proper tension and relaxation. Prereq: MUTH 003.

MUDE 102. Eurhythmics II (0)
(See MUDE 101.)

MUDE 201. Eurhythmics III (0)
Continuation of MUDE 102. Material of increased difficulty as well as study of syncopation, rhythmic counterpoint, and conducting movements.

MUDE 202. Eurhythmics IV (0)
(See MUDE 201.)

MUDE 301. Eurhythmics V (1)

MUDE 302. Eurhythmics VI (1)
ous instruments. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: 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 279. Conducting: Accompaniment (2)
Prepares music education majors for the assignment of conducting small instrumental or vocal groups. Topics include: the conductor and his role; conducting techniques; and national and state standards. Clinical/Field experiences (all ages) required.

MUED 285. Conducting: Recital (2)
This course acquaints students with effective ways to develop, organize and maintain a successful performance program for any age group. This course includes: the use of technology in the instrumental program; philosophy of music education; the child voice, the adolescent voice, and adult voice; vocal tone; 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; and national, state, and professional standards. Clinical/Field experiences (Clinical-all ages; Field-focus on Pre-K through elementary) required.

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. Prereq: MUED 240.

MUED 350. General Music Methods A (3)
General Music A introduces students 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; national, state, and professional standards; and assessment. Clinical/Field experiences (Clinical-all ages; Field-focus on Pre-K through elementary) required.

MUED 351. General Music Methods B (3)
General Music B provides a more in-depth exploration of general music methods and materials for all ages, with concentration in grades 7 through adults. Topics of the course include: characteristics/needs of children, especially adolescents and young adults; creating a supportive learning environment through curriculum planning and design; instructional planning, implementation, and record keeping; involving students in moving, performing, creating and listening experiences with music, including individual and collaborative learning; music for exceptional children; using technology for music instruction; developing a personal philosophy of music education; teaching the arts together and integrating music into the school curriculum; multicultural musical experiences; motivation and classroom management; national, state, and professional standards; and assessments. Clinical/Field experiences (Clinical-all ages; Field-focus on middle school through adult) 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 assessment, 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 pro-
Students explore different theories regarding development in Music (3). In Music Education (3), students will work toward development of a curriculum in an area of their interest and expertise.

MUED 443. Cognitive Psychology of Music (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)
(See MUED 396A.) Coreq: MUED 496B.

MUED 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. Approved SAGES capstone. Coreq: MUED 496A.

MUED 501. Special Reading (M.A. and M.M.) (1-18)
(See MUED 496A.) Coreq: MUED 496A.

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. Prereq: MUED 444.

MUED 550. Effective Teaching in General Music: Ideas that Work (2)
Designed for elementary and middle school general music teachers, this hands-on course will focus on a variety of effective and practical teaching approaches for music teaching and learning, among them: enactive/iconic/symbolic approach to conceptual learning; active participation techniques; creating visual maps for listening lessons; teaching musical concepts through children’s literature; using the generative approach learning rhythms and melodies; sound compositions, and song games. In addition, four areas of understanding that are critical to successfully teaching general music in school situations will be addressed: (1) importance of music for every child; (2) developmental characteristics of children that must be considered in designing learning experiences; (3) age-appropriate learning goals and objectives (including National Standards in Music) and how they may be assessed; and (4) sequencing of curriculum.

MUED 590. Music Education Seminar in Creativity (3)
In this seminar, we will explore issues and theories involving creative thinking in general, and examine how creative thinking and musical experience interact. Topics include: definitions and theories of creativity; the creative process; the creative product; assessment; creativity in gifted education; teaching for creative growth; creative thinking and music composition (including improvisation); performance and listening; designing creative activities for the music classroom and rehearsals; available resources and professional organizations; and creativity as encouraged by state/national standards. Students will work toward development of a personal definition of creative thinking and how it can be applied to teaching in the music classroom.

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)

MUED 703. Dissertation Fellowship in Music Education (1-8)

MUEU 300. Accompanying Class (1)

MUEU 310. Two Piano and Piano Duet Class (1)

MUEU 315. Accompanying at the Harpsichord (2)
A practical introduction to accompanying a variety of Baroque vocal and instrumental works in a stylistically appropriate manner. Particular emphasis on the Bach sonatas for flute, violin, and viola da gamba. Students who are accompanying in recitals are encouraged to perform in class and receive coaching. Limited to six students. Prereq: MUGN 315 and consent of department.
MUEN 324. Case Percussion Ensemble (0-2)
The Case Percussion Ensemble is open to all interest-
ed Case-affiliated individuals who seek to continue
their musical development by performing percus-
sion ensemble literature. Membership is contingent
on an audition that demonstrates moderate percus-
sion ability and the ability to read music. Audition
materials can be acquired through the director.

MUEN 330. Opera Production (3)

MUEN 335. Miscellaneous Ensembles (0-2)

MUEN 356. University Circle Wind Ensemble (0-1)
Designed for the most advanced woodwind, brass,
and percussion players. Stresses the single-perfor-
manence concept utilizing only players needed for a
given piece. Audition required.

MUEN 357. New Music Ensemble (1-2)

MUEN 358. String/Piano Chamber Music (1)

MUEN 359. Intensive Quartet Seminar (2)

MUEN 373. Jazz Ensemble I (0-1)

MUEN 374. Jazz Ensemble II (0-1)

MUEN 381. CIM Symphony Orchestra (0-1)
This select chamber group performs a wide variety of a
cappella and accompanied choral works. Membership
is gained only through an audition with the director. Prereq: Audition required.

MUEN 383. Symphonic Winds (0-1)
Performance of advanced symphonic band reperto-
ire. 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, fac-
ulty, staff and community players who play strings,
woodwinds, brass and percussion. Prereq: Audition
required.

MUEN 386. Case Cameraata Chamber Orches-
tra (0-1)
This chamber string ensemble is open to all interest-
ed Case affiliated individuals who seek to continue
their music developement 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. Prereq: 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 395. Collegium Musicum (0-1)
Prereq: Audition required.

MUEN 396. Early Music Singers (0-1)
Prereq: Audition required.

MUEN 397. Baroque Orchestra (0-1)
Prereq: 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 pri-
marily 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. Prereq:
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. Prereq: MUGN 201.

MUGN 290. Opera Workshop I (2)
The structured workshop setting utilizes arias,
scenes, improvisations and music-theater exercises
to develop performance skills and build strength and
clarity of communication for the opera stage. Students are required to spend twelve hours per se-
mester in technical support for the opera produc-
tions. Prereq: THTR 100, THTR 103, or assign-
ment by Director of Opera Program.

MUGN 291. Opera Workshop II (3)

MUGN 308. Computers and Music (3)
Emphasis on development of music notation and
sequence skills with some attention to word-pro-
cessing and graphics. Introduction to data manage-
ment 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, CWRUNet and the
music department's Center for Music and T echnol-
gy. No formal training in computers required. Pre-
req: Music majors only.

MUGN 315. Introduction to the Harpsichord
(2)
Introduction to the harpsichord technique and the
interpretation of 17th- and 18th-Century Baroque
keyboard music. Study of national styles, ornamen-
tation, articulation, tempi, dynamics, fingering, and
registration. Focus is on short representative works
of Byrd, Couperin, Rameau, Duphly, Bach, Scar-
latti, and Soler, as well as other works chosen by
participating students. Limited to six students. Pre-
req: Open to CIM and CWRU music majors with
keyboard background; consent of department; not
open to harpsichord majors.

MUGN 319. Jazz Skills I (3)
This class is designed to teach students basic skills in
jazz improvisation, jazz keyboard, arranging/com-
position and pedagogy. Basic theory is required.
Students will eventually arrange their own compo-
sition for big band, which will feature them as the
improvising soloist. Prereq: MUTH 102/MUTH 106, MUGH 108 or permission of instructor.

MUGN 320. Jazz Skills II (3)
This course will build on the foundational skills de-
veloped in Jazz Skills I, providing a more intensive
study of Jazz harmony, improvisation and melodic
construction. It is designed to give students an ad-
vanced experiential understanding of the theory and

MUGN 321. Diction For Singers I (2)

MUGN 322. Diction For Singers II (2)

MUGN 325. Broadcast Procedures (1-3)

MUGN 371. Choral Conducting I (1)
Study of the techniques of choral conducting and a
general survey of choral literature.

MUGN 373. Orchestral Conducting I (1)
Study of orchestral scores, covering elements of
style, form, and interpretation. Development of ba-
ton technique through conducting of small instru-
mental ensembles.

MUGN 399. Undergraduate Independent
Studies (1-3)
Each student develops a topic of interest to be ex-
plored with a faculty member.

MUGN 471. Graduate Choral Conducting I
(1)
Study of the techniques of choral conducting and a
general survey of choral literature.

MUGN 472. Graduate Choral Conducting II
(1)
Advanced study of choral conducting and rehearsal
techniques using varied repertoire of all styles.

MUGN 473. Grad Orchestral Conducting I
(1)

MUGN 493. Opera Workshop III (2)

MUGN 501. Special Reading (M.A. and
M.M.) (1-18)

MUGN 651. Thesis: (M.A. and M.M.) (1-6)

MUHI 301. History of Western Music I (3)
Developments in Western music from Early Chris-
tian times to the present, especially great periods
and composers. Reference to life and thought; il-
lustrated lectures; style analysis. Prescribed listen-
ing and reading. Prereq or Coreq: MUTH 108 or equivalent.

MUHI 302. History of Western Music II (3)
(See MUHI 301.) Prereq: MUTH 102 or MUTH 106.
MUHI 303. History of Western Music III (3)
Music of the twentieth century, covering history, analysis, and aesthetic issues. Prereq: MUHI 302.

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. Prereq: MUTH 106.

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. Prereq: MUTH 106.

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. Prereq: 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. Prereq: MUHI 301 and MUHI 302.

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. Prereq: MUHI 341.

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.” Prereq: Permission of department.

MUHI 390. Undergraduate Research Seminar (3)
Special projects appropriate to individual interests and needs.

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 431. Medieval Music: Early Christian to 1425 (3)
The mass, liturgical drama, and early polyphony through the Ars Nova.

MUHI 432. Music of the Renaissance (3)
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)
(See MUHI 341.)

MUHI 442. Seminar in Early Music Performance Practice (3)
(See MUHI 342.)

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)
(See MUHI 350.) Prereq: Permission of department.

MUHI 501. Special Reading (M.A. and M.M.) (1-18)

MUHI 509. Seminar in Musicology (3)
Problems in musical criticism, aesthetics, and analysis, as well as interdisciplinary methodologies.

MUHI 701. Dissertation Ph.D. (1-18)

MUHI 703. Dissertation Fellowship (1-18)

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 320. Piano Literature (3)
Chronological survey of keyboard literature from the 17th century to the present (may focus on more limited repertoire). Detailed analysis of representative works; study and comparison of keyboard styles. Prereq: Either MUTH 202 and 206 or MUTH 208, plus MUHI 302.

MULI 321. Chamber Music Literature (3)
Chronological survey of important chamber literature. Analysis of representative sonatas, trios, quartets, and large ensembles. Prereq: MUTH 202 or MUHI 302.

MULI 322. Symphonic Literature (3)

MULI 323. Vocal Literature (3)

MULI 324. Opera Literature (3)
Historical development of opera from the 17th century to the present. Detailed analysis of representative works. Prereq: MUHI 302.

MULI 325. Guitar Literature (3)

MULI 399. Undergraduate Independent Studies (0)
Each student develops a topic of interest to be explored with a faculty member.

MUPD 340. Piano Pedagogy I (1)

MUPD 341. Piano Pedagogy II (1)

MUPD 342. Piano Pedagogy III (1)
Organizing piano literature into levels of difficulty; appropriate use of published materials; in-depth study of psychological/developmental differences in the various age groups; problems pertaining to the adult pupil and the pupil who has had inadequate previous training; teaching of secondary piano at the collegiate level. The class meets one hour weekly. Class members observe instruction within the CIM Conservatory and Preparatory Departments.

MUPD 343. Piano Pedagogy IV (1)
(See MUPD 342.)

MUPD 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. Prereq: Consent of department.

MUPD 364. Principles of String Playing and
Teaching II (2)
This course is a continuation of MUPD 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. Prereq: Consent of department.

MUPD 399. Undergraduate Independent Studies (1-3)
Each student develops a topic of interest to be explored with a faculty member.

MUPD 445. Suzuki Pedagogy I (2)
Exploration and application of the philosophies and principles of playing and teaching the violin using the Suzuki method. In-depth study and performance of the Suzuki Violin School Volumes 1-5. Supplemental scales, arpeggios, etudes, and works from the standard repertoire will also be included.

MUTH 108. Theory for Music Majors II (4)
This is the course for the second of four semesters of music theory for Case music majors. It includes further study of harmony, analysis, eartraining, sight-singing, and keyboard. Use of dissonance and chromaticism, chromatic voice leading technique. Prereq: MUTH 207 or placement exam through department.

MUTH 201. Harmony-Keyboard III (2)
Continuation of MUTH 101 and 102. Chromatically altered triads and 7th chords; 9th, 11th, 13th. Neapolitan and augmented 6th chords, regular and irregular solutions. Correlated and taken concurrently with MUTH 205 and 206. Both aspects of the course must be passed in order to complete requirements. Prereq: MUTH 102 or placement exam.

MUTH 202. Harmony-Keyboard IV (2)
(See MUTH 201.) Prereq: MUTH 102 or placement examination.

MUTH 205. Sightsinging-Eartraining II (3)
Aural and vocal study using alto and tenor clefs, in addition to treble and bass. Correlated and taken concurrently with MUTH 201 and 202. Both aspects of the course must be passed in order to complete requirements. Prereq: MUTH 205 and 206. Sixteenth century modal counterpoint. Exercises in five species. Writing of short compositions and motets in two, three and four voices. Prereq: MUTH 202 or MUTH 206.

MUTH 310. Sightsinging-Eartraining V (3)
Continuing emphasis on the development of aural and vocal skills in all clefs, with particular attention to contemporary music, and increased emphasis on performance and preparation at sight of a wide range of literature. Prereq: MUTH 206.

MUTH 311. 16th Century Counterpoint (2)

MUTH 312. Eighteenth Century Counterpoint (3)
Analysis and writing of inventions in two parts, and fugues in three and four parts. Prereq: MUTH 202 or MUTH 206.

MUTH 315. 17th Century Counterpoint (3)
Writing of short compositions and fugues in three and four parts. Prereq: MUTH 202 or MUTH 206.

MUTH 320. Form and Analysis (3)
Aural and visual analysis of structural and stylistic features of 16th through 20th century music. Prereq: MUTH 202 or MUTH 206.

MUTH 321. Introduction to Analysis of 20th Century Music (2)
A study of compositional techniques as used in selected works by major 20th century composers. Prereq: MUTH 202 and MUTH 206.

MUTH 361. Theory Pedagogy I (2)
Principles of the teaching of theory at all levels, with examination and appraisal of teaching methods, textbooks, recent concepts, etc.

MUTH 362. Theory Pedagogy II (2)
(See MUTH 361.)

MUTH 395. Seminar in Music Theory (3)

MUTH 398. Seminar in Music Theory (3)

MUTH 399. Undergraduate Independent Studies (1-3)
Each student develops a topic of interest to be explored with a faculty member.

MUTH 400A. Review of Musical Structure (3)
Instruction of fundamentals of form, counterpoint, and four-part harmony. Designed for graduate students; credit not applicable toward degree requirements.

MUTH 400B. Sightsinging and Eartraining Review (2)
Background in fundamentals of sight singing in four clefs; melodic and harmonic dictation including chromatic harmony and modulation. Designed for graduate students; credit not applicable toward degree requirements.

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 422. Musical Analysis for Educators (3)
Musical Analysis for Educators is designed to strengthen the analysis skills of music educators and explore practical application of these skills. Prereq: Placement exam.

MUTH 423. Analysis of Musical Styles (3)

MUTH 495. Seminar in Music Theory (3)

MUTH 501. Special Reading (M.A. and M.M.) (1-18)

DOUBLE MAJOR AND DUAL DEGREE OPPORTUNITIES
The department encourages qualified students to consider a dual or double major in music and another subject. More than one-half of music majors at Case pursue double major. Typical combinations include the Bachelor of Arts in music with theater, English, classics, psychology, sociology, and 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 is concerned with studies in music and the liberal
arts. This degree program stresses a humanistic orientation.

Approximately one half of the total 120 semester credit hours necessary for the degree is devoted to music study, with the remaining credit devoted to the SAGES requirements (39 hours), a possible minor program, and a liberal selection of elective courses. This arrangement differs from student to student. The department offers several concentrations within the music portion of the degree (described below). Core music courses for these programs are: (1) Music theory: MUTH 107, 108, 207, 208 (or 101/105, 102/106, 201/205, 202/206), and 320 for a total of 19 semester hours; (2) Music history and literature: MUHI 301, 302, and 303 for a total of 9 semester hours; (3) performance instruction (applied music) for a minimum of 15 semester hours; and (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 major
- Two semesters of eurhythmics (fulfills physical education requirement)

Additional course work in music is required for each concentration as follows:

Music History
Additional Applied Music study at the 300 level (3); MUHI 341, Introduction to Early Music Performance Practices (3); Two electives from music history or literature courses at the 300 level or above (6); Foreign language (6-8)

Music Theory
Additional Applied Music study at the 300 level (3); MUTH 311, 312, Counterpoint I and II (4); One elective from music history or literature courses at the 300 level or above (3)

Early Music Performance Practices
Additional Applied Music study at the 300 level (3); MUHI 341, Introduction to Early Music Performance Practices (3); MUHI 342, Seminar in Early Music Performance Practices (3); One elective from music history or literature courses at the 300 level or above (3); Foreign language (6-8)

Performance
Additional Applied Music study at the 300 level (9); One elective from music history or literature courses at the 300 level or above (3); Foreign language (6-8)

General Musicianship
One elective from music history or literature courses at the 300 level or above (3)

Audio Recording Technology
MUAR 151B, 152B, 153B, 154B, Case Audio Internship I, II, III, IV (1,1,1,1); MUAR 251B, 252B, 253B, 254B, Case Audio Recording Internship I, II, III, IV (1,1,1,1); MUAR 200, 201, Audio Recording I and II (2,2); MUAR 300, 301, Advanced Recording Techniques I and II (2,2); MUAR 387, 388, Multi-track Recording Techniques I and II (2,2); MUAR 310, 311, Recording Studio Maintenance I and II (1,1); MUAR 380, Junior Audio Recording Thesis (3); MUAR 390, Senior Audio Recording Thesis (6); MUAR 320, 321, Acoustics of Music I and II (1 credit hr., taken 3 times) (3); MUAR 385, Recording Studio Internship (Commercial) (4); MUAR 322, 323, Recording Workshop I and II. A Minor in Electronics is available from the Electrical Engineering and Computer Science Department. A five-year, dual degree program is also available where the student earns a B.A. in music/audio and a B.S. in an elective field of engineering.

**CAREER OPPORTUNITIES WITHIN THE BACHELOR OF ARTS DEGREE**

Students choosing the audio recording technology concentration are prepared to enter professional positions in that field immediately upon graduation. Graduates of the other concentrations are prepared to enter programs of advanced study in music or in other professional programs such as those in medicine, law, and management. Because of the humanistic orientation of the degree and the stress on the liberal arts, students are also able to pursue careers in a wide assortment of fields such as communications, publications, business, and arts criticism.

**Bachelor of Science in Music Education**

The program in Music Education, which leads to the Bachelor of Science degree, requires a total of 129 credits and is designed to educate professional teachers of music education for public and private schools. The program meets requirements of the Ohio Department of Education to prepare students to take the state 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 degree:

**Music Education Major Requirements**

(*Indicates courses fulfilling SAGES curriculum requirements)

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Applied Music Lessons (7 semesters)</td>
<td>21</td>
</tr>
<tr>
<td>Case Music Theory (MUTH 107, 108, 207, 208, 320)</td>
<td>19</td>
</tr>
<tr>
<td>Some students may opt to take CIM Music Theory in place of Case Music Theory:</td>
<td></td>
</tr>
<tr>
<td>CIM Music Theory (MUTH 101/105, 102/106, 201/205, 202/206, 320)</td>
<td>19</td>
</tr>
<tr>
<td>Eurhythmics I &amp; II (MUDE 101*, 102*) (fulfills PE Req.)</td>
<td>0</td>
</tr>
<tr>
<td>Foundations of Music Education (MUED 240)</td>
<td>3</td>
</tr>
<tr>
<td>Elements of Conducting (MUED 275)</td>
<td>2</td>
</tr>
<tr>
<td>Advanced Conducting (MUED 276)</td>
<td>2</td>
</tr>
<tr>
<td>Instrumental and Choral Arranging (MUED 310)</td>
<td>3</td>
</tr>
<tr>
<td>Music History (MUHI 301*, 302*, 303)</td>
<td>9</td>
</tr>
<tr>
<td>Technology-Assisted Music Teaching and Learning (MUED 320)</td>
<td>3</td>
</tr>
<tr>
<td>General Music Methods A or B (MUED 350 or 351)</td>
<td>3</td>
</tr>
<tr>
<td>Instrumental Methods and Materials (MUED 352)</td>
<td>3</td>
</tr>
<tr>
<td>Choral Methods and Materials (MUED 353)</td>
<td>3</td>
</tr>
<tr>
<td>Electives from various MUED 200 Basic Skills and Pedagogy Courses (1 credit each)</td>
<td>5</td>
</tr>
<tr>
<td>Participation in assigned home ensemble each semester of major except for student teaching</td>
<td>7</td>
</tr>
<tr>
<td>Participation in 1 additional ensemble for one year (1 credit each)</td>
<td>2</td>
</tr>
</tbody>
</table>
Recital class attendance and performance every semester of major (except during student teaching) (MUAP 011)  

Language and Literacy Across Content Areas (COSI 463)  

Introduction to Psychology (PSCL 101*)  

Introduction to Education (EDUC 310)  

Educational Psychology (EDUC 304*)  

Student Teaching in Music Education (MUED 396A)  

Student Teaching Seminar in Music Education (SAGES Capstone course) (MUED 396B*)

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recital class attendance and performance every semester of major (except during student teaching) (MUAP 011)</td>
<td>0</td>
</tr>
<tr>
<td>Language and Literacy Across Content Areas (COSI 463)</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Psychology (PSCL 101*)</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Education (EDUC 310)</td>
<td>3</td>
</tr>
<tr>
<td>Educational Psychology (EDUC 304*)</td>
<td>3</td>
</tr>
<tr>
<td>Student Teaching in Music Education (MUED 396A)</td>
<td>9</td>
</tr>
<tr>
<td>Student Teaching Seminar in Music Education (SAGES Capstone course) (MUED 396B*)</td>
<td>3</td>
</tr>
</tbody>
</table>

**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.

**Decision Point 1: Application for Admission to the program**

Official admission to the Music Education Program generally happens at the end of the Freshman year. Admission to the program requires: (1) being accepted to Case; (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) 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 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 4 of the third semester after Decision Point 1 (usually the Fall of the third year at Case). Application for Advanced Standing requires: (1) A successful review of the updated Teaching ePortfolio; (2) Submission of a current DPR form documenting the following: cumulative GPA of 2.5 or better, music 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 Music Education Faculty.

**Decision Point 3: Application for Student Teaching**

Application for Student Teaching should be completed by Week 4 of the semester prior to Student Teaching. Application for Student Teaching requires: (1) A successful review of the updated Teaching ePortfolio; (2) Submission of a current DPR form documenting the following: cumulative GPA of 2.5 or better, music 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 Music Education Faculty; (4) Passing a TB Test; (5) Presentation of documentation of Hepatitis B vaccination; and (6) passing an official criminal background check.

**Decision Point 4: Recommendation for Initial Licensure**

Application for Initial Licensure happens after successful completion of all degree requirements. Application for Initial Licensure requires: (1) A successful review of the updated Teaching ePortfolio; (2) Submission of a current DPR form documenting the following: cumulative GPA of 2.5 or better, music 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 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 MAL students); and (6) completion of the Case Teacher Licensure Exit Interview and Survey.

Upon successful completion of the four decision points, the student is recommended by the University Director of Teacher Licensure 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 on this program is available in the office of the director of teacher licensure.

**Music Minor**

A minor in music requires a minimum of five courses (at least 15 credits), usually two in music theory (generally MUTH 103, 104), two 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. A minor in music education may be devised in consultation with a music education advisor. The department welcomes students’ initiatives in the development of minor programs suited to their needs.

**Non-Music Majors**

All MUTH, MUHI, and MUGN courses may count toward SAGES breadth requirements. Sequences for students in the Engineering Core (non-SAGES)

A sequence requires three courses. The department welcomes students’ initiatives in developing sequences suited to their needs. The following are sample sequences:

**Music and its theory**

- MUTH 103, MUGN 202
- MUGN 201, MUTH 103, 104
- Music and its history
- MUTH 103, 104, and MUHI 301 or 302
- MUGN 201, MUTH 103, MUGN 202
- Music and computers
- MUTH 103, 104, MUGN 308
- MUGN 201, MUTH 103, MUGN 308
- Music history and jazz
- MUTH 103 or 104, MUGN 202, MUGN 215
- MUGN 201, 202, 215

**Music and performance**

- MUTH 103, MUGN 201, MUAP
- MUTH 103 or 104, MUGN 202, MUAP
- Electives for Non-Music Majors

Electives designed for students not majoring in music are MUTH 103, 104, 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. MUGN 201 and 202 are offered as courses that satisfy the breadth requirements of SAGES. Music ensembles (MUEN) are available, normally
by audition. Individual instruction in piano, harpsichord, organ, voice, violin, and all other orchestral instruments is available with consent of the department.

See further information under Applied Music.

DEPARTMENTAL HONORS

Departmental Honors Programs for the Bachelor of Arts and Bachelor of Science degrees have the following admission and completion requirements:

For B.A. students, admission to honors status requires second semester sophomore or junior standing, 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. The student must register for independent study or an approved seminar during the project period. B.S. students are held to the same standards, with additional evidence of strong interest in becoming a teacher and excellence in teaching. Candidates must have been granted Advanced Standing status to apply. The honors project may not be pursued or completed during student teaching.

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; however, 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 programs in Music History, Musicology, and Early Music Performance Practices, and an audition is necessary for students interested in the Early Music Performance Practices programs.

Master of Arts in Music History

The concentration in music history and literature emphasizes research, history, literature, and the theory of music. The early music performance practices program presupposes the same strong liberal arts training as the music history and literature concentration plus a strong performance interest and background. Research and its application to music performance are stressed.

Within the 30 hours required for either concentration, the following are minimum requirements: music history, 9 hours; research, 6 to 9 hours; theory-analysis, 6 hours; electives, 6 to 9 hours.

Remaining hours are more freely elected with advisor’s approval, but 9 hours of applied music are required for performance practices students. Ensemble participation is required for performance practices students but does not earn credit hours toward the degree. Examinations include initial placement tests in history and theory, a reading test in German or French, and final written and oral examinations. In addition, performance practices students must audition as part of the admissions process and must present a lecture-recital near the completion of the degree program. At least 18 credit hours must be at the 400 level or higher.

Master of Arts in Music Education

This degree is built on a set of foundation courses in philosophy, curriculum, psychology, research, evaluation, and musicianship. Additional courses and independent studies enable students to tailor programs to their interests and needs.

Students may pursue one of three degree options. Persons in Plan A (thesis option) write a thesis based on original research and defend the thesis in an oral examination. Persons in 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 education, a good undergraduate academic record, and at least one year of successful music teaching experience, usually in the public schools. Persons seeking teacher licensure credentials pursue Plan C (MA for Licensure or MAL option). The program includes a core of graduate music education courses, graduate music courses, undergraduate music methods courses, and one semester of student teaching. Applicants for MAL should have a bachelor’s degree in music (B.A. or B.M.), a good undergraduate academic record, and some prior experience in working with children. The regulations in the B.S. program regarding advanced standing, grade point averages, and the Praxis II Exam apply to graduate 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 MA degrees in music education include a music education core of philosophy, curriculum, and research (12 hours); a music core of history, theory (3-9 hours), and performance (0-6 hours); and electives (0-9 hours). Persons in Plan A receive 6 credit hours for thesis research. A comprehensive written examination at the conclusion of course work is required for persons in Plan B. A comprehensive oral exam at the conclusion of course work is required for persons in Plan C. A minimum of 30 credit hours is required for Plans A and B. Plan C/MAL degree combines an expanded music education core (41 hours), graduate music core (9 hours), professional education requirements (9 hours) and skills and pedagogy courses (5 hours). The MAL degree requires a minimum of 59 hours. To remain in the program, students must meet GPA and professional standards on a yearly basis. For more information, contact the Director of Music Education.

DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy degree is offered in two fields: musicology, with concentrations in music history and early music performance practices; and 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 qualifies applicants may enter this program directly upon completion of a bachelor’s degree.

All programs are formulated to suit the individual needs of the student and require the consent of the advisor. The Ph.D. in Historical Musicology requires 36 credit hours.
of coursework and an additional 18 hours of dissertation research credit hours. Required coursework includes three doctoral seminars, MUHI 501 (Bibliography), and MUTH 424 (Schenkerian Analysis). 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 the first year of the program. Based on these examinations, students may be required to enroll in specific courses to address deficiencies; these course credits may be applied toward the requirement. At the end of the first year of study, the musicology faculty will conduct a formal review with each student. This process will include an evaluation of progress to date and advisement regarding the remainder of the program.

A written summary of this review, along with coursework grades and materials, will constitute the beginnings of the portfolio maintained by the Director of Graduate Studies that will be the basis for consideration of a student’s advancement into the Ph.D. program. At the end of the second year of coursework, students will be asked to submit a qualifying paper, 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 will 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 will register for dissertation research credits and begin research work for the dissertation. Working with a faculty advisor, the 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 years 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.

The Ph.D. in Historical Musicology with a concentration in Early Music Performance Practices requires a minimum of 48 hours (36 for students with a master’s degree) of coursework, seminars, and tutorials. The last 36 hours (24 for students with a master’s degree) must be completed at the University.

For performance practices students, coursework distribution is as follows: applied music, 9-12 hours (6-9 with master’s degree); course work, 36-39 hours (27-30 with master’s degree).

For other musicology students, private lessons at the 400 level, although not required, may be counted to a maximum of six credits at the discretion of the advisor.

Examinations include initial placement tests in history and theory; an audition for performance practices students; reading tests in German and one other foreign language; qualifying examinations in history and theory prior to admission to candidacy; and a general examination with history, theory, style analysis, and oral sections. Upon completion of the dissertation, an oral defense is held. In addition, performance practices students must audition as part of the admissions process and must present a lecture-recital in conjunction with the dissertation. 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.

Normally all performance practices students will participate in the Collegium Musicum or Baroque Orchestra during each semester in which they are on campus. Credit hours obtained for this participation are not applicable toward the degree.

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 positions of leadership in elementary, secondary, and collegiate instruction. Prior to graduation, doctoral students demonstrate competency 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 major 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 on a yearly basis. For more information, contact the Director of Music Education.

A total of 54 credit hours is required for the doctoral degree beyond the master’s level.

A typical division would be:

- Music education: philosophy, psychology, curriculum, research, measurement (15 hours)
- Music: theory (3-6), history (3-6), performance (0-6) (category total 9-15)
- Non-music electives: psychology, art, education, sociology, others (0-3)
- Seminars and special readings (6-12)
- Dissertation (18)

A comprehensive examination follows the completion of coursework, prior to beginning work on 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 the major advisor. A minimum of 24 hours (after the master’s degree) of course work, seminars, and tutorials is required. 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 German and one other foreign language; an advisory examination after one year of full-time study and a comprehensive examination with history, theory, performance practices, and oral sections. Three juried recitals are required, each to be accompanied by a research document and preceded by a short lecture. Exceptional students may be admitted to a combined M.A./D.M.A. degree program in early music.
Special Facilities

Harkness Chapel, the setting for concerts presented by the Case Music Department, features neo-Gothic architecture, antique oak and Georgia pine woodwork and Tiffany windows. It is a warm, intimate yet acoustically resonant space ideal for the performance of vocal and instrumental chamber music. The building provides space for music classes, department recitals and concerts, and is the home of the department’s early music concert series.

Kulas Music Library, a branch of the university library, is located on the first floor of Haydn Hall, the home of the Department of Music. The library contains approximately 40,000 music scores, books on music, sound recordings, videos, bound periodical volumes, and microforms. Particularly strong are the collections in historical musicology and early music performance practice. Equipment is available in the library in order to listen to or view the sound recording and video collections. The library shares a central on-line catalog and liberal interlibrary lending policies with the central academic library of the university. Access to interlibrary loan from libraries outside of Ohio is also available. The music library is connected to the Case network – the university’s fiber optic network, which provides access to many on-line databases. The collections and services of the Kulas Music Library are available to all University students, whether or not they are music majors. Music majors at the university also have access to the library of the Cleveland Institute of Music, which collects performing materials for solo and chamber music of all kinds and scores for large orchestral, vocal, and dramatic works, as well as selected musicological works.

CENTER FOR MUSIC AND TECHNOLOGY

The department supports a computer laboratoryresource center devoted to furthering the use of technology in music. The Center for Music and Technology houses Macintosh-based music workstations that are linked by the Case network, the university’s vast fiber optic network system and gateway to the Internet. This state-of-the-art network allows extremely fast access to a multitude of resources both on and off campus. Using the Case network, students in the center are able to access computers and databases as well as share ideas and research with colleagues around the world. Through the use of MIDI (Musical Instrument Digital Interface) keyboards, users may explore computer-assisted composition and sequencing, music synthesis and sampling, and computer-generated music calligraphy. 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 works closely with faculty in providing support facilities for the department’s technology-related courses. For example, students enrolled in Computers and Music use the center to explore sequencing, MIDI communication, and musical score production. Designed to meet the specific needs of music students and faculty, the center supports an array of non-musical software including word processing, database, and graphics applications. As the department becomes increasingly technology-oriented and the Case network is increasingly utilized by the faculty in their curricula, the Center for Music Technology plays an ever increasing role by providing technical support and a necessary focal point for the interchange of ideas and creative solutions.

KULAS COLLECTION OF EARLY MUSIC INSTRUMENTS

The Department of Music maintains an impressive collection of modern reproductions of medieval, Renaissance, and baroque instruments. The instruments are used by the Collegium Musicum, Baroque Orchestra, and the department’s program in Early Music Performance Practices. The collection includes recorders, crumhorns, shawms, sackbuts, cornetti, viols, and baroque strings and woodwinds.

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 audio-visual 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 Renaissance and Baroque instruments, as well as the usual orchestral instruments, piano, and voice. Students have the unique opportunity to study with outstanding teachers, most of whom are faculty at the Cleveland Institute of Music. Students interested in private instruction should come to the department prior to registration in order to complete the Applied Music Permit form and to learn of 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 1.5 or 3 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 requirements. Graduate 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 available for students at Case. 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 held during the first week of classes each semester. Dates and times are available from the department.
NATURAL SCIENCES
Academic Representative
Dr. Joanne Westin
214 DeGrace Hall, Phone: 368-3566
Email: jxw3@case.edu

UNDERGRADUATE PROGRAMS

Major
The Natural Sciences major is an interdepartmental science program that leads to the Bachelor of Arts degree. It is intended to serve students whose interests and objectives call for a major in the humanities or social sciences that is accompanied by broad background in the natural sciences; e.g. history and philosophy of science and technology. Natural Sciences is available only as a second major for the B.A.; the first major for the B.A. must be in one of the departments within the arts and humanities or the social sciences, excluding the programs in American Studies, Asian Studies (Track 2), Environmental Studies, Gerontological Studies, Pre-Architecture, and Women’s 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 the departments, a minimum of 8 hours each in each of two other of these departments listed, and 3 hours in each in of the remaining two departments. In addition, all natural sciences majors must complete MATH 125 and 126 or MATH 121 and 122. The courses selected in each of these departments must generally be courses that also satisfy major or related course 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 specified below for any four of the six departments listed.

Astronomy
Completion of one of the following sequences:
• ASTR 201 and any other 200 level ASTR course; or
• ASTR 221, 222

Biology
• Any two of BIOL 214, 215, 216

Chemistry
Completion of one of the following sequences:
• CHEM 105, 106, 113 or
• 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
Completion of one of the following sequences:
• MATH 125, 126 or
• MATH 121, 122

Physics
Completion of one of the following sequences:
• PHYS 115, 116 or
• PHYS 121, 122, 221

DEPARTMENT OF NUTRITION
2109 Adelbert Road, Room WG 48
Phone 368-2440; Fax 368-6644
Website: http://www.case.edu/med/nutrition/home/html
Henri Brunengraber, Chair

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 following: 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)
Assistant 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 Tseng, 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 Genueth, 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
Adjunct Instructor
Diane Ohama Yates, B.S. (Hawaii)
Adjunct Instructor
Melissa Wilson, B.S. (Mercyhurst College)
Adjunct Instructor
Anita Ullman, M.S. (San Diego State University)
Adjunct Instructor
Norliza Tayag, B.S.
Adjunct Instructor
Margaret Tate, M.S. (Colorado State)
Adjunct Instructor
Norliza Tayag, B.S. (San Diego State University)
Adjunct Instructor
Anita Ullman, M.S. (Ohio State University)
Adjunct Instructor
Melissa Wilson, B.S. (Mercyhurst College)
Adjunct Instructor
Diane Ohama Yates, B.S. (Hawaii)

Adjunct Instructor
Mary Zyga, B.S. (Ohio State University)
Adjunct Instructor

UNDERGRADUATE (NTRN)

NTRN 201. Nutrition (3)
The nutrients, their functions, food sources, and factors affecting human needs throughout life.

NTRN 328. Child Development and Health (3)
Growth and development of the child from prenatal through adolescence, including individuality, maturation, and biological needs.

NTRN 342. Food Science (5)
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: NTRN 201 or consent.

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. Prereq: 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 services are included. Prereq: Nutrition major or consent of instructor.

NTRN 350. 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. Prereq: NTRN 363 or NTRN 433 or consent.

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. Prereq: 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. Prereq: 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 or consent.

NTRN 365. Nutrition in Disease (4)
Application of nutrition principles to the problems of diet in disease. Prereq: NTRN 363 and BIOC 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. Prereq: Written consent of faculty sponsor.

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. Approved SAGES departmental seminar. Prereq: NTRN 201 and NTRN 342.

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. Approved SAGES capstone. Prereq: NTRN 397.

NTRN 399. Senior Project (3)
Formal investigation of a topic in nutrition culminating in a paper and oral presentation. Requires definition of a problem, evaluation of the scientific literature and delineation of problem-solving approaches. Prereq: Twenty-one hours of Nutrition and consent of supervising instructor.

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. Prereq:
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. Prereq: 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. Prereq: 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. Prereq: Nutrition major and standing graduate 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. Prereq: NTRN 365 or equivalent.

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. Prereq: 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. Prereq: NTRN 435 or consent.

NTRN 451. Food Service Systems Management (3)
Application of organizational theory and skills in the preparation and service of quantity food. Laboratory experiences in professional food services are included. Students will analyze one aspect of food service management in depth. Prereq: Nutrition Major or consent.

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. Prereq: BIOC 307 or equivalent. Cross-listed as BIOC 452.

NTRN 454. Isotope Tracer 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. Prereq: 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. Prereq: 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. Prereq: NTRN 365 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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: Consent of instructor.

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. Prereq: 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. Prereq: 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. Prereq: NTRN 435 or consent.

NTRN 534. Advanced Public Health Nutrition Field Experience (1)
Individually planned advanced public health experience. Prereq: 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 (2-3)

NTRN 561. Investigative Methods in Nutrition (1-4)
Research methods appropriate for nutrition. Methods for conducting research in nutrition and food sciences, food service management and dietetics. Designing research proposals. Prereq: Nutrition major or consent of instructor.

NTRN 601. Special Problems (1-18)

NTRN 651. Thesis M.S. (1-18)

NTRN 701. Dissertation Ph.D. (1-18)

NTRN 703. Dissertation Fellowship (1-8)

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 dietet-
ics; (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 Science degree requires the completion of SAGES, PHED 101, 102, and the following courses:
- NTRN 201, 342, 343, 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

### Bachelor of Science in Nutrition

#### First Year

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<tr>
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<tr>
<td>CHEM 105</td>
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<td>NTRN 201</td>
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<td>PHED 101</td>
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<td>CHEM 113</td>
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<td>BIOL 214</td>
<td>Genes and Evolution 4</td>
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<td>PHED 102</td>
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#### Second Year

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<tr>
<td>NTRN 342</td>
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<tr>
<td>CHEM 223</td>
<td>Introductory Organic Chemistry I 3</td>
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### Bachelor of Science Menu Options

- **Microbiology**: BIOL 348, Human Anatomy and Physiology 4
- **Biochemistry**: BIOL 307, Biochemistry 4
- **Breadth Requirements**: NTRN 343, Dietary Patterns 3

### 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: NTRN 328, 342, 351, 363, 364, 388, 435, 437, 440, 452, 454, 455, 460.

### Bachelor of Arts in Nutrition

#### First Year

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<tr>
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<td>Introductory Organic Chemistry Lab *</td>
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<td>SAGES</td>
<td>University Seminar *Strongly recommended, but not required</td>
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<td>NTRN 343</td>
<td>Dietary Patterns 3</td>
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<td>CHEM 224</td>
<td>Introductory Organic Chemistry II *</td>
</tr>
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<td>CHEM 234</td>
<td>Introductory Organic Chemistry Lab *</td>
</tr>
<tr>
<td>SAGES</td>
<td>University Seminar 3</td>
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<tr>
<td>STAT 201</td>
<td>Statistics for Social &amp; Life Sciences *Strongly recommended, but not required</td>
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### Third Year

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<td>Laboratory for Microbiology*</td>
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<td>NTRN 398</td>
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### Bachelor of Arts in Nutritional Biochemistry and Metabolism

#### First Year

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**Note**: The above courses are subject to change, and students are advised to consult with their academic advisors for any updates or adjustments.
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<th>Fall</th>
<th>Breadth Requirement</th>
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<td>Mathematics I</td>
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| Third Year   |                    |   |
| Fall         |                    |   |
| BIOL 348     | Human Anatomy and Physiology | 4 |
| PHYS 115     | Introductory Physics I   | 4 |
| BIOC 307     | General Biochemistry    | 4 |
|              | Breadth Requirement     | 3 |
|              |                    |   |
| Spring       |                    |   |
| Phys 116     | Introductory Physics II | 4 |
| NTRN 397     | Capstone Proposal Seminar | 3 |

### DEPARTMENT OF PHILOSOPHY

203 Clark Hall  
Phone 216-368-2810; Fax 216-368-0814  
Colin McLarty, Chair

The Department of Philosophy offers an undergraduate major leading to the Bachelor of Arts degree. A student majoring in philosophy must satisfy the requirements of the Arts and Sciences General Education Requirements. It offers minor programs and sequences for the undergraduate along with graduate-level courses for candidates for the Master of Arts degree in other fields such as biomedical, ethics, history, English, math, and science. 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, and disciplines in 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 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. The department participates in an interdisciplinary major program in the history and philosophy of science and technology leading to the Bachelor of Arts degree in collaboration with the Department of History. The department also participates in, and contributes courses to, the interdisciplinary minor in artificial intelligence.

### FACULTY

**Colin McLarty, Ph.D.**  
(Case Western Reserve University)  
Associate Professor and Chair

Logic; philosophy of logic; philosophy of mathematics; philosophy of science; contemporary French philosophy  
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.  
(Harvard University)  
Professor  
History of philosophy (17th, 18th, and 19th-century philosophy); theory of knowledge, metaphysics; ethics; phenomenology  
Caroline A. Whitbeck, Ph.D.  
(Massachusetts Institute of Technology)  
The Elmer G. Beamer-Hubert H. Schneider Professor of Ethics

Ethics; practical ethics; professional ethics  
Sara Waller, Ph.D.  
(Loyola University Chicago)  
Professor  
Philosophy of Mind, Neurology and Language, Epistemology, 20th Century Analytic Philosophy  
Philosophy of Psychology, Philosophy of Science

**Associate Faculty**

Patricia Princehouse, Ph.D  
(Harvard University)  
Lecturer in History and Philosophy History and philosophy of science (19th and 20th centuries), biology, geology, race, gender and cultural history.

**Adjunct Faculty**
Joel Levin, Ph.D. (University of Oxford)
Adjunct Associate Professor of Philosophy
Adjunct Professor of Law

Stephen Post, Ph.D. (University of Chicago)
Associate Professor of Biomedical Ethics
Biomedical ethics; applied ethics

Rosalind Simson, Ph.D. (Yale)
Adjunct Associate Professor of Philosophy, Associate Professor of Law

UNDERGRADUATE (PHIL)

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 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”; science and “pseudo-science.” First half of a year-long sequence. Cross-listed as HSTY 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. Cross-listed as HSTY 207.

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)
(See RLGN 221.) Cross-listed as RLGN 221.

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. Cross-listed as ANTH 225, BIOL 225, GEOG 225, and HSTY 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 feminist theory. An interdisciplinary course, it covers approaches used in literary criticism, history, philosophy, political science, sociology, anthropology, psychology, film studies, cultural studies, and art history. It is the required introductory course for students taking the women’s studies major. Cross-listed as WMST 201.

PHIL 271. Bioethics: Dilemmas (3)
(See BETH 271.) Cross-listed as BETH 271.

PHIL 301. Ancient Philosophy (3)

PHIL 302. Modern Philosophy (3)
British empiricism: Bacon, Hobbles, Locke, Berkeley, and Hume. Continental rationalism: Descartes, Spinoza, and Liebniz. The critical philosophy of Kant. Prereq: PHIL 101 or consent of instructor.

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. Prerequisite: PHIL 201 or 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? Prerequisite: PHIL 101 or PHIL 102 or PHIL 205 or consent of department.

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. Prerequisites: PHIL 101, PHIL 102 or PHIL 205 or consent of department.

PHIL 306. Mathematical Logic and Model Theory (3)
Propositional calculus and quantification theory; consistency and completeness theorems; goedel incompleteness theorems and their philosophical significance; introduction to basic concepts of model theory; problems of formulation of arguments in philosophy and the sciences.

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. Prerequisites: PHIL 101 or PHIL 205 or PHIL 215 or PHIL 304.
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. Prereq: PHIL 101 or PHIL 201.

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. 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. Prereq: PHIL 101 or consent.

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. 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 to ethics to philosophy and another discipline. Prereq: PHIL 101, PHIL 102, or PHIL 205 or consent of department.

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. Prereq: PHIL 101. Cross-listed as RLGN 333.

PHIL 334. 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. Prereq: PHIL 101. Cross-listed as POSC 354.

PHIL 335. Philosophy of Law (3)
Nature of law and legal systems; bearing of moral justice on legal validity; nature and justification of criminal law and punishment; nature of legal rules and of obligations to law in legal systems; logic of legal reasoning; distinctions of concepts such as legal responsibility and causation. Reading from classical and contemporary sources. Prereq: PHIL 101. Cross-listed as LAWS 353.

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 priori, and the role of sense perception in knowledge. Metaphysical presuppositions and implications of epistemological views. Forms of realism and anti-realism. Prereq: PHIL 101.

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. Prereq: PHIL 101.

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 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 philosophical perspective. Prereq: PHIL 101 or COGS 201. Cross-listed as COGS 363.

PHIL 365. Philosophy of Mind (3)
Traditional problems such as the relation of mind and body, knowledge of other minds, free will and determinism, and nature of psychological explanation. Analysis of chief theories of mind. Analysis of mental concepts such as intention, action, decision, emotion, and will. Prereq: PHIL 101.

PHIL 367. Topics in Evolutionary Biology (3)
(See ANTH 367.) Cross-listed as ANTH 367.

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? Prereq: PHIL 101 or COGS 201. Cross-listed as COGS 373.

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 actually 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 systemic? The laboratory work begins with an understanding of different software for sound analysis with an emphasis on the bioacoustics 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. Prereq: PHIL 101 or COGS 201. Cross-listed as COGS 383L.

PHIL 390. Senior Research Seminars in History and Philosophy of Science (3)
(See HSTY 390.) Cross-listed as HSTY 390.

PHIL 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. Cross-listed as ANTH 394, BIOL 394, GEOL 394, and HSTY 394.

PHIL 396. Undergraduate Research in Evolutionary Biology (3)
(See ANTH 396.) Cross-listed as ANTH 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)**
(See PHIL 303.)

**PHIL 404. Science and Engineering Ethics (3)**
(See PHIL 304.)

**PHIL 405. Ethics (3)**
(See PHIL 305.)

**PHIL 406. Mathematical Logic and Model Theory (3)**

**PHIL 409. Philosophical Issues in Genetics (3)**
(See PHIL 309.)

**PHIL 411. Altruism in Bioethics (3)**
(See BETH 411.) Cross-listed as BETH 411.

**PHIL 413. Philosophy of Mathematics (3)**
(See BETH 411.) Cross-listed as BETH 411.

**PHIL 415. Selected Topics In Philosophy (3)**
(See PHIL 313.)

**PHIL 420. The Phenomenological Tradition (3)**
(See PHIL 320.) Prereq: Graduate standing or consent.

**PHIL 425. Philosophy of Feminism (3)**
(See PHIL 325.) Prereq: PHIL 101.

**PHIL 430. Topics in Ethics (3)**
(See PHIL 330.)

**PHIL 433. Philosophy of Religion (3)**
(See PHIL 333.) Prereq: PHIL 101. Cross-listed as RLGN 433.

**PHIL 434. Political and Social Philosophy (3)**
(See PHIL 334.) Cross-listed as POSC 454.

**PHIL 435. Philosophy of Law (3)**
(See PHIL 335.) Prereq: PHIL 101.

**PHIL 445. Epistemology and Metaphysics (3)**
(See PHIL 345.)

**PHIL 455. 19th and Early 20th Century Philosophy (3)**
(See PHIL 355.)

**PHIL 456. Comparative Philosophy (3)**
(See PHIL 356.) Prereq: PHIL 101.

**PHIL 465. Philosophy of Mind (3)**
(See PHIL 365.)

**PHIL 467. Topics in Evolutionary Biology (3)**
(See ANTH 467.) Cross-listed as ANTH 467.

**PHIL 470. Philosophy and Literature (3)**
(See PHIL 370.)

**PHIL 494. Seminar in Evolutionary Biology (3)**
(See PHIL 394.) Cross-listed as ANTH 494, BIOL 494, GEOL 494, and HSTY 494.

**PHIL 600. Tutorial (1-18)**
Prereq: Consent of instructor.

**PHIL 651. Thesis M.A. (1-6)**

**PHIL 700. Advanced Tutorial and Dissertation (1-18)**
For Ph.D. candidates in fields related to philosophy. Prereq: Consent of instructor.

**Major**

The major consists of 30 hours (ten, 3-credit courses) in philosophy, including PHIL 101, 201, 301, 302, and six other courses to be determined in consultation with the department's undergraduate advisor. However, a student may request of the advisor that up to 6 hours (two 3-credit courses) of the required 18 hours in six 3-credit philosophy electives be taken 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.

**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.

**SEQUESES FOR STUDENTS IN THE ENGINEERING CORE**

All sequences must include PHIL 101 and two other philosophy courses at the 200- or 300-levels (excluding PHIL 390 and 399) as approved by the undergraduate advisor. A typical sequence, for example, will consist of PHIL 101 and two courses from one of the following groups:

- Logic and Scientific Methodology PHIL 201, Introduction to Logic (3)
- PHIL 203, Natural Philosophy I (3)
- PHIL 204, Natural Philosophy II (3)
- PHIL 303, Evolution, Creation and Science (3)
- PHIL 309, Philosophical Issues in Genetics (3)
- Logic, Formal Systems, and Philosophy of Mathematics PHIL 201, Introduction to Logic (3)
- PHIL 306, Mathematical Logic (3)
- PHIL 313, Philosophy of Mathematics (3)
- Value Theory PHIL 102 Ethics- An Interdisciplinary Introduction
- PHIL 305, Ethics (3)
- PHIL 205, Contemporary Moral Problems (3)
- PHIL 304, Science and Engineering Ethics
- PHIL 325, Philosophy of Feminism (3)
- PHIL 334, Political and Social Philosophy (3)
- PHIL 335, Philosophy of Law (3)
- Language, Mind and Cognition PHIL 201, Introduction to Logic (3)
- PHIL 345, Epistemology and Metaphysics (3)
- PHIL 365, Philosophy of Mind (3)
- PHIL 385, Philosophy of Language (3)
- Philosophy and Culture PHIL 225, Evolution
- PHIL 301, Ancient Philosophy (3)
- PHIL 320, Phenomenology, Existentialism, and Hermeneutics (3)
- PHIL 333 Philosophy of Religion
- PHIL 345, Epistemology and Metaphysics (3)
- PHIL 355, Nineteenth and Twentieth-Century Philosophy (3)
- PHIL 356, Comparative Philosophy (3)
- PHIL 370, Philosophy and Literature (3)

There are other possible sequences.

- Philosophy Courses for the General Education Requirement: PHIL 201 may be used to satisfy the Mathematical Reasoning and Analysis requirement.
- PHIL 101, with any one of the following courses, 204, 205, 302, 305, 334, 345, and 370, may be used to satisfy the sequence requirement in History, Philosophy and Religion.
- PHIL 356, Comparative Philosophy may be used to satisfy the Global and Cultural Diversity requirement.

**DEPARTMENTAL HONORS**

The department offers an Honors Program for students enrolled in its major program, which
The Department of Physical Education offers the student a variety of opportunities from challenging academic classes to vigorous recreational activities.

FACULTY

Jennie Amodio, M.S.
(Cleveland State University)
Instructor

Freeman Blade, B.S.
(Eastern Montana State College)
Instructor

Assistant Women's Basketball Coach

Chris Conlon, M.A.
(Johns Hopkins University)
Instructor

Men and Women's Swim Coach

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

Head Football Coach

Robert Del Rosa, M.A.
(Western Reserve College)
Associate Professor

Assistant Director of Athletics

Wrestling Coach

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

Emily Donovan, M.B.A
(Case Western Reserve University)

Instructor

Assistant Athletics Director/SWA

Women's Soccer Coach

Matt Englander, B.A.
(The College of Wooster)
Instructor

Baseball Coach

Karen Farrell, M.S.
(University of Massachusetts at Amherst)
Instructor

Volleyball Coach

Carrie Fister, M.Ed. (University of Virginia)
Instructor

Assistant Athletic Trainer

Dennis Harris, B.S.
(The Ohio State University)
Instructor

Men's and Women's Track and Field Coach

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

Tom Kaufman, M.A. (Heidelberg College)
Instructor

Assistant Football Coach

Patrick Kennedy, M.S.
(University of Maryland)
Associate Professor

Associate Athletic Director

Director of Intramurals and Coordinator of Club Sports

Erin Lake, M.Ed. (Bowling Green)
Instructor

Assistant Athletic Trainer

Kathy Lanese, B.S. (Ohio University)
Instructor

Assistant Women's Track and Field Coach

Men's and Women's Cross Country Coach

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

Head Men's Basketball Coach

Todd McGuinness
Instructor

Assistant Men's Basketball Coach

Barb Moore, M.S. (West Virginia University)
Instructor

Head Athletic Trainer

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

Associate Director, Intramurals

Dan Palmer, M.A. (N.E. Illinois University)
Instructor

Men's Soccer Coach

Nancy Rahn, M.S. (West Chester University)
Instructor

Men's and Women's Tennis Coach

Coordinator of Physical Education

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

Assistant Football Coach

Jacki Windon, B.S. (Gannon University)
Instructor

Head Women's Basketball Coach

UNDERGRADUATE (PHED)

PHED 010A. 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.

PHED 010B. 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.

PHED 011A. 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.

PHED 011B. 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.

PHED 012A. 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.
PHED 012B. 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.

PHED 013A. Rock Wall Climbing (First Half) (0)
This course is designed to give students a comprehensive introduction to the skills, safety, terminology and equipment used in the sport of recreational rock climbing.

PHED 013B. Rock Wall Climbing (Second Half) (0)
This course is designed to give students a comprehensive introduction to the skills, safety, terminology and equipment used in the sport of recreational rock climbing.

PHED 016A. Cross Country Skiing (First Half) (0)

PHED 017A. Dance Aerobics (First Half) (0)

PHED 017B. Dance Aerobics (Second Half) (0)

PHED 019A. Golf (First Half) (0)

PHED 019B. Golf (Second Half) (0)

PHED 021A. 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.

PHED 021B. 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.

PHED 022A. 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.

PHED 022B. 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.

PHED 024A. Jogging (First Half) (0)

PHED 024B. Jogging (Second Half) (0)

PHED 025A. Power Volleyball (First Half) (0)
This class introduces volleyball skills, techniques, strategies, rules and scoring. This class is appropriate for most students.

PHED 025B. Power Volleyball (Second Half) (0)
This class introduces volleyball skills, techniques, strategies, rules and scoring. This class is appropriate for most students.

PHED 026A. 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.

PHED 026B. 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.

PHED 027A. 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.

PHED 027B. Indoor Group Cycling (Second 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.

PHED 028A. 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.

PHED 028B. 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.

PHED 029A. Swimming - Beginning and Intermediate (First Half) (0)
This class focuses on basic swimming skills and safety. This class is appropriate for non-swimmers to those students with mid-range swimming skills. Students with disabilities may be accommodated.

PHED 029B. Swimming - Beginning and Intermediate (Second Half) (0)
This class focuses on basic swimming skills and safety. This class is appropriate for non-swimmers to those students with mid-range swimming skills. Students with disabilities may be accommodated.

PHED 030A. 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.

PHED 030B. 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.

PHED 031A. 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.

PHED 031B. 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.

PHED 033A. 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.

PHED 033B. 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.

PHED 039A. Bowling (First Half) (0)

PHED 040A. Basketball (First Half) (0)
This class introduces basketball skills, techniques, rules and basic offense and defense. This class is appropriate for most students.

PHED 040B. Basketball (Second Half) (0)
This class introduces basketball skills, techniques, rules and basic offense and defense. This class is appropriate for most students.

PHED 041A. Softball (First Half) (0)

PHED 042B. 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.

PHED 050A. 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.

PHED 050B. Personal Safety Awareness (Sec-
PHED 055A. 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.

PHED 055B. 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.

PHED 070A. Varsity Baseball (First Half) (0)
PHED 079A. Varsity Golf (First Half) (0)
PHED 085A. Varsity Golf (First Half) (0)

PHED 102. Archery (0)

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 110. Hiking and Exploring (0)

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 114. Modern Dance (0)

PHED 119. Skin and Scuba Diving (0)
Prereq: Advanced swimming skills.

PHED 120. Skin and Scuba Diving - Advanced (0)
Prereq: Skin and Scuba Certification.

PHED 127. Water Safety Instructors (0)
Prereq: Emergency Water Safety or Lifeguarding Certificate.

PHED 129. Life Guarding (0)
Prereq: 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 176. Varsity Fencing (Men) (0)
PHED 177. Varsity Fencing (Women) (0)

PHED 178. Varsity Football (0)
PHED 179. Varsity Golf (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 210. Skin and Scuba Diving (1)
Prereq: Advanced swimming skills.

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

PHED 215. Water Safety Instructors (1)
Prereq: 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. Prereq: Advanced swimming skills.
The purpose of this course is to give the students an understanding of biomechanics. This course will help students better understand why specific mechanisms result in specific injuries. Topics include a functional standpoint, responds and adjusts to exercise. The study of exercise physiology is based on factual information derived primarily from experimental research. Laboratory work is an integral part of this course. Prereq: PHED 332 and PHED 340.

PHED 340. Human Anatomy (3)
The purpose of this course is to instruct the student in basic anatomy. Joint and muscle action as it relates to performance is covered.

PHED 341. Physiology of Exercise (3)
Exercise physiology is an aspect of sports medicine that involves the study of how the body, from a functional standpoint, responds and adjusts to exercise. The study of exercise physiology is based on factual information derived primarily from experimental research. Laboratory work is an integral part of this course. Prereq: PHED 340.

PHED 342. Biomechanics (3)
The purpose of this course is to give the students an understanding of biomechanics. This course will help students better understand why specific mechanisms result in specific injuries. Topics include strength vs. power, dynamics, closed kinetic chain, open kinetic chain, and biomechanical analysis of specific joints. Prereq: PHED 340.

PHED 357. Principles of Coaching (2)
Designed to provide methods and techniques for coaching sport. Topics include teaching skill, motivating participants, training, conditioning, practice organization, budget, equipment, and facility management, and psychological, sociological and philosophical implications.

Sports Medicine
The purpose of the sports medicine minor is to expose students to the theory and practical aspects of prevention, recognition, and treatment of athletic injuries.

• Required: PHED 332, 334, 339, 340, 341, 342

Lifetime Sports Program
The department has designed an instruction 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: residence hall, fraternity, women, coed, graduate, and open. Intercollegiate varsity athletic competition is available in ten sports for men and nine sports for women.
Kathleen Kash, Ph.D.
(Massachusetts Institute of Technology)
Professor (kckk43@case.edu)
Experimental condensed matter and mesoscopic physics, quantum semiconducting structures
Kenneth L. Kowalski, Ph.D.
(Brown University)
Professor (kklk3@case.edu)
Theoretical and experimental particle physics
Lawrence M. Krauss, Ph.D.
(Massachusetts Institute of Technology)
Ambrose Swasey Professor of Physics, Professor of Astronomy and Director Center for Education and Research in Cosmology and Astrophysics (lmk9@case.edu)
Theoretical physics, particle physics, astrophysics, cosmology.
Walter Lambrecht, Ph.D.
(University of Ghent)
Professor (wxi2@case.edu)
Theoretical condensed matter physics; electronic structure based physics of materials
Harsh Mathur, Ph.D. (Yale University)
Associate Professor, (hxm7@case.edu)
Condensed matter theory
Rolfe G. Petschek, Ph.D.
(Harvard University)
Professor (rgp@case.edu)
Theoretical condensed matter, optical materials
Charles Rosenblatt, Ph.D.
(Harvard University)
Director of Graduate Studies, Professor (cxr@case.edu)
Experimental condensed matter, liquid crystals and complex fluids
John Ruhl, Ph.D. (Princeton University)
Professor (ruhl@erebus.phys.cwru.edu)
Experimental Astrophysics and Cosmology
Jie Shan, Ph.D. (Columbia University)
Warren E. Rupp Assistant Professor (jsx209@case.edu)
Experimental condensed matter physics, ultrafast optics, terahertz spectroscopy
Thomas A. Shutt, Ph.D.
(University of California, Berkeley)
Agnar Pytte Associate Professor thomas.shutt@case.edu
Experimental Astrophysics
Kenneth D. Singer, Ph.D.
(University of Pennsylvania)
Associate Chair, Professor (kds4@case.edu)
Experimental condensed matter physics, non-linear optics
Glenn D. Starkman, Ph.D.
(Stanford University)
Armitage Professor (gd6@case.edu)
Theoretical cosmology, particle physics, astrophysics
Philip L. Taylor, Ph.D.
(University of Cambridge)
Perkins Professor of Physics (plt@case.edu)
Theory of solids, polymers and other materials
Tanmay Vachaspati, Ph.D. (Tufts University)
Professor (txv7@case.edu)
Theoretical astrophysics, cosmology, particle physics

Secondary Faculty
J. Iwan Alexander, Ph.D.
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Eckhard Jankowsky, Ph.D.
(Dresden Institute of Technology)
Assistant Professor of Biochemistry (eckhard.jankowsky@case.edu)
proteins and enzymes; structural biology; regulation of gene expression
R. Earle Luck, Ph.D.
(University of Texas at Austin)
Warner Professor of Astronomy (rel2@case.edu)
Stellar and galactic chemical evolution; stellar spectrophotometry
J. Christopher Mihos, Ph.D.
(University of Michigan)
Associate Professor of Astronomy (jcm9@case.edu)
Maureen W. McEnery, Ph.D.
(The Johns Hopkins University)
Assistant Professor, School of Medicine (mwm4@case.edu)
Molecular analysis of cellular processes; biophysical and biomedical imaging
Heather Morrison, Ph.D.
(Australian National University)
Associate Professor of Astronomy (hbm5@case.edu)
Galactic structure; stellar populations; dark matter
Masood Tabib-Azar, Ph.D.
(Rensselaer Polytechnic Institute)
Associate Professor of Electrical Engineering and Applied Physics (mx7@case.edu)
Semiconductor device physics
Idit Zehavi, Ph.D.
(Hebrew University of Jerusalem)
Assistant Professor of Astronomy (idit.zehavi@case.edu)
Astrophysics

Adjunct faculty
Krouki Fujita, Ph.D.
(Case Western Reserve University)
Senior Research and Development Scientist, USA Instruments, Inc., (Aurora, OH)
RF instrumentation in imaging
E. Mark Haacke, Ph.D.
(University of Toronto)
Professor, Wayne State University
Physics of imaging; experimental biophysics
Jingzhi Liu, Ph.D.
(Case Western Reserve University)
Senior Staff Scientist, Cleveland Clinic Foundation
Functional imaging and biophysics
Andrey Petukhov, Ph.D.
(St. Petersburg State Technical University)
Associate Professor of Physics, South Dakota School of Mines and Technology
Philip Phillips, Ph.D.
(University of Washington)
Associate Professor of Physics, University of Illinois, Urbana
Condensed Matter Theory
Shmaryu Shvartsman, Ph.D.
(Tomsk State University)
Senior Staff Scientist, Phillips Medical Systems (Cleveland, OH)
Magnetic field systems research and development
Michael Thompson, Ph.D.
(Case Western Reserve University)
Senior Staff Scientist, Phillips Medical Systems (Cleveland, OH)
Signal processing

Visiting faculty
Richard Schnee PhD (Princeton)
Visiting Assistant Professor of Physics (pxg26@case.edu)
Experimental Particle astrophysics

UNDERGRADUATE (PHYS)
PHYS 100. Space, Time, and Motion (3)
An introductory course in physics for students of the liberal arts. Discussion of how physics is performed, what important discoveries about natural phenomena have been made by physicists, and what are the most exciting questions being tackled by physicists today. Connections to current work appearing in various popular media will be made. In particular, emphasis is made on the connections between the fundamental discoveries that led to our understanding of motion and the light, and much of the ongoing research at the forefront of modern physics.

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. Prereq: PHYS 100, PHYS 115, PHYS 121, or PHYS 123.

PHYS 113A. Principles of Physics Laboratory - Mechanics (1)
The laboratory portion of first semester introductory physics. Prereq: Departmental permission.

PHYS 113B. Principles of Physics Laboratory - Electricity and Magnetism (1)
The laboratory portion of the second semester of physics. Prereq: Departmental permission.

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. Prereq: PHYS 115.

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. Prereq: 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. Prereq: PHYS 121 or PHYS 123. Coreq: MATH 122, 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 consent of department. Coreq: MATH 122 or MATH 124.

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 188. On Being a Scientist (1)
(See ASTR 188.) Cross-listed as ASTR 188.

PHYS 196. Energy and Society (3)
Global and national perspectives on the problems of energy supply and demand, global warming, oil cartels, solar, nuclear and wind energy, energy history, politics and economics of fossil fuels, and alternative energy sources. Cross-listed as GEOL 196, HSTY 196, and POSC 196.

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. Prereq: 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 basically 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 analysis, technical writing and oral presentations. Prereq: PHYS 116, PHYS 122, or PHYS 124.

PHYS 204. Advanced Instrumentation Laboratory (4)
Principles of experimental design; limits of resolution via bandwidth, 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. Prereq: PHYS 203 and PHYS 221.

PHYS 208. Instrumentation and Signal Analysis Laboratory (4)
AC circuit theory, Fourier series, discrete Fourier series. Fourier integral, discrete Fourier integral; 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. Prereq: PHYS 221 and ENGR 210.

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 (4)
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. Prereq: PHYS 204.

PHYS 301B. Advanced Laboratory Physics for B.A. (2)
This course is the second half of the laboratory requirement for the B.A. degree in Physics and is basically the second half of PHYS 301. Problem solving approach with a range of available experiments in classical and modern physics. Emphasis on experimental technique and data and error analysis, and the formal presentation of the work performed. Prereq: PHYS 203 or PHYS 203A.

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. Prereq: PHYS 301.

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. Prereq: 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. Prereq: PHYS 331.

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. Prereq: PHYS 331.

PHYS 317. Engineering Physics Laboratory I (4)
Laboratory course for engineering physics majors. Emphasis 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.

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. Prereq: PHYS 122 or PHYS 124 or consent of department.

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; 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. Prereq: PHYS 331 or PHYS 481.

PHYS 328. Cosmology and the Structure of the Universe (3)
(See ASTR 328.) Cross-listed as ASTR 328.

PHYS 329. Independent Study (1–4)
An individual reading course in any topic of mutual interest to the student and the faculty supervisor. Prereq: PHYS 349 or consent of instructor.
PHYS 351. Senior Physics Project (3)
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 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 public symposium. Approved SAGES capstone. Prereq: PHYS 301B, PHYS 302 or PHYS 472.

PHYS 353. Senior Engineering Physics Project (3)
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. Approved SAGES capstone. Prereq: PHYS 318.

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. Prerequisite may be waived with consent of department. Consent of department.

PHYS 367. Modern Physics for Innovation I (3)
The first half of a two-semester sequence providing an understanding of physics as a basis for success- fully launching new high-tech ventures. The course will examine physical limitations to present tech- nologies, and Einstein's theory. Consequences of the theory as well as its experimental tests will be discussed. An introduction to cosmology will be given. Prerequisite may be waived with consent of department.

PHYS 368. Modern Physics for Innovation II (3)
The second half of a two-semester sequence providing an understanding of physics as a basis for success- fully launching new high-tech ventures. The course will examine physical limitations to present tech- nologies, and Einstein's theory. Consequences of the theory as well as its experimental tests will be discussed. An introduction to cosmology will be given. Prerequisite may be waived with consent of department.

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. Prereq: PHYS 414. Classical and Statistical Mechanics II (3)

PHYS 415. Introduction to Solid State Physics (3)
(See PHYS 315.) For graduate students in engineer- ing and science. (May not be taken for credit by graduate students in the Department of Physics.) Prerequisite may be waived with consent of depart- ment. Prereq: PHYS 331.

PHYS 423. Classical Electromagnetism (3)
(See PHYS 326.)

PHYS 427. Quantum Electronics (3)
(See PHYS 327.) Prereq: PHYS 331 or PHYS 481.

PHYS 428. Cosmology and the Structure of the Universe (3)
(See ASTR 428.) Cross-listed as ASTR 428.

PHYS 431. Physics of Imaging (3)
Description of physical principles underlying the spin behavior in MR and Fourier imaging in multi- dimensions. 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. Prereq: PHYS 122 or PHYS 124 or EBME 410. Cross-listed as EBME 431.

PHYS 436. Modern Cosmology (3)
(See PHYS 336.)

PHYS 439. Special Topics Seminar (1-3)
Intermediate level seminar for advanced undergrad- uate and beginning graduate students.

PHYS 441. Physics of Condensed Matter I (3)

PHYS 442. Physics of Condensed Matter II (3)
Continuation of PHYS 441. Lattice vibrations, thermal properties of solids, semiconductors, mag- netic properties of solids, and superconductivity. Prerequisite may be waived with consent of depart- ment. Prereq: 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 proper- ties; biaxiality; isotropic phases; the role of chirality; defects in liquid crystals; interactions at interfaces; smectic order and smectic polymorphism; ferro- electricity, antiferroelectricity, and ferrielectricity; phases associated with complex molecular architec-
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. Prereq: PHYS 491.

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. Prereq: Permission of department.

PHYS 541. Quantum Theory of Solids I (3)

PHYS 544. Advanced Theory of Materials (3)

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. Prereq: Consent of the department.

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 and consent of department.

PHYS 592. Gauge Field Theory II (3)
(See PHYS 591.) Prereq: PHYS 591.

PHYS 601. Research in Physics (1-9)

PHYS 651. Thesis M.S. (1-9)

PHYS 701. Dissertation Ph.D. (1-9)

PHYS 703. Dissertation Fellowship (1-8)

PHYS 820. Teaching Physics: Hands-On and Inquiry-Based (2)
This lab-based course is directed at in-service teachers of science in the middle and high schools. The course content will cover the basics of electricity (current, voltage, power, energy, Kirchhoff’s laws and their relation to the laws of conservation of charge and energy, Ohm’s law). Some elements of magnetism will also be introduced, time-permitting. The sessions will be hands-on and activity-based. The sessions will also model and discuss teaching pedagogy such as cooperative learning, interactive lectures, learning styles, constructivism and inquiry-learning. The technology used will involve simple and cheap equipment that can be easily replicated in classrooms. Evaluation will be based on attendance, participation, pre- and post-tests, and journals.

The Department of Physics offers Bachelor of Arts and Bachelor of Science degrees in Physics, as well as a Bachelor of Science in Mathematics and Physics. It also offers a Bachelor of Science in Engineering (B.S.E.) with a major in Engineering Physics. The B.A. and B.S. programs are traditional degrees offered by the College of Arts and Sciences. These liberal arts degrees carry the General Education Requirements of the College of Arts and Sciences. A variety of electives within and outside of the department are available in these programs to provide the breadth and flexibility that will considerably enhance the student’s opportunities at the best graduate schools and in industrial and government organizations.

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. The B.S. degree has two alternatives to the standard program: a Mathematical Physics Concentration and a Biophysics Concentration. 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 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.

The B.S. in Mathematics and Physics degree is a single degree for students interested in both advanced mathematics and theoretical physics and their relationships. This degree is distinct from the Mathematical Physics Concentration in the B.S. in Physics degree. Students may be advised by either physics or mathematics faculty members. The student will complete a significant number of advanced mathematics
courses and somewhat fewer laboratory courses than in the B.S. in Physics program. All B.S., B.A. and B.S.E. candidates complete a year-long senior project in which the student works one-on-one with a faculty researcher, writes a senior thesis and presents the work in a public seminar.

Employment opportunities at the bachelor's level include research, development and technical assistance (engineering, computer programming and management) in industrial, government and university settings. A program in teacher certification (grades 7 through 12), based on the BA degree, is available for students interested in a career in teaching physics at the secondary level.

**Teacher Licensure**

Two options are available within the B.A. physics major for students to become eligible for licensure as teachers in secondary schools (Adolescents to Young Adults) qualified to teach physics or to teach physical sciences (both physics and chemistry). Students interested in either option should contact Professor Gary Chottiner. In addition to content (subject area) requirements, a 35 semester hour sequence in professional education is required comprising courses taken at Case Western Reserve University and at John Carroll University, culminating in student teaching. (See Teacher Licensure -- [EDUC and EDJC].)

**Subject Area Requirements (Physics Licensure):**

- ASTR 201 or BIOL 114 or GEOL 101; PHYS 115 or 121; PHYS 116 or 122; PHYS 196, 221, 250, 309, 313, 331, 351; CHEM 105, 106, 113; ENGR 131; MATH 121 or 125; MATH 122 or 126; MATH 223, 224; three of PHYS 310, 315, 316, 324, 325, 326, 328, 332.

**Subject Area Requirements (Dual Field Physical Science Licensure):**

- ASTR 201 or BIOL 101 or GEOL 110; PHYS 121, 122, 196, 221; CHEM 105, 106, 113, 223, 224, 323, 324, 331; ENGR 131; MATH 121, 122, 223; PHYS 250, 309; CHEM 301 or 335; PHYS 313, 351; two of PHYS 310, 315, 316, 324.

* Course requirements for students majoring in chemistry and seeking physical science teacher licensure are listed for the Department of Chemistry.

**Physics Minor Program**

- PHYS 121 (or 115 or 123) and PHYS 122 (or 116 or 124) and PHYS 221 plus two or three of the following courses:
  - PHYS 196, PHYS 204 or 208, PHYS 309, PHYS 310, PHYS 313, PHYS 315, PHYS 316, PHYS 326, PHYS 331, PHYS 332, PHYS 324, PHYS 328

*As stated in the Handbook for Undergraduate Students, the Case School of Engineering requires "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." So CSE students may have to choose between using physics courses as technical electives or counting them as part of a minor in physics.

**GRADUATE PROGRAMS AND RESEARCH**

The physics department offers programs of study and research leading to both the Master of Science and 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.

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:

- Condensed-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 in a microgravity environment; and the physics of surfaces and interfaces; electronic structure of materials and their defects, vibrational properties of solids (phonons), magnetism and magnetic materials.
- 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.
- 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, ultrafast optics, and the optical properties of fluids, liquid crystals, polymers, and crystals, including semiconductors and semiconductor mesoscopic 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.

In addition to a traditional physics program, the Department has created a Physics Entrepreneurship Master's degree program. This unique 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 start-up and growing ventures.

**Center for Education and Research in Cosmology and Astrophysics**

The recently formed Center for Education and Research in Cosmology and Astrophysics (CERCA) comprises groups from the Physics Department, Astronomy Department, and the Cleveland Museum of Natural History. This 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.

**REQUIREMENTS TABLES FOR PHYSICS PROGRAMS**

**The Bachelor of Science in Physics**

The Bachelor of Science in Physics requires completion of the Arts and Sciences General Education Requirements (GER), the courses listed in the following table, and 127 total credits. 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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Year</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 122 or 124. Physics II, Electric. &amp; Magnetism</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 221. Introduction to Modern Physics</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 203. Analog and Digital Electronics</td>
<td>2F</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 204. Advanced Instrumentation Laboratory</td>
<td>2S</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 250. Mathematics, Physics, and Computing</td>
<td>2S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 310. Classical Mechanics</td>
<td>2S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 301. Advanced Laboratory Physics I</td>
<td>3F</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 331. Introduction to Quantum Mechanics I</td>
<td>3F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 302. Advanced Laboratory Physics II</td>
<td>3S</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 324. Electricity and Magnetism I</td>
<td>3S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 332. Introduction to Quantum Mechanics II</td>
<td>3S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 325. Electricity and Magnetism II</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 351. Physics Senior Project</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

(1) of the following:

| PHYS 315. Introduction to Solid State Physics | 4F   | 3      |

Subtotal: 60

<table>
<thead>
<tr>
<th>Course</th>
<th>Year</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 105 or 111. Principles of Chemistry I</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 106 or ENGR 145, Principles of Chem. II 1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 113. Principles of Chemistry Laboratory</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>ENGR 131. Elementary Computer Programming**</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>MATH 121 or 123. Calculus 1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 122 or 124. Calculus 2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>MATH 223 or 227. Calculus 3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>MATH 224. Elementary Differential Equations</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>PHED two semesters</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Subtotal: 25 (27)

<table>
<thead>
<tr>
<th>Course</th>
<th>Year</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Electives</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>SAGES 1st &amp; University Seminars</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>A&amp;S SAGES breadth requirements</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

Total: 127

- course usually taken in this year, offered only in F = fall, S = spring or other approved computational course
- The number of open electives may vary as determined by the degree requirement that the total number of credits add to 127 or more.

**The Mathematical Physics Concentration in the Bachelor of Science in Physics Degree Program**

Students who are interested in theoretical physics and who have a strong background in mathematics may consider applying for admission to this variation on the B.S. in Physics. This 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.

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 to be replaced are shown in brackets and are followed by their replacements.

<table>
<thead>
<tr>
<th>Course</th>
<th>Year</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 121 or 123. Physics I, Mechanics</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 122 or 124. Physics II, Electricity &amp; Magnetism</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 221. Introduction to Modern Physics</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 203. Analog and Digital Electronics</td>
<td></td>
<td>2F</td>
</tr>
<tr>
<td>M-group 1** Adv. Math</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 204. A dvanced Instrumentation Laboratory</td>
<td>2S</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 250. Mathematics, Physics, and Computing</td>
<td>2S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 310. Classical Mechanics</td>
<td>2S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 301. Advanced Laboratory Physics I</td>
<td>3F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 349. Methods of Mathematical Physics I</td>
<td>3F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 331. Thermodynamics &amp; Statistical Mechanics</td>
<td>3F</td>
<td>3</td>
</tr>
</tbody>
</table>
The Biophysics Concentration in the Bachelor of Science in Physics Degree Program

This concentration is directed towards students interested in a combined study in biology and physics. The degree is a track within the standard B.S. in Physics. Four physics courses and certain open-elective credits are replaced by a “biogroup” of five courses, and a technical elective described below. 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 to be replaced are shown in brackets; their replacements are either found in the same entry or in the biogroup category.

<table>
<thead>
<tr>
<th>Course</th>
<th>Year</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 105 or 111. Principles of Chemistry I</td>
<td>4</td>
<td>3(4)</td>
</tr>
<tr>
<td>CHEM 106 or ENGR 145. Principles of Chemistry II</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 113. Principles of Chemistry Laboratory</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>ENGR 131. Elementary Computer Programming</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>MATH 121 or 123. Calculus 1</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>MATH 122 or 124. Calculus 2</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>MATH 223 or 227. Calculus 3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>MATH 224. Elementary Differential Equations</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PHED two semesters</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
<td>25</td>
<td>(27)</td>
</tr>
<tr>
<td>Open Electives</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>SAGES 1st &amp; University Seminars</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>A&amp;S SAGES breadth requirements</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>127</td>
<td></td>
</tr>
</tbody>
</table>

The Bachelor of Arts Degree with Physics Major

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 56 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.
**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 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 in the concentration discipline is required. The project includes a written report and participation in the senior 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 development of technology. This education at the intersection of engineering and physics will enable students to seek employment in engineering upon graduation while, at the same time, provide a firm foundation for the pursuit of graduate studies in either 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. 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:

Graduates of the Engineering Physics program will have a deep knowledge of physics, equal to that of students in the B.S. Physics program. This will provide students with the tools to address new engineering problems and contribute to emerging technology.

Graduates of the Engineering Physics program will have a strong grounding in engineering design, science, practice and the application of physics to engineering.

Graduates of the Engineering Physics program will have extensive experience with laboratory methods, instrumentation, materials, and data analysis.

Graduates of the Engineering Physics program will have developed strong communication skills, work well in teams, and be knowledgeable in ethical and societal issues important for practicing engineers and scientists.

**THE BACHELOR OF SCIENCE IN ENGINEERING DEGREE WITH ENGINEERING PHYSICS MAJOR**

![Course Table](https://example.com/couresetable.png)

<table>
<thead>
<tr>
<th>Course</th>
<th>Year</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 115,121 or 123. Intro. Mechanics</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 116, 122 or 124. Intro Electricity &amp; Magnetism</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 221. Introduction to Modern Physics</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 250. Mathematics, Physics, and Computing</td>
<td>2S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 309. Selected Physics Experiments</td>
<td>2F</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 313. Thermodynamics &amp; Statistical Mechanics</td>
<td>3F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 331. Introduction to Quantum Mechanics I</td>
<td>3F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 351. Physics Senior Project</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>(2) of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHYS 310. Classical Mechanics</td>
<td>2S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 324. Electricity and Magnetism I</td>
<td>3S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 315. Introduction to Solid State Physics</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 316. Intro. to Nuclear &amp; Particle Physics</td>
<td>4S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 326. P physical Optics</td>
<td>S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 327. Quantum Electronics</td>
<td>4F</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 328 or PHYS 336. CosmologyS</td>
<td>S</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 365. General Relativity</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Subtotal</td>
<td>36</td>
<td></td>
</tr>
</tbody>
</table>

- Course usually taken in this year, offered only in F = fall, S = spring
- A two course science sequence chosen from: CHEM 105 and 106; CHEM 111 and ENGR 145; BIOI 110 and either BIOI 210 or BIOI 220; or another two course sequence totaling 6 or more credits in a quantitative science (other than physics), with written approval of the Physics Undergraduate Curriculum Committee or other approved computational course
- The BA degree requires a minimum of 30 semester hours at the 300-400 level, of which only 22 are specified as PHYS courses.

**PHED 2 semesters** 0

| Subtotal                          | 20 |
| Open electives****                | 42 |
| SAGES 1st & University Seminars   | 10 |
| A&S SAGES breadth requirements    | 12 |
| Total                             | 120 |

**First Year Class-Lab-Credit Hours**

<table>
<thead>
<tr>
<th>Course</th>
<th>Year</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro. Science 1**</td>
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<td>Intro. Science 2**</td>
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<td>ENGR 131. Elementary Computer Programming***</td>
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<tr>
<td>MATH 121, 123 or 125. Calculus 1</td>
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<td>MATH 122, 124 or 126. Calculus 2</td>
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<td>MATH 223 or 227. Calculus 3</td>
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<td>3</td>
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**Fall**

CHEM 111 Principles of Chemistry for Engineers (4-0-4)
CHEM 113 Principles of Chemistry Laboratory (1-3-2)
MATH 121 Calculus for Science and Engineering I (4-0-4)
PHYS 121 General Physics I. Mechanics (4-3-4)
ENGL 150 Expository Writing (3-0-3)
PHED 101 Physical Education Activities (0-3-0)
Total (16-9-17)

**Spring**

MATH 122 Calculus for Science and Engineering II (4-0-4)
PHYS 122 General Physics II. Electricity & Magnetism (4-3-4)
ENGR 131 Elementary Computer Programming (2-2-3)
ENGR 145 Chemistry of Materials (4-0-4)
### Third Year Class-Lab-Credit Hours

**Fall**
- PHYS 313 Thermodynamics and Statistical Mechanics (3-0-3)
- PHYS 317 Engineering Physics Lab I (2-4-4)
- PHYS 331 Introduction to Quantum Mechanics I (3-0-3)
- Engineering Concentration (3-0-3)
- Humanities/Social Science Sequence I (3-0-3)
- Engineering Concentration (3-0-3)
- Total (14-4-16)

**Spring**
- PHYS 318 Engineering Physics Lab II (2-4-4)
- PHYS 324 Electricity and Magnetism I (3-0-3)
- ENGL 398N Professional Communications (3-0-3)
- Humanities/Social Science Sequence I (3-0-3)
- Engineering Concentration (3-0-3)
- Total (14-4-16)

### Fourth Year

**Fall**
- PHYS 315 Introduction to Solid State Physics (3-0-3)
- PHYS 325 Electricity and Magnetism II (3-0-3)
- PHYS 353 Senior Engineering Physics Project (0-6-3)
- Engineering Concentration (3-0-3)
- Humanities/Social Science Sequence II (3-0-3)
- Total (12-6-15)

**Spring**
- PHYS 353 Senior Engineering Physics Project (0-6-3)
- Applied Quantum Mechanics (3-0-3)
- Engineering Concentration (3-0-3)
- Humanities/Social Science Elective (3-0-3)
- Humanities/Social Science Sequence III (3-0-3)
- Total (12-6-15)

**Hours required for graduation 127**

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### DEPARTMENT OF POLITICAL SCIENCE

Department of Political Science  
111 Mather House  
Phone 216-368-2424; Fax 216-368-4681  
Joseph White, Ph.D. Chair  
(joseph.white@case.edu)

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 tries 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 or teaching, in public administration, or jobs in private industry and business. Both the public and private sectors hold career possibilities for the political science major.

### FACULTY

**Joseph White, Ph.D.**  
(University of California, Berkeley)  
Luxenberg Family Professor of Public Policy and Chair; Director, Center for Policy Studies

American government; Congress; public policy; health and welfare policy

Karen Beckwith, Ph.D. (Syracuse University)  
Flora Stone Mather Professor of Political Science  
Politics of Gender; American Government; Western Europe; Research Methods; Social Movements

Justin Buchler Ph.D.  
(University of California, Berkeley)  
Assistant Professor of Political Science  
Congress; Redistricting; Political Strategy; Parties and Elections

Alexander P. Lamis, Ph.D. (Vanderbilt University), J.D. (University of Maryland)  
Associate Professor  
American government; electoral politics; constitutional law

Kathryn C. Lavelle, Ph.D.  
(Northwestern University)  
Associate Professor  
International relations; Africa; political economy; U.S. foreign policy; international organizations

Vincent E. McHale, Ph.D.  
(Pennsylvania State University)  
Marcus A. Hanna Professor of Political Science and Director, International Studies Program  
Comparative politics; Europe; political sociology; methodology

Kelly M. McMann, Ph.D.  
(University of Michigan)  
Assistant Professor  
Comparative politics; Central Asia; Russia and former East Bloc; democratization

Peter W. Moore Ph.D. (McGill University)  
Assistant Professor  
Economic development and state-society relations, especially in Middle East; regional security; sub-state conflicts

Associate Faculty  
Robert H. Binstock, Ph.D.  
(Harvard University)
POSC 272. Introduction to International Politics (3)
American government; public policy; health care and aging
Jonathan L. Entin, J.D.
(Northwestern University)
Professor of Law, School of Law; and Professor of Political Science

American constitutional law; social science and the law
Andrew M. Lucker, Ph.D.
(Case Western Reserve University)
Adjunct Assistant Professor of Political Science

Comparative politics is the study of processes and institutions within countries. Prompted by real-world puzzles, comparativists investigate broad, theoretical questions: What constitutes a revolution, and why do revolutions occur? How does one country become more democratic than another? Why do relations between some ethnic groups turn violent? This course introduces students to some of the central puzzles and theories of comparative politics in order to help them better understand world events.

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?

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. Examines 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 196. Energy and Society (3)
Global and national perspectives on the problems of energy supply and demand, global warming, oil cartels, solar, nuclear and wind energy, energy history, politics and economics of fossil fuels, and alternative energy sources. Cross-listed as PHYS 196.

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, theoretical questions: What constitutes a revolution, and why do revolutions occur? How does one country become more democratic than another? Why do relations between some ethnic groups turn violent? This course introduces students to some of the central puzzles and theories of comparative politics in order to help them better understand world events.

POSC 273. 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.

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.

POSC 326. Comparative Constitutions (3)
Overview of ancient Greek and Roman constitution-making, 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.

POSC 327. Civil Liberties in America I (3)
Supreme Court’s interpretation of the First Amendment: liberty of religion through the establishment and free exercise clauses, freedoms of speech 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 (census speech codes and the feminist anti-pornography movement).

POSC 328. Topics in Civil Liberties (3)
Rights of the accused as outlined in the Fourth, Fifth, Sixth, and Eighth Amendments. Topics covered are (1) searches, seizures, and arrests, (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.

POSC 334. 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.

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.

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.

POSC 346. Women and Politics (3) Examination of the role of women in politics. Topics include: political socialization; sources and implications of gender difference in political participation (voting, candidacy, leadership); and the politics of "women's issues."

POSC 348. Political and Social Thought in the Machine Age (3) Explores the responses of economist writers, philosophers, cultural critics, and public policy makers to changes in Western society wrought by industrialization, by focusing on their concerns with technological change. Cross-listed as HSTY 348.

POSC 349. Political Science Research Methods (3) Research methods in political science and other social sciences. Research design, including development of hypotheses and operational measures, and evaluation of quantitative and qualitative methodologies. Useful for students going into graduate school, policy analysis, or consulting.

POSC 351. Modern Political Thought (3) Examination of a limited topic in the study of modern political thought. Topics vary.

POSC 352. American Political Thought (3) Examination of the unique contribution to the science of government made by American political thinkers.

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. Pre-req: PHIL 101. Cross-listed as PHIL 334.

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.

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.

POSC 358. Political Strategy (3) The objective of this course is to provide a general overview of strategic behavior in politics. In one sense, this is a "how-to" course that covers a broad range of political activities, but the primary objective is to link practical issues with theories of politics in order to help you understand why events happen the way they do. The focus of the course will be on strategy in American politics, but the general concepts and methods will be applicable to a wide range of situations. Also note that the approach of this course is completely divorced from all normative concerns; for the purposes of this course, "good" and "evil" do not exist—only success or failure. Readings will range from classics like Machiavelli’s The Prince to modern studies of Congress, the Presidency and interest groups.

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.

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 Kazakhstan. We will review the nationalism, foreign relations, religion, ethnicity, and economics of the region. Cross-listed as ETHS 362.

POSC 363. 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.

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. Cross-listed as ETHS 364.

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. Cross-listed as HSTY 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. Cross-listed as HSTY 366.

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.

POSC 368. The People’s Republic of China (3) (See HSTY 383.) Cross-listed as HSTY 383.

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.

POSC 370C. The United States and Asia (3) Survey and analysis of U.S.-Asia relations in the post-World War II period. Focus specifically 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."

GENERAL BULLETIN 2007-2008
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.

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, with primary focus on the evolving role of law in dealing with global problems, e.g., war, the environment, economic cooperation, and human rights.

POSC 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. Cross-listed as ETHS 370K.

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.

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.

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 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.

POSC 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. Cross-listed as ETHS 374.

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. Cross-listed as HSTY 377.

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.

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.

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.

POSC 381. City as Classroom (3)
(See HSTY 381.) Cross-listed as HSTY 381.

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.

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 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 policy, followed by an application of these differing perspectives to selected policy areas such as welfare, euthanasia, school choice, drug laws, censorship, or others.

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 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.

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 subgovernments to issue networks and advocacy coalitions.

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.
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.

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. Prereq: 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. Approved SAGES capstone. Prereq: Junior or Senior political science major or senior political science minor and departmental prospectus form.

POSC 401. Decision-Making in American Cities (3)
(See POSC 301.)

POSC 406. Interest Groups in the Policy Process (3)
(See POSC 306.)

POSC 408. The American Presidency (3)
(See POSC 308.)

POSC 410. The Legislative Process (3)
(See POSC 310.)

POSC 420B. The U.S. Midterm Elections (3)
(See POSC 320B.)

POSC 420C. The Presidential Election (3)
(See POSC 320C.)

POSC 420D. Politics of the American South (3)
(See POSC 320D.)

POSC 423. Judicial Politics (3)
(See POSC 323.)

POSC 425. American Constitutional Law (3)
(See POSC 325.)

POSC 703. Dissertation Fellowship (1-8)

Major
The major in political science leads to the Bachelor of Arts degree. While the specific courses to be taken are determined by the student’s interest, with approval of a faculty advisor, those majoring in political science must complete 30 hours of course work in the department, distributed as follows:
- Three hours of POSC 109
- Six hours of POSC courses at the 200 level
- Eighteen hours of POSC courses at the 300 level
- Three hours of a senior project, POSC 396
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.

Minor
A minor in political science consists of 15 hours (5 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 economics and management programs in the Weatherhead School of Management. The public policy minor consists of 15 credit hours, ordinarily including:
- ECON 205 or ECON 102
- POSC 386, POSC 383, or POSC 306
- One course from the following list of approved courses: HSTY 256, HSTY 358, POSC 308, POSC 310, POSC 323, POSC 385
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.

Sequences
(Engineering Core Curriculum)
All sequences must include POSC 109 (3 hours), POSC 272 (3 hours), and one additional course (3 hours) selected in consultation with the department’s sequence advisor. Contact the department chair, for advice about all Case sequences.

Departmental Honors
Majors who maintain a grade point average of at least 3.3 overall and 3.8 in political science courses, and a grade of A in POSC 396, “Senior Project SAGES Capstone,” will receive their degrees “with Honors in Political Science.”

Integrated Graduate Studies
Application to the Integrated Graduate Studies program in political science must occur no later than the beginning of the second semester of the junior year, but preferably earlier. Upon completion of 90 undergraduate hours, the student must have satisfied all general requirements for the B.A., including at least 21 hours in the political science major, the General Education Requirements, and one minor program; and must have a 3.5 grade point average in political science courses and 3.3 overall. If admitted to the IGS program, the student will take 30 hours of graduate-level 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.

GRADUATE PROGRAMS
Master of Arts
Requirements for admission to the Master of Arts program in political science are three letters of recommendation from former instructors; a minimum score of 500 on the verbal and quantitative segments of the Graduate Record Examination (GRE) and 4.5 on the analytical section. For students from other countries, 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, in addition to 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 department strongly prefers that applicants have a minimum GPA of 3.2 overall and a minimum GPA of 3.4 on political science
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 applicants without an M.A. in Political Science to 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 these 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 must be distributed as follows:

- 12 hours in primary subfield (American, comparative, or international relations)
- 9 hours in secondary subfield (one of the remaining two fields)
- 6 hours in the remaining subfield
- 6 hours in Research Methods (including POSC 449 Research Methods)
- 12 hours of electives

A maximum of 9 hours of independent study (POSC 449) may count toward the degree. A minimum grade point average of 3.0 must be maintained throughout the Master of Arts program. Failure to maintain a GPA of 3.0 in the M.A. program will result in the student being 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 less than 30 hours and no more than 42 hours of Master of Arts 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. Complete information on the Master of Arts program in political science is available from the department office and the departmental website.

**Doctor of Philosophy**

**DEPARTMENT OF PSYCHOLOGY**

103 Mather Memorial Building
Phone 216-368-2686; Fax 216-368-4891
Robert L. Greene, Chair

The Department of Psychology offers programs leading both to undergraduate (Bachelor 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, or 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 careers.

**FACULTY**

Robert L. Greene, Ph.D. (Yale University)  
Professor and Chair  
Human memory and cognition  
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 neu-
roimaging
Julie J. Exline, 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
Grover C. Gilmore, Ph.D.
(Johns Hopkins University)
Professor and Dean, Mandel School of Applied Social Sciences
Perceptual development and aging; visual information processing; memory; psychophysics
Bonnie M. Lawrence, Ph.D.
Visiting Assistant Professor
Sensorimotor transformations; response selection; working memory; MRI research
T. J. McCallum, Ph.D.
(University of Southern California)
Assistant Professor
Older adults; caregiving; ethnicity; stress and coping
James C. Overholser, Ph.D.
(Ohio State University)
Professor
Adult psychopathology; depression; suicide; personality disorders
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)
Associate Professor
Human behavior genetics; child development
Social psychology; personality theory; health psychology

Associate Faculty
Richard E. Boyatzis, Ph.D.
Professor
Weatherhead School of Management/Department of Organizational Behavior
Jane R. Buder-Shapiro, Ph.D.
Adjunct Assistant Professor
Private Practice
Jennifer L. Butler, Ph.D.
Adjunct Assistant Professor
Wittenberg University
Carin L. Cunningham, Ph.D.
Assistant Professor
School of Medicine/Pediatrics
Dennis Drotar, Ph.D.
Professor
School of Medicine/Department of Psychiatry
Norah Feeny
Assistant Professor
School of Medicine/Department of Psychiatry
Howard Hall, Psy.D., Ph.D.
Assistant Professor
School of Medicine/Pediatrics
Ethan D. Schafer, Ph.D.
Adjunct Assistant Professor
Spectrum Psychological Associates
Lynn Singer, Ph.D.
Professor
School of Medicine/University Hospitals
Terry Stancin, Ph.D.
Associate Professor
School of Medicine/MetroHealth Medical Center
Mariani Suarez, Ph.D.
Assistant Professor
School of Medicine/Pediatrics
Thomas P. Swales, Ph.D.
Assistant Professor
School of Medicine/MetroHealth Medical Center
Gerry Taylor, Ph.D.
Professor
School of Medicine/Department of Pediatrics
Kathleen Wells, Ph.D.

Associate Professor
Mandel School of Applied Social Sciences
Carol Sue White, Ph.D.
Associate Professor
School of Medicine/MetroHealth Medical Center
Peter J. Whitehouse, M.D., Ph.D.
Professor
School of Medicine/Department of Neurology
James M. Yokely, Ph.D.
Assistant Professor
School of Medicine/Department of Psychiatry
Cameron Camp, Ph.D.
Adjunct Professor
Myers Research Institute
Robert Goldberg, Ph.D.
Adjunct Assistant Professor
Cleveland Veterans Administration Medical Center
Carolyn Landis, Ph.D.
Adjunct Instructor, Rainbow Babies and Children's Hospital
Jeffrey Rosenbaum, Ph.D.
Adjunct Assistant Professor, Children's Aid Society/Beech Brook
Philip Safford, Ph.D.
Adjunct Professor/Professor Emeritus, Kent State University
Jes-James Sellers, Ph.D.
Adjunct Assistant Professor
University Counseling Center
Jeremy Shapiro, Ph.D.
Adjunct Assistant Professor
The Guidance Centers
Harry Sivec, Ph.D.
Adjunct Assistant Professor
Northcoast Behavioral Healthcare
Kenneth Weiss, Ph.D.
Adjunct Assistant Professor
V.A. Medical Center at Brecksville

Clinical Faculty
Karen Kernberg Bardenstein, Ph.D.
Clinical Instructor, Mark Lovinger and Associates
Richard A. Cirillo, Ph.D.
Clinical Assistant Professor
Cuyahoga County Board of Mental Health and Developmental Disabilities
Sandra L. Curry, Ph.D.
Assistant Clinical Professor
Lori L. D’Angelo, Ph.D.
Clinical Instructor, Hill House
Mathew A. Fuller, Ph.D.
Clinical Instructor
Veterans Affairs Medical Center
William Hale, Ph.D.
Clinical Instructor
University Counseling Services
Susan M. Knell, Ph.D.
Clinical Instructor
Child Guidance Center of Greater Cleveland
Maureen Kreick, Ph.D.
Clinical Instructor, Private Practice
Marilyn Malkin, Ph.D.
Clinical Instructor, Roth Stanley and Associates
Maryann McGlenn, 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 Service
David Pincus, Ph.D.
Assistant Clinical Professor, School of Medicine/Department of Psychiatry
Robert Smith, Ph.D.
Assistant Clinical Professor
Behavior Management Associates, Inc.
Terry Tobias, Ph.D.
Assistant Clinical Professor
School of Medicine/University Hospitals
Kelly L. Wadeson, Ph.D.
Clinical Instructor
School of Medicine/Rainbow Babies & Children’s Hospital
Richard Weisberg, Ph.D.
Clinical Instructor
Access Behavioral Care
Lucene Wisniewski, Ph.D.
Clinical Instructor, Laurelwood Hospital & Counseling Center

UNDERGRADUATE (PSCL)

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 188. On Being a Scientist (1)
(See ASTR 188.) Cross-listed as ASTR 188.

PSCL 230. Child Psychology (3)
Basic facts and principles of psychological development from the prenatal period through adolescence. Prereq: PSCL 101.

PSCL 231. Child Psychology Practicum (1)
The course will involve three hours per week of practicum experience at either the Church of the Covenant day care center or the Mental Development Center School. Student will be given an orientation to child development in the context of a preschool program. Prereq: PSCL 101. Coreq: PSCL 230.

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. Prereq: 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. Prereq: PSCL 101.

PSCL 329. Adolescence (3)
Psychological perspectives on physical, cognitive, and social development. Prereq: PSCL 101.

PSCL 334A. Seminar and Practicum: Pre-school and Daycare (3)
Supervised field placement and attendance at staff conferences in various child and adolescent settings. Regular seminar meetings. Prereq: PSCL 230.

PSCL 334C. 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.

PSCL 335A. Seminar and Practicum: Pre-school and Daycare (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.

PSCL 388. Seminar and Practicum in Adolescence (3)
(See EDUC 338.) Cross-listed as EDUC 338 and SOCI 338.

PSCL 389. Seminar and Practicum in Adolescents (3)
(See SOCI 339.) Prereq: PSCL 230. Cross-listed as SOCI 339.

PSCL 340. Seminar and Practicum with Aging Populations (3)
Supervised field placement with aging populations. Regular seminar meetings. Goal is to integrate readings, lectures, and practicum experiences with aging populations. Prereq: PSCL 101.

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. Prereq: PSCL 230 or PSCL 321.

PSCL 345. Mind, Culture and Religious Experience (3)
(See RLGN 344.) Cross-listed as RLGN 344.

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. Prereq: PSCL 101.

PSCL 352. Physiological Psychology (3)
The nervous system as it relates to behavior. Prereq: 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. Prereq: PSCL 101.

PSCL 355. Sensation and Perception (3)


PSCL 357. Cognitive Psychology (3)


PSCL 360. Laboratory and Seminar in Human Experimental Psychology (3)

Methods of research in human learning, cognition, and perception will be examined through seminar discussions and laboratory experiments.

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. Prereq: PSCL 101.

PSCL 371. Religion of the Life Cycle in Cultural Context (3)

(See RLGN 370.) Cross-listed as RLGN 370.

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 mathematical operations. Prereq: PSCL 282.

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. Prereq: 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. Prereq: 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. Prereq: PSCL 101.

PSCL 395. Capstone and Honors Program (3)

Supervision in carrying out an independent research study in the student's area of interest. Approved SAGES capstone. Prereq: PSCL 375.

PSCL 397. Independent Study (1-3)

Individual study involving specific programs of reading, research, and special projects. Prereq: PSCL 101.

PSCL 400. Ethics for Professional Researchers (3)

Ethical principles applied to topics including authorship, plagiarism, grants, ownership of intellectual property, conflict of interest, harassment, and treatment of animal or human subjects.

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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: Limited to Grad students in Clinical Psychology. Requires approval of the Director of Clinical Training.

PSCL 427. Special Assessment Methods with Children with Multiple Problems (3)

PSCL 429. Practicum in Assessment I (1)

PSCL 430. Practicum in Assessment II (1)
Prereq: Approval of the Director of Clinical Training. Coreq: 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. Prereq: 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.

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. Pediatric Psychology I (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, neuro-

PSCL 524. Advanced Psychopathology (3)
Theoretical issues and current research data bearing on major patterns of psychological disturbance.

PSCL 525. Professional Issues in Clinical Psychology (3)
Consideration of legal and ethical principles in research and practice in clinical psychology and contemporary controversies in professional psychology. Prereq: Graduate standing in Psychology.

PSCL 527. 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)
Prereq: Graduate standing in clinical psychology.

PSCL 529C. Practicum in Intervention I: Psychodynamic (1)
Prereq: Graduate standing in clinical psychology.

PSCL 530A. Practicum in Intervention II: Behavior Therapy (1)
Prereq: Graduate standing in clinical psychology.

PSCL 530C. Practicum in Intervention II: Psychodynamic (1)
Prereq: Graduate standing in clinical psychology.

PSCL 531A. Seminar in Intervention I: Behavior Therapy (2)
Theoretical issues and research on psychological interventions. Prereq: Graduate standing in clinical psychology.

PSCL 531C. Seminar in Intervention I: Psychodynamic (2)
Theoretical issues and research on psychological interventions. Prereq: Graduate standing in clinical psychology.

PSCL 532A. Seminar in Intervention II: Behavior Therapy (2)
Theoretical issues and research on psychological interventions. Prereq: Graduate standing in clinical psychology.

PSCL 532C. Seminar in Intervention II: Psychodynamic (2)
Theoretical issues and research on psychodynamic intervention. Prereq: 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. Prereq: 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. Prereq: 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.)

PSCL 703. Dissertation Fellowship (1-8)
The undergraduate programs in psychology are designed to provide broad education in the science of behavior. The curriculum consists of three levels: an introductory level that is a prerequisite for most other courses in the department; an intermediate level, covering the various substantive areas of psychology; and an advanced level that offers numerous unique opportunities for undergraduates to engage in specialized and individualized work. In order to be assigned an undergraduate major/minor advisor, please obtain a declaration form from...
the Office of Undergraduate Studies, and see the staff in Mather Memorial 103 in order to complete the form.

**Major**

Students completing the B.A. may major in psychology. 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)
- PSCL 357, Cognitive Psychology (3)
- PSCL 382, Psychological Measurement (3)
- PSCL 393, Experimental Child Psychology (3)

The remaining hours can be fulfilled by taking psychology electives chosen by the major and his or her advisor.

**Minor (15 hours)**

**Required Course**
- PSCL 101 (3 hours)

**Electives**

A minimum of four courses (12 hours) 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.

**Sequence for Engineering Core (9hours)**

The sequence reflects an emphasis on either the cognitive/biological or social/personal aspects of the field. All sequences must include PSCL 101 and two courses from one of the following groups:

- Personal and Social Behavior: PSCL 102, 230, 300, 313, 315, 317, 321, 325
- Cognitive/Biological Behavior: PSCL 352, 353, 355, 357, 360

**Departmental Honors**

Junior majors with a 3.0 overall grade point average and a 3.25 average in psychology are encouraged to apply to the department’s Honors Program. This program consists of one three-credit course PSCL 395, during 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 Programs**

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.

**GRADUATE PROGRAMS**

Graduate programs leading to the Doctor of Philosophy degree are offered in the fields of adult clinical, child clinical, experimental psychology, social psychology, and mental retardation research. The Master of Arts degree can be earned in the department as part of work toward a doctorate. Additional information about graduate work in psychology is available at the departmental web site www.case.edu/artscl/pscl.

**Psychology (PSCL)**

Undergraduate Courses

**PUBLIC POLICY PROGRAM**

113 Mather House
Phone 216-368-2426
Joseph White, Academic Representative and Minor Advisor (jxw87@case.edu)

**PROGRAM FACULTY**

Joseph White, Ph.D.
(University of California at Berkeley)
Director, Center for Policy Studies, and Luxenberg Family Professor of Public Policy

Robert H. Binstock Ph.D.
(Harvard University)
Professor of Epidemiology and Biostatistics, School of Medicine

Brian Gran, Ph.D., J.D.
(Northwestern University, University of Indiana)
Assistant Professor of Sociology

David C. Hammack, Ph.D.
(Columbia University)

Hiram C. Haydn Professor of History

**UNDERGRADUATE PROGRAM**

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 of the Weatherhead School of Management; through the Schools of Law, Medicine, and Nursing; and through the Mandel School of Applied Social Sciences and the Mandel Center for Nonprofit Organizations. Students can engage with policy issues through both courses and the extracurricular programming of the Center for Policy Studies and other university bodies.

An undergraduate minor is available to undergraduates in the College of Arts and Sciences and in the economics and management programs housed within the Weatherhead School of Management. The requirements are in four categories, listed below. Substitutions can be made under exceptional circumstances, at the discretion of the Minor Advisor.

**Minor-hours: 15**

A. The policy process: One course from POSC 386, 383, or 306
B. Economic analysis: One course from ECON 205 or 102
C. Policy making institutions: one course selected from HSTY 256, 358, 400; POSC 308, 310, 323, 324, 385
D. Two courses on a particular field of public policy. selected with the approval of the advisor.

**DEPARTMENT OF RELIGIOUS STUDIES**

111 Mather House
Phone 216-368-2210; Fax 216-368-4681
Peter J. Haas, Chair (pjh7@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 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. Minors or sequences in Religious Studies complement and broaden any field chosen as a major.

**FACULTY**

Peter J. Haas, Ph.D. (Brown University)
*Abba Hillel Silver Professor of Jewish Studies and Chair*

Jewish literature and thought; Western religions; science and religion; religion and culture

Alice Bach, Ph.D. (Union Theological Seminary [NY])
*Archbishop Paul J. Hallinan Associate Professor of Catholic Studies*

Literary and cultural studies of the Bible; feminist thought; film studies; religion and culture

Timothy K. Beal, Ph.D. (Emory University)
*Harkness Professor of Biblical Literature*

Biblical studies; Near Eastern studies; environmental studies; religion and culture; gender studies

William E. Deal, Ph.D. (Harvard University)
*Severance Associate Professor of the History of Religion*

Buddhism; Chinese and Japanese religions; methodology of religion; ethics; religion and culture

**Associate Faculty**

Stephen G. Post, Ph.D. (University of Chicago)
*Associate Professor of Biomedical Ethics, School of Medicine; and Associate Professor of Religion*

Biomedical ethics; American religious thought; philosophy of religion

**UNDERGRADUATE (RLGN)**

**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. Prereq: Priority given to first and second year students; permit required.

**RLGN 201. Literature and History of Ancient Israel (3)**

The purpose of the course is to introduce students to the literature and thought of the Hebrew Bible. The approach will be historical-critical while examining traditional Jewish and Christian interpretations. The goal is to enrich and deepen the student's knowledge of the Bible and its context and open new horizons to the Biblical works and world.


The literature of the New Testament in its historical, ideological, and religious setting.

**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.

**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. Religion and Feminism (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.

**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 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.

**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 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.

**RLGN 216. Hinduism (3)**

The dominant religious tradition of India. The evolution of Hinduism from Vedic religion; classical Hindu mythology, philosophy, and theology as well as the modern transformation of Hinduism; orthodox Hindu practices as well as beliefs and practices found in regional and village settings; visions of the universe, humanity, and existence that differ radically from monotheistic and secular traditions of the West.

**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, Nagarjuna 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.

**RLGN 218. Islam: Religion, Society 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.

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.

RLGN 221. Indian Philosophy (3)
A survey of Indian philosophical thought with emphasis on the Vedas, early Hindu, and Jain literature. Cross-listed as PHIL 221.

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.

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 Emancipation and Enlightenment on the social situation of the Jews in Europe and America and the corresponding changes within each community and among the different communities.

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. Cross-listed as J DST 233 and ANTH 233. Cross-listed as J DST 233.

RLGN 234. Diversity and Women’s Folk Religion (3)
Focusing on folk religion, the course examines a range of women’s expressive behaviors such as art, needlework, story-telling, joking, singing, dancing, cooking, mourning and praying. Through native folklore genres of women’s expressivity, the course will afford access to strategic and creative ways that women of diverse religious, ethnic and regional backgrounds have brought and still bring substance and meaning to American folk religion.

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 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 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. Cross-listed as HSTY 254.

RLGN 259. Tricksters, Conjurers, and Gods: Religion in West Africa and Diaspora (3)
(See ETHS 259.) Cross-listed as ETHS 259.

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 (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.

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, religion, anthropology, psychology, film studies, cultural studies, and art history. It is the required introductory course for students taking the women’s studies major. Cross-listed as WMST 201.

RLGN 271. Bioethics: Dilemmas (3)
(See BETH 271.) Cross-listed as BETH 271.

RLGN 275. Jerusalem Perspectives (3)
Topics in the religious, cultural, and historical legacy of past and present Middle Eastern societies. The course is taught by Fellows of the Samuel Rosenthal Center who are faculty members of the Hebrew University in Jerusalem. Course repeatable for credit up to four times.

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 CWRU 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. Cross-listed as JDST 280.

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.

RLGN 303. Japanese Religions (3)
Thematic and historical survey of major Japanese religious ideas and institutions. Emphasis on translated readings in primary texts. Issues covered include Shinto and Buddhist traditions, religion and state, and role of religion in modern Japan.

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. Cross-listed as CLSC 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 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 crea-
RLGN 315. Heresy and Dissidence in the Middle Ages (3)
Survey of heretical individuals and groups in Western Europe from 500 to 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. Cross-listed as HSTY 315.

RLGN 316. Modern Religious Thought: 1800 to the Present (3)
A survey of some major religious thinkers of Europe 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)
(See HSTY 319.) Cross-listed as HSTY 319.

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.

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 metatypology; knowledge, belief and faith; nature of religious discourse. Readings from traditional and contemporary sources. Prereq: PHIL 101 or RLGN 102. Cross-listed as PHIL 333.

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.

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 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 344. Mind, Culture, and Religious Experience (3)
Critical examination of several major approaches to the psychological foundations of religious experience. Topics will include such phenomena as conversion, spirit possession, mystical and ecstatic states, religious leadership, perception of the divine, and personalization of religious symbolism. Phenomenological and anthropological studies of religious experience will be used. Cross-listed as PSCL 345.

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 monstrosity in literature and film. Prereq: RLGN 102 or permission of department.

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 ethical 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.

RLGN 353. Hindu and Jain Bioethics (3)
This course will provide an introduction to Hindu and Jain Bioethics. We will ask: How would a Hindu or a Jain respond to issues concerning euthanasia, abortion, and other topics of controversy? Are these answers altered in the North American context or in the light of recent technological changes? Guest speakers with Hindu and Jain backgrounds from local hospitals will speak to the class about their experiences and attempts to balance their beliefs with their views on medical ethics.

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.

RLGN 370. Religion and the Life Cycle in Cultural Context (3)
A comparative exploration of how religious thought and practice relate to psychological development and the human life cycle in two cultural settings—the United States and India. The course is interdisciplinary. Students will read foundational psychological studies of the life cycle, religious development, and the role of religion in facilitating or impeding personality development. They will also consider anthropological accounts of indigenous notions of personality, human development, and the life course in India. Consideration of these studies will lead students to a constructive critique of Western psychological theories and their applicability to Indian, particularly Hindu, lives. Cross-listed as PSCL 371.

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. Prereq: ANTH 102 or consent of department. Cross-listed as ANTH 372.

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 to be 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. Cross-listed as HSTY 303.

RLGN 374. Reformation Europe, 1500–1650 (3)
Origins and development of Protestantism, the Catholic counter-reformation, and the interaction between secular power and religious identification in Christian Europe. Cross-listed as HSTY 309.

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.

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. Prereq: Consent of department.

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. Prereq: Consent of department chair.

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. Approved SAGES capstone. Prereq: RLGN 102 and one other RLGN course or permission of chair.

RLGN 411. Altruism in Bioethics (3)
(See BETH 411.) Cross-listed as BETH 411.

RLGN 433. Philosophy of Religion (3)
(See RLGN 333.) Cross-listed as PHIL 433.

RLGN 441. Religion and Postmodernism (3)
(See RLGN 341.)

RLGN 445. Religion and Horror (3)
(See RLGN 345.)

RLGN 453. Hindu and Jain Bioethics (3)
This course will provide an introduction to Hindu and Jain Bioethics. We will ask: How would a Hindu or a Jain respond to issues concerning euthanasia, abortion, and other topics of controversy? Are these answers altered in the North American context or in the light of recent technological changes? Guest speakers with Hindu and Jain backgrounds from local hospitals will speak to the class about their experiences and attempts to balance their beliefs with their views on medical ethics. Cross-listed as BETH 453.

RLGN 466. Religion and Film (3)
(See RLGN 366.)

RLGN 488. Topics in Religion (3)
(See RLGN 388.) Project must be accepted by a member of the department faculty prior to registration.

RLGN 601. Special Research (1-6)
Project must be accepted by a member of the department faculty prior to registration. Prereq: Graduate standing and consent of instructor.

RLGN 651. Thesis M.A. (1-9)
Project must be accepted by a member of the department faculty prior to registration.

The Department of Religion offers a major and a minor in Religion—as well as a Departmental Honors Program—for students pursuing the Bachelor of Arts degree. Humanities and Social Science sequences are offered for B.S. degree students in Engineering. Both the major and minor programs acquaint the student with the texts and traditions of major religious traditions, 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 (IGS). 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, Women’s Studies, Environmental Studies, International Studies, the Program in Judaic Studies, and the College Scholars Program.

**Major**

Students majoring in Religious Studies must complete a minimum of 30 semester hours of work in the Department. Courses required of all majors are RLGN 102: Introduction to the Study of Religion and at least three hours of RLGN 399/499: Major/Minor Seminar (repeatable up to six hours). In addition, majors must complete three courses in one of the three areas described below, one course in each of the other two areas outside of the area of concentration, and three elective courses. A list of courses assigned to each area of concentration is available from the Department. Additionally, majors are encouraged to develop interdisciplinary competency by taking courses in other departments relevant to their area of concentration. Majors are urged to take a second language related to their interests and concentration.

**Area 1: Religious Texts and Traditions**

Courses in Area 1 focus on the critical study of religious texts and traditions and their historical development. These courses encourage critical reflection on the methods and theories employed to study them. Interpretive perspectives include those drawn from the academic study of religion and other disciplines in the arts and humanities, social sciences, and natural sciences.

**Area 2: Religion and Culture**

Courses in Area 2 examine ways that religious discourses and practices are woven into larger webs of culture and are related to other elements within those webs. Through analysis of a wide range of cultural productions, both ancient and contemporary, from visual culture to popular media, these courses focus on the complex ways that religion takes form within particular cultural contexts, and conversely, helps to form cultural artifacts.

**Area 3: Religion in Society**

Courses in Area 3 investigate the various ways that people practice their religious beliefs within their own social groups and sustain their traditions within the larger society. Within this area are courses on the tensions between religion and science, ethics across religious boundaries and within religious traditions, and how religious groups affect political, economic, and social issues within local and world communities. Some courses in this area offer opportunities for working with social service and advocacy agencies in the community.

**Minor**

Students minoring in Religious Studies must complete 15 semester hours of work in the Department. Courses required of all minors are RLGN 102: Introduction to the Study of Religion and three hours of RLGN 399/499: Major/Minor Seminar. Nine hours of course work must be chosen in consultation with a departmental advisor. These courses must demonstrate diversity in the study of religion.

**Sequences (Engineering Core)**

Sequences normally include three courses that demonstrate diversity in the study of religion. Approval for sequences must be obtained from the departmental advisor. In selecting courses, attention will be given to religious pluralism and diversity of approaches to the academic study of religion.

**Departmental Honors**

Students who are majoring in Religious Studies and have an overall grade point average of 3.5 and also a grade point average of 3.5 in Religion courses may apply for the honors program. Honors candidates enroll in RLGN 395: Honors Research each semester during their senior year. A year-long honors project
must be accepted by a member of the Department faculty who normally would be the major advisor for the project, and must be formally approved by a majority of the full-time faculty members of the Department. The approval must be granted not later than the end of the first semester. A faculty committee awards departmental honors upon satisfactory completion, defense, and acceptance of the senior project, provided that the required grade point averages are maintained.

RESEARCH
Faculty members in the Department are engaged in scholarly research, writing, editorial projects, and leadership roles in professional societies.

DEPARTMENT OF SOCIOLOGY
226 Mather Memorial Building
Phone 216-368-2700; Fax 216-368-2676
Dale Dannefer, Chair

Sociology is a fundamentally important perspective for understanding individual lives and relationships and the social structures and social forces that affect them. Sociologists explore the dynamics of social institutions, and how economic and cultural forces interact with factors such as age, gender, race and ethnicity in shaping experience. Sociology courses also explore social change and conflict, crime and deviant behavior, as well as innovations in social practices and policies that are designed to respond to social problems and cope with new individual and social challenges. Sociologists conduct surveys and other quantitative and qualitative studies for understanding public opinion, social needs, trends, and institutions. The Department of Sociology places special emphasis on social influences on health and on health policies and health disparities throughout the life course. Study in sociology 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. Majoring in Sociology provides a broad preparation for understanding the social context in which we live, for obtaining positions in diverse work settings and/or for pursuing graduate or professional degrees.

The Department of Sociology offers programs leading to the Bachelor of Arts, Master of Arts and Doctor of Philosophy degrees. Sociology majors have the option of electing to do a general sociology curriculum or to choose one of four concentrations: 1) Crime and Delinquency, 2) Health and Aging, 3) Social Inequality, and 4) Gender, Work and Family. Additional options include participation in the Integrated Graduate Studies Bachelor of Arts/Master of Arts sequence and a joint degree program in Law and Sociology.

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.

FACULTY
Dale Dannefer, Ph.D. (Rutgers University)
Selah Chamberlain Professor of Sociology and Department Chair
Aging and the lifecourse, 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. (Northwestern University)
Assistant Professor
Sociology of law; political sociology; comparative sociology; health care policy.
Gunhild Hagestad, Ph.D. (University of Minnesota)
Visiting Professor
Life course; gender; social policy
Susan W. Hinze, Ph.D. (Vanderbilt University)
Assistant 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 Humanities
Sociology of aging; medical sociology; social factors in stress and coping.
Emilia McGucken, Ph.D. (University of Akron)
Instructor
Criminology; juvenile delinquency; deviance; theory; urban sociology

Associate Faculty and Lecturers
David E. Beigel, Ph.D. (University of Maryland at Baltimore)
Henry Zucker Professor, Mandel School of Applied Social Sciences; Professor of Sociology
Family; social networks; caregiving; mental health.
Robert Binstock Ph.D. (Harvard University)
Henry R. Luce Professor of Health, Aging and Society, School of Medicine, Professor of Sociology
Public policy and aging; health care policy.
Jennifer Fishman, Ph.D. (University of California San Fransisco)
Empirical bioethics, social studies of biomedical technologies; ethics of clinical drug trials; gender, health and medicine.
Linda Noelker, Ph.D. (Case Western Reserve University)
Associate Director of Research, Benjamin Rose Institute of Cleveland; Adjunct Professor of Sociology
Sociology of aging; family sociology; sex and gender.
Kathleen Smyth, Ph.D. (Case Western Reserve University)
Associate Professor, Medicine, Epidemiology and Biostatistics; Associate Professor of Sociology
Medical sociology; research methods; sociology of aging.
Kurt Stange, M.D., Ph.D. (University of North Carolina)
Professor, Medicine and Epidemiology and Biostatistics; Associate Professor of Sociology
Epidemiology; preventative health care; biostatistics; disability prevention in the elderly.
Aloen Townsend, Ph.D. (University of Michigan)
Adult development and aging, research methods, and statistics, mental health, families and former service systems.

UNDERGRADUATE (SOCI)

SOCI 112B. Introduction to Sociology: Human Interaction (3)
How can so many different people who have competing ideals and lifestyles live together in harmony? What makes one organization successful and another one fold? This course examines such questions from the social scientist's viewpoint. Topics include: how people learn to be human, families, markets and economic institutions, class structures, crime and deviant behavior, aging, self-identity, and social change.

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 188. On Being a Scientist (1)
(See ASTR 188.) Cross-listed as ASTR 188.

SOCI 203. Human Development: Medical and Social (3)
Social influences on health and illness across the lifespan. Social determinants of health and behavior, and delivery of health care. Guest lectures from the medical school and other health care providers address professional practice issues across the lifespan. Issues include: new approaches to birthing; 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. Cross-listed as WMST 222.

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 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 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 112B and Sophomore standing.

SOCI 302. Race and Ethnic Minorities in American Society (3)
Has the United States become a melting pot of ethnic groups or does it remain a salad bowl? American society is uniquely diverse in its ethnic and racial composition. This diversity has influenced much of American history and had substantial impact on the structure of social organization of present day society. This course familiarizes students with basic concepts of race and ethnicity, relevant theories and their applications to critical issues. Prereq: SOCI 112B.

SOCI 303. Social Research Methods (3)
Principles of making causal inferences about human behavior; problem formulation and research design; measurement of sociological concepts; data collection and analysis methods; evaluation of research findings. Prereq: SOCI 112B and Sophomore standing.

SOCI 310. The Individual in Society (3)
This course focuses on the relationship 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. Prereq: SOCI 112B.

SOCI 311. 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. Prereq: SOCI 112B and Sophomore standing.

SOCI 313. 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. Prereq: SOCI 112B 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. Prereq: SOCI 112B 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. Prereq: SOCI 112B 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 112B.

SOCI 326. Women in Societies in the Modern World (3)
Participation of women in both family and economic institutions in developed and developing societies around the world. Prereq: SOCI 112B or permission of program director. Cross-listed as WMST 326.

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 112B.

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 112B.

SOCI 338. Seminar and Practicum in Adolescence (3)
(See EDUC 338.) Cross-listed as EDUC 338 and PSCL 338.

SOCI 339. Seminar and Practicum in Adolescents (3)
(See SOCI 338.) Cross-listed as PSCL 339.

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. Prereq: SOCI 112B and Sophomore standing.

SOCI 355. Special Topics (3)
One or more sections each semester focusing on selected areas of study in sociology.

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 nonlawyers? Prereq: SOCI 112B 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. Prereq: SOCI 112B and Sophomore standing.

SOCI 365. Health Care Delivery (3)
Health care in the U.S. may be approaching a critical cross-road. 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. Prereq: SOCI 112B 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. Prereq: SOCI 112B and Sophomore standing.

SOCI 370. Family Structure and Process (3)
This course focuses on the conduct, conflicts and triumphs encountered in everyday living by families. Examines how families from different historical periods, classes and races experience life. Attention will be given to the sense of variety inherent in family forms and intrafamilial experiences. Using sociological, theoretical and historical perspectives, learn why the family is often blamed for major societal problems. Prereq: SOCI 112B 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. Prereq: SOCI 112B and Sophomore standing. Cross-listed as WMST 372.

SOCI 375. Independent Study (1-3)
Prereq: SOCI 112B and SOCI 300.

SOCI 381. City as Classroom (3)
(See HSTY 381.) Cross-listed as HSTY 381.

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. Approved SAGES Capstone. Prereq: SOCI 112, SOCI 300, SOCI 303, STAT 201 or PSCL 282.

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 the major social 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 relationship 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.

SOCI 411. Health, Illness, and Social Behavior (3)
(See SOCI 311.)

SOCI 413. Sociology of Stress and Coping (3)
(See SOCI 313.)

SOCI 414. Qualitative Methods/Field Research (3)
(See SOCI 314.)
SOCI 419. Sociology of Institutional Care (3)  
(See SOCI 319.)

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.

SOCI 449. Social Inequality (3)  
(See SOCI 349.)

SOCI 455. Special Topics (3)  
One or more sections each semester focusing on selected areas of study in sociology.

SOCI 460. Criminal Justice and Law (3)  
(See SOCI 360.)

SOCI 461. The Life Course (3)  
(See SOCI 361.)

SOCI 465. Health Care Delivery (3)  
(See SOCI 365.)

SOCI 469. Aging in American Society (3)  
(See SOCI 369.)

SOCI 470. Family Structure and Process (3)  
(See SOCI 370.)

SOCI 472. Work and Family: U.S. and Abroad (3)  
(See SOCI 372.)

SOCI 473. Methods of Life-Course Research (3)  
This course is about how to conduct research on the dynamics of human growth and development over the life course. It draws upon research from several disciplines related to developmental science, and it focuses on the complexities of studying human lives in time and place. For example, we will consider challenges associated with designing research for various kinds of developmental questions: disentangling age, period, and cohort effects; conducting longitudinal research; handling social contexts; conducting multi-level research; analyzing secondary and archival data; and making comparisons in human development. Prereq: SOCI 406 or equivalent.

SOCI 481. City as Classroom (3)  
(See HSTY 481.) Cross-listed as HSTY 481.

SOCI 496. Public Policy and Aging (3)  
(See EPBI 408.) Cross-listed as EPBI 408.

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 with 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, SOCI 406, and SOCI 407 or permission of department.

SOCI 601. Reading and Research (1-9)  
Individual study and/or project work.

SOCI 701. Dissertation Ph.D. (1-18)  

SOCI 703. Dissertation Fellowship (1-8)  

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 work. All majors complete the common core requirements: (15 hours):  
• SOCI 112B Introduction to Sociology: Human Interaction  
• SOCI 300 Modern Sociological Thought  
• SOCI 303 Social Research Methods  
• SOCI 392 Senior Capstone Experience  
• STAT 201 or PSCL 282 Statistics  
Plus 15 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.

Minor  
The minor consists of 15 credit hours in sociology, including:  
• SOCI 112B Introduction to Sociology: Human Interaction  
• SOCI 300 Modern Sociological Thought  
• plus three additional electives, of which at least two must be 300 level courses.

Sociology Sequence for Engineering Majors  
Choose on the these sequences and any two courses listed in parentheses:  
A. Social Institutions  
• SOCI 112B or 113 (SOCI 204, 300, 320, 328, 333, 349)  
B. Human Behavior  
• SOCI 112B or 113 (SOCI 203, 208, 222, 361, 369)

Departmental Honors  
Juniors majoring in sociology with a 3.0 overall GPA and a 3.4 GPA in sociology are invited to apply for the department’s Honors Program, which consists of an intensive, year-long investigation of a research problem under the guidance of a faculty member. Students will earn credit through registration in SOCI 397 and SOCI 398. Admission to honors work is by faculty approval.

Honor Society  
The opportunity to join Alpha Kappa Delta (AKD), the sociology honors fraternity, is available to selected juniors and seniors (Membership requires a 3.4 GPA in sociology and a 3.2 GPA overall.)

Integrated Graduate Studies  
The Department of Sociology participates in the Integrated Graduate Studies Program. Students in the program are able to obtain B.A. and M.A. degrees simultaneously. Interested students should note the general requirements and the admission procedures in the appropriate section of this bulletin and may consult the department for further information.

GRADUATE PROGRAM  
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.

RESEARCH PROGRAMS
The Elderly Care Research Center
Funded research projects of the center focus on theory-based and public policy relevant issues in aging and medical sociology. Current projects relate to physical and mental health outcomes of stress, coping, cancer survivorship and adaptation to frailty and life-threatening illness in late life. The center is recipient of an NIA Merit Award for a long-term study of very old residents of a retirement community. This research seeks to understand health promotion, pro-active 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 and universities in Israel, Hungary, Britain, and Germany.

Cancer Survivor Research Program
Conducted at the Sociology Department of Case Western Reserve University, 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 the CSRP’s director and principle 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 project allows students in the Sociology Ph.D. program to gain hands-on experience in a formal research setting while putting their coursework into practices.

DEPARTMENT OF STATISTICS
323 Yost Hall
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webmaster@stat.case.edu

Statistics links mathematics to other disciplines to understand uncertainty and probability in the abstract and in the context of actual applications to science, edicine, actuarial science, social science, management science, business, engineering, and to contemporary life. As technology brings advances, the statistical theory and methodology required to do them justice becomes more challenging: higher dimensional, dynamic, or computer-intensive.

The field of statistics is rapidly expanding to meet the three facets of these challenges: the underlying mathematical theory, the data analysis and modeling methodology, and the interdisciplinary collaborations and new fields of application.

FACULTY
Wojbor Wojczynski, Ph.D. (Wroclaw University, Poland)
Professor
Stochastic models, probability, random fields, time series, dynamics of chaotic processes, nonlinear diffusion, turbulence
Paula FitzGibbon, M.S. (Miami University)
Lecturer
Catherine Loader, Ph.D. (Stanford University)
Associate Professor
Local regression and likelihood; mixture models; functional data analysis and application to biological data; numerical algorithms in statistics and applied probability; boundary crossing problems and statistical applications.
Ramani Pilla, Ph.D. (Penn State)
Bioinformatics, genetics, correlated data (clustered and longitudinal); estimating equations; mixture models (nonparametric and semiparametric); random effects models; random fields; statistical computation; spatial scan analysis
Joseph Sedransk, Ph.D. (Harvard University)
Professor
Bayesian inference, sample survey theory, methodology and applications
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
Lajos Takacs, Ph.D. (Budapest University)
Professor Emeritus
Stochastic processes, probability, queuing systems

Adjunct Faculty
Mary H. Regier, Ph.D. (University of California at Berkeley)
Adjunct Professor

UNDERGRADUATE (STAT)

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. Prereq: 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)
Introduction to fundamental concepts of statistics

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. Prereq: MATH 122 or MATH 126 or equivalent.

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. Prereq: STAT 317 and one of the following: STAT 207, 312, 345, or equivalent.

STAT 325. 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. Prereq: Permission of department.

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, E-M algorithm, CART. Introduction to generalized linear modeling. Case studies of complex data sets with multiple objectives for analysis. Prereq: STAT 325.

STAT 332. Statistics for Signal Processing (3)

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. Prereq: 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 undergraduate in engineering or an industrial setting. Written report. Prereq: Permission of department.

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. Prereq: 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 an...
Completion of additional assignments required for graduate students registered in this course. 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 main-stream 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). Mathematica notebooks and simulations will be used. Random number generators and their testing. Monte Carlo methods. Note: Credit given for only one (1) of STAT 312, 313, 333, 433. Graduate students are required to do an extra project. Prereq: MATH 223 or MATH 122.

STAT 437. Stochastic Modeling of Scientific Data (3)
Introduction to stochastic modeling of data. Emphasis on models and statistical analysis of data with a significant temporal and/or spatial structure. Markovian and semi-Markovian models, point processes, point cluster models, queuing models, likelihood methods, estimating equations. Note: Restricted to declared graduate and undergraduate majors and minors in Statistics and Biostatistics only. Prereq: STAT 333 or STAT 433 (preferred) or STAT 325, STAT 425, or STAT 445, or permission of department.

STAT 439. Integrated Numerical and Statistical Computations (3)
(See MATH 439.) Cross-listed as MATH 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. Prereq: MATH 122 or MATH 223. Cross-listed as EPBI 481.

STAT 446. Theoretical Statistics II (3)

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. Prereq: STAT 445.

STAT 453. Time Series and Wavelets I (3)

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. Prereq: 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 professional 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 Practitioners (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 entrepreneur-
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. Prereq: Permission of department.

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. Prereq: Permission of department.

STAT 601. Reading and Research (1-9)
Individual study and/or project work. Prereq: Permission of department.

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. Prereq: Permission of department.

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. Prereq: Permission of department.

STAT 701. Dissertation Ph.D. (1-18)
(Credit as arranged.) Prereq: Permission of department.
Students in statistics begin with a foundation in mathematics, then add statistical theory, and substantive scientific terms. Oral presentation and interpretation of research projects may be given in either graduate student seminar or consulting forum. Prereq: Permission of department.

(1) MATH 121, 122, 223, 224, and 201 or
(2) ENGR 131 or ECMP 251 or approved alternate; plus an additional higher numbered course in computation from ENGR or ECMP offerings or EPBI 414 or EPBI 420;
(3) STAT 325 and 326, STAT 345 and 346;
(4) At least 15 hours of courses in statistical methodology to be chosen from statistics courses numbered 300 and higher offered by the Statistics Department, or approved courses in statistical methodology or probability taught in biostatistics, computer science, economics, mathematics, operations research, systems engineering, etc. At least 6 hours must be in STAT courses; STAT 243 and 244 may be counted;

PROTOTYPE PROGRAMS-
STATISTICS COURSE WORK

Statistics B.A. Program

Year 1
Fall
MATH 121
Cmps 131
ENGL 150
GER: Science
GER: Social Science
Physical Education Requirement
Total: 16 hours

Spring
MATH 122
GER: Arts and Humanities
GER: Science
GER: Social Sciences
Free Elective
Physical Education Requirement
Total: 16 hours

Year 2
Fall
MATH 223
STAT 243
GER: Arts and Humanities
GER: Social Sciences
Free Elective
Total: 15 hours

Spring
MATH 224
MATH 201
STAT 244
GER: Arts and Humanities
GER: Global and Cultural Diversity
Total: 15 hours

Year 3
Fall
STAT 345
EPBI 420
Substantive Field Requirement
GER: Arts and Humanities

Bachelor of Arts
The B.A. degree in statistics requires a minimum of 120 hours, including at least 56 hours of approved course work, including 27 hours in statistics, the remainder in related disciplines and a substantive field of application, to satisfy the following requirements:

(1) MATH 121, 122, 223, 224, and 201 or equivalent;
(2) ENGR 131 or ECMP 251 or approved alternate; plus an additional higher numbered course in computation from ENGR or ECMP offerings or EPBI 414 or EPBI 420;
(3) STAT 325 and 326, STAT 345 and 346;
(4) At least 15 hours of courses in statistical methodology to be chosen from statistics courses numbered 300 and higher offered by the Statistics Department, or approved courses in statistical methodology or probability taught in biostatistics, computer science, economics, mathematics, operations research, systems engineering, etc. At least 6 hours must be in STAT

Year 4
Fall
MATH 121
MATH 122
ENGR 131
ENGL 150
GER: Science
GER: Social Sciences
Physical Education Requirement
Total: 16 hours

Spring
GER: Arts and Humanities
GER: Science
GER: Social Sciences
Free Elective
Physical Education Requirement
Total: 16 hours

Year 2
Fall
MATH 223
STAT 243
GER: Arts and Humanities
GER: Social Sciences
Free Elective
Total: 15 hours

Spring
MATH 224
MATH 201
STAT 244
GER: Arts and Humanities
GER: Global and Cultural Diversity
Total: 15 hours

Year 3
Fall
STAT 345
EPBI 420
Substantive Field Requirement
GER: Arts and Humanities
Science Requirement
Total: 15 hours

Spring
STAT 346
STAT Elective
Substantive Field Requirement
Free Elective
Science Requirement
Total: 15 hours

Year 4
Fall
STAT 325
STAT Elective
STAT 391
Free Elective
Free Elective
Free Elective
Total: 16 hours

Spring
STAT 326
STAT 395
STAT 391
Free Elective
Free Elective
Free Elective
Total: 16 hours

STATISTICS

Combined B.S.—M.S. Program

Year 1
Fall
MATH 121
ECMP 251
ENGL 150
GER: Science
GER: Social Sciences
Physical Education Requirement
Total: 16 hours

Spring
MATH 122
GER: Arts and Humanities
GER: Science
GER: Social Sciences
Free Elective
Physical Education Requirement
Total: 16 hours

Year 2
Fall
MATH 223
STAT 243
STAT GER: Arts and Humanities
GER: Social Science
Science Requirement
Total: 15 hours

Spring
MATH 224
MATH 201
STAT 244
GER: Arts and Humanities
Science Requirement
Total: 15 hours

Year 3
Fall
STAT 345/445
EPBI 420
Substantive Field Requirement
GER: Arts and Humanities
Free Elective
Total: 15 hours

Spring
STAT 346
STAT Elective
Substantive Field Requirement
GER: Global and Cultural Diversity
Free Elective
Total: 15 hours

Year 4
Fall
STAT 425
STAT Elective
STAT 491 (1)
Free Elective
Free Elective
Free Elective
Total: 16 hours

Spring
STAT 426
STAT Elective
STAT 391
Free Elective
Free Elective
Free Elective
Total: 16 hours

Bachelor Degrees - Option in Actuarial Science

The actuarial program leading to a either 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 of courses in statistical methodology to be chosen from statistics courses numbered 300 and higher offered by the Statistics Department, or approved courses taught in biostatistics, computer science, economics, mathematics, operations research, systems engineering, 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 in Statistics

A minor in statistics requires a minimum of 15 hours of approved course work in statistics. The minor must satisfy the requirements below and must include a minimum of 9 credits in courses from the Statistics Department offerings.

(1) STAT 243 and 244 or STAT 345 and 346 or other approved sequence
(2) STAT 208 or STAT 312 or STAT 313 or STAT 332 or STAT 333 or STAT 325
(3) Two approved elective courses in statistics numbered 300 or above. Combined Bachelor-Master Degrees

The combined bachelor-master 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 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 methodol-
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 in Statistics

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 (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.
7. STAT 491 (0 credits)

The goals of this program are to give each student a balanced view of statistical theory and the application of statistics in practice or in substantive research and at the same time 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; and the third develops the theory underlying linear modeling. The requirement for applications of statistics will be satisfied through intensive participation in the Consulting Forum; selecting 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 which will culminate in polished written and oral presentations; in many cases the work will be suitable for presentation at professional society meetings or publishable in a substantive literature. A student coming to school from a position as 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 methodology to a new setting or to make a first essay at mathematical statistical research.

Master of Science in Statistics

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-type track which provides some business training. The Entrepreneurial Track provides instruction and real business-world experience to students who have a background in statistics and a vision for new and growing ventures.

The minimum number of hours required for the MSS-ET program is 27. A typical curriculum to be followed is listed below but variance could be granted at departmental discretion.

**Year 1**

**Fall**
- Data Analysis I
- Theoretical Statistics I

**Spring**
- Data Analysis II
- Theoretical Statistics II
- Technology Entrepreneurship

**Year 2**

**Fall**
- Statistical Computing
- Linear Models
- Consulting Forum/Internship

**Spring**
- Elective or Actuarial Science I or Actuarial Science II
- MS Project or Experimental Design
- Consulting Forum w/Practicum/Internship

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 one-week annual workshop on the industrial use of statistics from the management perspective. The up to 30 hour (no credit) workshop will take place during the fall or spring undergraduate breaks.

Doctor of Philosophy in Statistics

The focus of the doctoral program is on Research, and the plan of study emphasizes the theory of statistics so that graduates from this program 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.

TEACHER EDUCATION

EDUC 301, Introduction to Education (3)

The historical, sociological, and philosophical role of education in a diverse society. Contemporary practices and issues are introduced, researched, and debated. Issues of professional development. Application of research to instructional methodologies.
EDUC 304. Educational Psychology (3)

EDUC 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. Prereq: PSCL 101, EDUC 301, EDUC 304, and permission of program director. Cross-listed as PSCL 338 and SOCI 338.

EDUC 401. Introduction to Education (3)
(See EDUC 301.) Research project required for graduate students.

EDUC 404. Educational Psychology (3)
(See EDUC 304.) Research project required for graduate students. Prereq: PSCL 101

EDJC 186. Instructional Technology (2)
Principles and techniques of instructional design and use of technology in educational settings. Includes examination of emerging technologies and production of instructional materials. Lab fee required. Prereq: EDUC 301, EDUC 304, and EDUC 338.

EDJC 255. Literacy Across the Curriculum (3)
Literacy development examined through psychological, socio-cultural and historical perspectives. Examines reading as an interactive, problem-solving process. Strategies that foster critical thinking, active engagement and social interaction in the teaching of reading and writing across the curriculum. Includes field experience. Field assignments related to licensure and content area. Prereq: EDUC 301, EDUC 304, and EDUC 338.

EDJC 337. Adolescent Education Special Methods (3)
For Adolescent and Multi-Age licensure program students. General methods and specific content area methods for planning, implementing and integrating curriculum, evaluating pupil achievement, and teaching to individual differences. Aligned with Ohio Department of Education's Competency-Based Models, Praxis 2, INTASC, and learned Society Guidelines. Emphasis given to strategies related to effective teaching and learning in each licensure content area. Additional emphasis placed on nurturing a risk-taking classroom community responsive both to high standards of performance and to students with diverse backgrounds, abilities, and learning styles. Prereq: EDJC 186, EDUC 301, EDUC 304, and EDUC 338.

EDJC 405C. Adolescent Education Seminar (3)

EDJC 405D. Multi-Age Education Seminar (3)
Continued study of all grades' development, learner achievement, and assessment. Integrates program learning with student teaching experience. Development of the professional portfolio and preparation for job interviewing. Coreq: EDJC 444D and admission to the professional semester.

EDJC 427. Adolescent Education Special Topics (3)
Practical application of issues to pre-student teaching field setting. Taken by adolescent licensure program students the semester preceding student teaching. Issues of conflict negotiation, social justice, curriculum development and school reform as they relate to the secondary school setting. Prereq: Acceptance into pre-student teaching.

EDJC 444C. Adolescent Student Teaching (9)
A full-day, full-semester of teaching in an accredited secondary school under the direction of a classroom teacher qualified in the content area and a university supervisor. Supervision includes personnel with advanced training in the relevant content area. Lab fee required. Coreq: EDJC 405C and admission to the professional semester.

EDJC 444D. Multi-Age Student Teaching (9)
A full-day, full-semester experience of teaching in an accredited secondary school under the direction of a classroom teacher qualified in the content area and a university supervisor. Supervision includes personnel with advanced training in the relevant content areas. Lab fee required. Coreq: EDJC 405D and admission to the professional semester.

(Ohio Teacher Licensure Programs)
Teacher Education may be chosen only as a second major by students whose primary major is in a field in which Case has teacher licensure programs approved by the Ohio Department of Education. Ohio teacher licensure can be attained by those undergraduate students who complete the requirements for licensure candidates specified within their content field (primary major) and a second major in Teacher Education, which comprises 35 credit hours in professional education, 12 hours taken at Case and 23 hours taken at John Carroll University.

Adolescence/Young Adult teacher licensure programs are 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 programs are available in French and Spanish. For information concerning specific content requirements in the respective programs, turn to departmental listings in English, History, Mathematics, Biology, Chemistry, Physics, and Modern Languages and Literatures.

A 3.0 grade point average in all professional education courses and a cumulative overall GPA of 2.5 must be maintained to be recommended for Ohio teacher licensure. Completion of the program does not guarantee award of licensure. The Ohio Department of Education also requires that candidates receive passing scores on the PLT (Principles of Learning and Teaching) and Content Area subtests of the Praxis II examinations, as well as fingerprinting and criminal background check by the Ohio Bureau of Criminal Identification. Once licensed, teachers can apply to transfer Ohio licensure to over 40 states. Individual state departments of education can be contacted for reciprocity details.

Teacher licensure programs are also offered in art education and music education at the undergraduate (Bachelor of Science) and graduate (Master of Arts) levels, and school speech-language pathology personnel licensure can also be attained at the graduate level. For further information, turn to the departmental listing for Art History and Art, Music, and Communication Sciences.

PROGRAM FACULTY
William I. Bauer, Ph.D.
(Kent State University)
Director of Teacher Licensure
Philip Safford, Ph.D.
(University of Michigan)
Associate Director of Teacher Licensure
David Bellini, M.A.
(Cleveland State University)
Educational Psychology Instructor
Rita Saslaw, Ph.D.
(Case Western Reserve University)
Introduction to Education Instructor

DEPARTMENT OF THEATER AND DANCE
Drama And Dance
Eldred Hall: Phone 216-368-4868; Fax 216-368-5184
Mather Dance Center: Phone 216-368-
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 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.

**FACULTY**

Ron Wilson, B.G.S.
(Wichita State University)

Katharine Bakeles Nason Professor in Theater and Department Chair

Director of the MFA Graduate Theater Program, Case/Cleveland Play House

Movement for the actor; acting; playwriting; performance theory

Catherine Albers, M.F.A.
(University of Minnesota)

Associate Professor and Director of Undergraduate Theater Studies

Acting; audition laboratory; business of the business; directing

Russ Borski, M.F.A.
(Northwestern University)

Associate Professor

Stage and lighting design; portfolio; production

Joseph Fahey, Ph.D. (Ohio State University)

Visiting Assistant Professor

History; Dramatic Literature

Gary Galbraith, M.F.A.
(Case Western Reserve University)

Associate Professor

Contemporary dance technique; choreography; dance history; production; artistic director of Mather Dance Ensemble

Shanna Beth McGee, M.F.A.
(University of Georgia)

Associate Professor

Voice

John M. Orlock, M.F.A.
(Pennsylvania State University)

Samuel B. and Virginia C. Knight Professor of Humanities

Acting; performance theory; playwriting; screenwriting

Karen Potter, M.F.A.
(Case Western Reserve University)

Associate Professor and Director of Dance

Contemporary dance technique; choreography; pedagogy

Jerrold Scott, M.F.A.
(University of South Carolina)

Associate Professor

Acting; speech; directing

**Adjunct Faculty**

Lisa Bernd, Ph.D.
(University of Wisconsin-Madison)

Visiting Assistant Professor History; Dramatic Literature

Dean R. Gladden, M.A. (Drexel University)

Adjunct Assistant Professor and General Manager, The Cleveland Play House Urban Arts Administration

Mark Alan Gordon M.F.A. (Ohio university)

Adjunct Associate Professor and Associate Director of the Graduate MFA Program, The Cleveland Play House

Acting; script analysis

**CAREER OPPORTUNITIES**

**Acting**

Actor education in the Department of Theater and Dance prepares majors for acting career opportunities in the American theater and in theater education. Graduates are currently employed nationally and regionally. The Graduate Acting Program collaboration between the University and The Cleveland Play House provides a unique alliance between one of the oldest theater programs in the United States and the nation's first regional theater.

**Dance Training Program**

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.

**UNDERGRADUATE PROGRAMS**

**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 cultures specifically selected to encompass geographic 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)**

Movement and dance structures designed to engage responsibility in group dynamics applied to challenge specific technical components which include time, effort, shape, and kinetic awareness. Prereq: DANC 103.

**DANC 190. Improvisation II (1)**

Continuation of DANC 189. Prereq: DANC 189.

**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 preparation for the subsequent specialized training needs of the actor, dancer, and singer. Prereq: DANC 103 and DANC 104.

**DANC 204. Second-Year Modern Dance Techniques II (3)**
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. Developmental and critical thinking requirements of modern dance 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.

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. Prereq: Consent of department.

DANC 398. Honors Studies II (3)  
Individual projects in dance. Prereq: Consent of department.

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.

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. Choreography I (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. Choreography II (3)  
A perspective of choreographic craft elements through lecture and practical involvement with specified studies. Emphasized are the craft components of time structures. Prereq: DANC 413.

DANC 415. Choreography III (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 IV (3)  
Use of properties, costumes, and scenic elements in both first and second function. (Nth order) applications challenge the functional and aesthetic appropriateness of conjoined choices. Dance structures fully developed under supervision. Prereq: DANC 415.

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.

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 of current research 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 Science that impacts global dancer health and the care and prevention and treatment of dance specific injuries. Participation in the Dancer 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. Prereq: DANC 460.

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 advisement, in accord with production syllabus, and subcommittee approval.


DANC 644. M.A. Project (1-12) Research and development of a Master of Arts project in Theater.

THTR 308. 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 311. Audition Laboratory (1) 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 or consent of department.

THTR 312. Playwriting (3) Theory and practice of dramatic writing, in the context of examples, classic and contemporary. Cross-listed as ENGL 305.

THTR 314. Advanced Playwriting (3) Theory and practice of dramatic writing with special focus on the craft of writing a full-length play. Prereq: THTR 312 or consent of department.

THTR 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. 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. Cross-listed as AMST 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, upperclass status and permission of department.

THTR 331. Play Directing II (3) This course will continue with the basic concepts learned in THTR 330 and will expand those concepts into practical use. Topics will include directing mechanics, ground planning, blocking, and visualization, staging and working with actors. The course will culminate in a directing project. There are three evening labs for this course. Prereq: THTR 330, upperclass status, and permission of department.

THTR 334. Shakespeare: Histories and Tragedies (3) (See ENGL 324.) Cross-listed as ENGL 324.

THTR 335. Shakespeare: Comedies and Romances (3) (See ENGL 325.) Cross-listed as ENGL 325.

THTR 352. Costume Design and Construction (3) Design and ornamentation of stage costumes and accessories. Laboratory. Prereq: 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-realists. Texts reflect both character-based approaches and movement-based approaches to modern actor training. Prereq: THTR 101 and THTR 102 or THTR 103 and THTR 104.

THTR 375. Voice for the Stage I (3) Development of the actor’s vocal instrument. Work in articulation, range, and flexibility. Prereq: Theater 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 aspects of stage management.

THTR 382. Crossing Bridges: The Public Role of Artist in Understanding Disease (3) An in-depth look at the role of the artist in public life and in creating theatrical performance from life experience. The students interact with patients in medical treatment for catastrophic illness and as they understand the experience of disease, they help transform that experience into a performance that gives a voice to the unvoiced in our society. The approved service learning course is offered only as a Senior Capstone and is a demanding challenge for the serious student of theater. Approved SAGES capstone. Prereq: Acting concentration or consent of department.

THTR 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 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 386. Rehearsal and Performance (1) Practicum for students participating in performance in the Department of Theater and Dance, relating to the mainstage productions at Eldred Theater. This course may be repeated, for a maximum total of 2 credits.

THTR 396. Honors Studies I (3) Individual projects in acting, dance, and directing. Prereq: Consent of department.

THTR 397. Honors Studies II (3) Individual projects in acting, design, playwriting, and directing. Prereq: Consent of department.

THTR 399. Independent Study in Theater Arts (1-3) Independent research and project work in areas of acting, design, voice, theater history, playwriting, directing, or theater management.

THTR 401. Advanced Stage Movement I (3) This beginning class focuses on developing flexibility, alignment, strength, concentration and basic motor skills and serves as a base for the remaining three semesters. Yoga and Tai Chi exercises are used to develop flexibility and a relaxation of the breath. Elements of Decroux based corporeal mime technique will strengthen the student’s physical instrument as well as address alignment problems. Motor skills (articulations, inclinations and design work) will be developed with Decroux, as well as LeCoq based exercise. This work will be accompanied by Tai Chi and Aikido based chi energy work to develop the actor’s concentration. Prereq: Must be candidate in M.F.A. Acting program.

THTR 402. Advanced Stage Movement II (3) Continuation of THTR 401. The course focuses on simplifying and empowering motor activity by continuing to connect breath to action to discover relaxation within the given task, and beginning work in characterization. Strength, flow, energy and...
Continued laboratory for the exploration of alignment and vocal skills supportive of healthy vocal functioning. Continued exploration of the body and voice as it relates to breath, articulation, resonance, and the healthy exhalation of sound. Emphasis on the physical and energetic skills needed to produce full-bodied, healthy sound capable of being heard and understood while acting in theatrical productions. Required of M.F.A. candidates in the Acting program. Prereq: THTR 473.

THTR 475. Voice for Stage: Shakespeare (3) Development of skills needed to address the specific needs of Shakespeare in performance, including vocal skills, the use of breath, using imagery, and textual studies. Required of M.F.A. candidates in the Acting program.

THTR 479. American Stage Speech (2) Designed to evaluate the graduate student's 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, Performance, and Production (1-3) (See THTR 385.)

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 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) For design graduates in Theater Arts.

THTR 521. Advanced Problems/Design I (3) For design graduates in Theater Arts.

THTR 522. Advanced Problems/Design II (3) For design graduates in Theater Arts.

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. Integration of rehearsal discoveries into a practical performance situation. 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 situation. 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, the coaching of vocal performances, 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. Exercising 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 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: THTR 421 and 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 to understand 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 third-year M.F.A. Acting students enrolled in THTR 640. Coreq: THTR 640.

**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. Coreq: THTR 641.

**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. Satisfaction of 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. Satisfaction of 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 644. M.A. Project (1-12)**
Research and development of a Master of Arts project in Theater

An undergraduate major in the department can lead to the Bachelor of Arts degree. The Bachelor of Arts program is a diverse course of study in all the basic crafts of the theater: acting, dance, design, costuming, playwriting, directing and theater history. The undergraduate program is designed to integrate the various elements of theater to prepare students to pursue their chosen field of specialization after graduation. This degree requires 42 to 60 semester hours in theater and is available with areas of concentration in acting, dance, general theater, dramatic writing, directing, theater in society, and design/technical theater.

**BACHELOR OF ARTS**
The Bachelor of Arts program in theater offers concentrations in general theater, acting, contemporary dance, or design/technical theater, and dramatic writing.

- **Drama:** http://www.cwru.edu/artsci/thtr/
- **Dance:** http://Dance.cwru.edu

The following are the basic courses required for all theater majors.

**(see listing for the course descriptions)**

- **THTR 101, 102, 103, 123, 124 (121,122), 201. (18 hrs.)**

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.

**Courses Required by Concentration: General Theater:** (27 Hrs.)

- **THTR 223, 224, 228, 229, 231 or 232, 329, 331, 375, 312 or 327.**
- **Total hours, not including THTR 385/386 - 39**

**Acting:** (31 Hrs.)

- **THTR 228, 229, 231, 232, 306, 311 (1 hr.), 331, 375, 376, 223 or 224 or 352, 327 or 329.**
- **Total hours, not including THTR 385/386 - 43**

**Design/tech:** (30 Hrs.)

- **THTR 105, 223, 224, 228, 229, 331, 352, 380, 327 or 329, or 440**
- **Total hours, not including THTR 385/386 - 42**

**Dramatic Writing:** (30 Hrs.)

- **THTR 223, 228, 229, 312, 314, 316, 327, 329, 331, 399**
- **Total hours, not including THTR 385/386 - 42**
- **All majors are encouraged to apply for Honors Studies, THTR 397 and 398, in their final year. This adds 6 hours to the total.**

**Directing:** (30 Hrs.)

- **THTR 223, 224, 228, 229, 327 or 329, 330, 331, 380, ARTH 272, MUSC 221**
- **Total hours, not including THTR 385/386 - 42**

**Theater and Society:** (21)

- **THTR 228, 229, or 370, 312, 327 or 329, 330, 352**
- **An additional 9-10 hours from a variety of course options, to be scheduled with an advisor.**

**Minor (For the B.A.)**

**Concentration for the Minor**

- **Hours: 18**
  1. General Theater: THTR 101, 103, 223 or 224 or 352, and 228 or 229 or 327 or 325 or 370.
  2. Acting: THTR 101, 102, 231, 228, 229 and 375.
  3. Design/tech: THTR 105, 228, 229; two of the following: 223, 224, or 352, and one of the following: 329 or 327.
  4. Directing: THTR 228, 229, 223 or 224, 327, 330, 331
  5. Dramatic Writing: THTR: 101, 228, 229, 312, 316, 330
  6. Theater and Society: There is no minor concentration in this area.

**Humanities Sequence**
**(for the B.S.-based Engineering Core)**

- **Hours: 9**
  Note: All sequences must include THTR 123 or 124 and TWO additional courses selected in consultation with advisor.

**Sample Programs:**

1. Acting THTR 123 or 124, 101, 102.
2. Stagecraft: THTR 123 or 124, 105, and 223 or 224.
3. Costume Crafts and History: THTR 123 or 124, 352, and one of the following: 228, 229 or 327.
Dance
The following are the basic courses REQUIRED for all Theater/Dance majors. (see listing for course descriptions)
- DANC 103 or 104, 160 or 161, 121, 122 and THTR 101 (12 hrs.)
- At least 4 but not more than 8 hours of DANC 385/386 and 6 hours of English above the 300 level. The department strongly recommends ENGL 324 and 325.

Courses REQUIRED for Dance Concentration: (29 hrs.)
- DANC 189 or 190, 203 and 204, 260 or 261, 413, 423, 303, 304, 451, and one of the following: 414 or 415 or 416 and 445 or 455.
- Total hours, not including DANC 385/386 – 41 hrs.
- All majors are encouraged to apply for Honors Studies, DANC 397 and 398, in their final year. This adds 6 hours to the total.

Substitutions Made At The Discretion Of The Academic Representative
Minor (For the B.A.)
Concentration for the Minor
Hours: 18
- DANC: 103, 104 (or 160, 161), 203, 204 (260 or 261), 303, 304.

Humanities Sequence
(for the B.S.- based Engineering Core)
Hours 9
Sample Program in Dance:
- DANC: 121, 122, and one of the following 103, 104, 160, 161

DEPARTMENTAL HONORS
Majors wishing to take a Bachelor of Arts degree with honors in theater and dance 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 chairperson. Those accepted register for THTR 397 and 398 (Honors studies) or DANC 397, 398 during their senior year, a total of 6 hours. The honors project is defined as a production project in acting, design, playwriting, directing, management/outreach or dance. 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 and Dance” on their diplomas. Information about the structure and specific requirements of the honors project is available from the Director of Undergraduate Theater Studies.

GRADUATE PROGRAM
Master of Arts
Although the Department of Theater and Dance’s Graduate Dance Program is geared toward the Master of Fine Arts degree, the appropriate candidate may select or be encouraged to direct their graduate studies in pursuit of the Master of Arts degree, a 30-hour degree program. The focus of the studies may include similar course work to the Master of Fine Arts, while also facilitating particular studies that may be enhanced or assisted by related studies both within the Department of Theater Arts as well as with other complementary studies in other departments. The candidate’s program of study will be designed by the primary faculty of the Dance Program within the Department of Theater Arts. As required by the School of Graduate Studies, a minimum grade point average of 2.75 must be maintained.
M.A. candidates must complete a minimum of 30 hours following a recommended program similar to the courses suggested below. The principle faculty advisor may suggest modifications.
1. 9-12 hours of Technique Classes from: DANC 303/4, 403/4, 460/1
2. 6-9 hours of Choreography from: DANC 413, 414, 415, 416
3. 1-2 hours of Improvisation from: DANC 405/6
4. 12 hours of Eurhythmics from: MUSC 501
5. 3 hours of Kinesiology for Dance from: DANC 445/446- Topics in Dance Medicine, Science, and Wellness
6. 3 hours of Suggested Advanced electives: i.e. DANC 535 (Pedagogy) or 455 (History)
7. 3 hours of Music Resources: DANC 505
8. 2-4 hours of project oriented seminars from: DANC tr. 601, 423 or 451

Recommended is Plan B with requirements including a non-performance, non-production 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
The Master of Fine Arts degree, available with concentrations in acting and contemporary dance, is a terminal pre-professional degree with candidacy limited to students who wish to serve the professional theater. Candidacy for the Master of Fine Arts program requires either an undergraduate major in the field of theater arts, equivalent training and experience, or demonstrable potential for work in the theater arts at the Master of Fine Arts 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 their work in the department. Only students who have clearly demonstrated growth and excellence are permitted to remain in the program. The award of the Master of Fine Arts 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 serve the theater on a professional level.

Requirements for the Master of Fine Arts 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. Performance in the Mather Dance Center mainstage season, or successful completion of the Third Year Internship at the CPH.

Specific requirements in each area of emphasis include:

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COLLEGE OF ARTS & SCIENCES
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. The level of involvement with the Play House increases every semester, and in the third year the graduates become the professional apprentices in the Play House Company.
1. Eighteen semester hours of acting including script analysis, implementation of acting theory, characterization, and Shakespeare.
2. Seven to twelve semester hours of movement chosen from period movement, stage combat, and commedia.
3. Ten to twelve semester hours of voice chosen from voice production, articulation, and interpretation, dialects, verse and lyric drama, and Shakespeare.
4. Twelve semester hours of performance theory and professional seminars.
5. Up to six semester hours, under advisement, in allied fields.

Contemporary Dance
1. Eighteen semester hours of dance technique.
2. Twelve semester hours of choreography.
3. Four semester hours (two each) of light and costume design.
4. Two semester hours of eurythmics, MUSC 501.
5. Three semester hours of contemporary dance history.
6. Two semester hours of music resources.
7. 12-15 semester hours under advisement from among kinesiology, pedagogy, and/or allied fields.
8. Six semester hours of creative thesis.
Required Total: 60 hours

National Theater Institute
The Department of Theater and Dance has an affiliation with the National Theater Institute, located in Waterford, Connecticut, for both their Moscow semester and the semester at NTI. This prestigious program gives our students the opportunity to be exposed to the best in concentrated theater training, as well as providing a different and unique cultural perspective. Full credit is available with no loss of scholarship aid. This is available for either semester. See the Director of Undergraduate Theater Studies for more information.

Junior Year Abroad
Many of our Drama students go abroad for either one semester at the BADA Program (British American Drama Academy) or a full year in many other programs. The BADA program is a conservatory based intensive in all aspects of actor training, with full credit transfer and no loss of financial aid. In Dance, there are opportunities for semesters abroad with the London Contemporary School of Dance and Yildiz University in Istanbul, Turkey. For more information on this and other programs, contact the Head of Undergraduate Theater Studies or the Academic Representative for Dance.

WASHINGTON STUDY PROGRAM
111 Mather House
Phone 216-368-2696
Alexander P. Lamis, Director
Alexander.lamis@case.edu

Students receive credit for interning in Washington, D.C., through the Washington Center Program. The emphasis is on practical 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 9 hours for their internship course (WASH 002A). For a summer internship, students receive 3 credit hours (WASH 002D). In addition, students receive 3 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 department(s).

WASH 002A. Washington Center Internship (9)
Credit for semester-length internship experience taken as part of the Washington Center Program during Fall or Spring terms.

WASH 002B. 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 002C. Washington Center - Portfolio (3)
Credit for the student’s portfolio taken as part of the Washington Center Program.

WASH 002D. Washington Center Summer Internship (3)
Credit for semester-length internship experience taken as part of the Washington Center Program during Summer term

WOMEN’S STUDIES PROGRAM
301 Guilford House
Phone 216-368-2303; Fax 216-368-2216
Margaretmary Daley, Director

PROGRAM FACULTY
Alice Bach, Ph.D. (Union Theological Seminary)
Archbishop Hallinan Associate Professor of Catholic Studies, Religion
Bible, women and religion, religion and film, cultural theory.
Mary D. Barkley, Ph.D. (UC, San Diego)
M. Roger Clapp University Professor of Arts & Sciences and Professor of Chemistry
Diana Bilimoria, Ph.D. (University of Michigan)
Associate Professor of Organizational Behavior
Susan S. Case, Ph.D. (State University of New York at Buffalo)
Associate Professor of Organizational Behavior
M. Gabriela Copertari, Ph.D. (Georgetown University)
Assistant Professor of Spanish
Margaretmary Daley, Ph.D. (Yale University)
Associate Professor of German and Comparative Literature
Eighteenth- and nineteenth-century German literature; German women writers; women’s studies; feminist literary criticism.
Gilbert Doho, Ph.D. (University of Sorbonne Nouvelle)
Associate Professor of Modern Languages and Literatures
Kimberly K. Emmons, Ph.D. (University of Washington)

SPECIAL PROGRAMS
The Marc A. Klein Playwriting Award
The Department of Theater Arts serves as the production agency for the Marc A. Klein Playwriting Competition, an annual national award designed to encourage and stimulate artistic growth among student playwrights, which features a cash prize of $1,000 and a full mainstage production. The Klein award has been responsible for the pre-professional production of a number of scripts that have moved on to Broadway, Off-Broadway, and regional theaters.
Assistant Professor, English  Discourse Analysis; medical discourse, gender and language, rhetoric and composition.
Christopher Flint, Ph.D.  (University of Pennsylvania)
Associate Professor of English
Atwood D. Gaines, Ph.D.  (UC, Berkeley)
Professor of Anthropology, Psychiatry, Bioethics, and Nursing
Mary Grimm, M.A.  (Cleveland State University)
Associate Professor of English
Anna Helmreich, Ph.D.  (Northwestern University)
Associate Professor of Art History
Laura E. Hengehold Ph.D.  (Loyola University of Chicago)
Assistant Professor, Philosophy
Political and social philosophy; philosophy of feminism; Foucault; continental philosophy.
Susan W. Hinze, Ph.D.  (Vanderbilt University)
Associate Professor, Sociology
Medical sociology; social inequality, sex and gender.
Janis H. Jenkins, Ph.D.  (University of California, Los Angeles)
Professor, Anthropology; Associate Professor of Psychiatry, School of Medicine
Jill Korbin, Ph.D.  (UCLA)
Professor of Anthropology
Ellen G. Landau, Ph.D.  (The University of Delaware)
Professor of Art and Art History
Marixa Lasso, Ph.D.  (University of Florida)
Assistant Professor of Latin American History
Marie Lathers, Ph.D.  (Brown University)
Treuhaft Professor of French and Comparative Literature
Women and the visual arts; Nineteenth-century French literature and the arts; Gender, science, and technology; Feminist theory.
Miriam Levin, Ph.D.  (University of Massachusetts)
Associate Professor of History
Colin McClarty, Ph.D.  (Case Western Reserve University)
Associate Professor of Philosophy and Mathematics
Heather Meakin, Ph.D.  (Hertford College, Oxford)
Assistant Professor, English
Renaissance literature, women's studies.
Dorothy Miller, D.S.W.  (Columbia University)
Director of Flora Stone Mather Center for Women
Jacqueline C. Nanfio, Ph.D.  (University of California, Los Angeles)
Associate Professor, Spanish and Comparative Literature
Colonial and 19th-century Latin American literature; Golden Age Hispanic literature; literary theory; Chicano literature; contemporary Latin American women writers.
Jonathan Sadowsky, Ph.D.  (The Johns Hopkins University)
Associate Professor of History
Renee Sentilles, Ph.D.  (College of William and Mary)
Associate Professor, History
American women's history; cultural history; American studies.
Cheryl Toman, Ph.D.  (University of Illinois, Urbana-Champaign)
Assistant Professor, French
French and Francophone literature, Cameroonian feminist writing.
Thirty Umrigar, Ph.D.  (Kent State University)
Assistant Professor of English
Athena Vrettos, Ph.D.  (University of Pennsylvania)
Associate Professor, English 19th-century British literature and culture; literature and the body; feminist criticism and theory; women writers; 19th-century history of medicine and psychology.
Caroline A. Whitbeck, Ph.D.  (Massachusetts Institute of Technology)
Professor of Philosophy
Rhonda Williams, Ph.D.  (University of Pennsylvania)
Associate Professor, History
African-American history; U.S. social history.
Martha Woodmansee, Ph.D.  (Stanford University)
Professor of English

UNDERGRADUATE (WMST)

WMST 188. On Being a Scientist (1)
(See ASTR 188.) Cross-listed as ASTR 188.

WMST 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. Cross-listed as ENGL 270, HSTY 270, PHIL 270, and RLGN 270.

WMST 222. Gender in U.S. Society (3)
(See SOCI 222.) Cross-listed as SOCI 222.
WMST 232. Women in India (3)
(See HSTY 232.) Cross-listed as HSTY 232.

WMST 312. Women in the Ancient World (3)
(See CLSC 312.) Cross-listed as CLSC 312.

WMST 322. Feminist Theory, Women's History, Gender History (3)
(See HSTY 322.) Cross-listed as HSTY 322.

WMST 326. Women in Societies in the Modern World (3)
(See SOCI 326.) Cross-listed as SOCI 326.

WMST 335. Women in Developing Countries (3)
(See FRCH 335.) Cross-listed as FRCH 335.

WMST 372. Work and Family: U.S. and Abroad (3)
(See SOCI 372.) Cross-listed as SOCI 372.

WMST 383. Gender Issues in Feminist Art (3)
(See ARTH 383.) Cross-listed as ARTH 383.

WMST 422. Feminist Theory, Women's History, Gender History (3)
(See WMST 322.) Cross-listed as HSTY 422.

The goal of the Women's 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) historicized and cross-cultural accounts of gender and gender inequality; (4) literary criticism; (5) contemporary theories of art, performance, language, jurisprudence, psychology and reli-

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gion 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 studies encompasses 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. The program’s focus is the study of women cross-culturally and in history.

Major
The Women’s Studies Program offers a major leading to the Bachelor of Arts degree. It may be elected as a second major only. As a double major, the program offers a sound course of study, with a disciplinary concentration grounding the interdisciplinary program objective. To declare a women’s studies major, students must have already declared their first major. Up to six hours credits in required or elective courses for the first major may be applied to the women’s studies major, with the exception of two women’s studies core classes.

Required Courses (6 hours)
In the required two courses, students will become fluent in the tools of research and interpretation currently used in women’s studies. WMST 201 Introduction to Gender Studies (cross listed as HSTY 270/ENGL 270/PHIL 270, RLGN 270) and a capstone class in one of the following disciplines: ANTH 365 Seminar in Women and Gender Studies, ENGL 371 Topics in Women’s Studies, or HSTY 400 Seminar in Women’s Studies. Major courses: 24 credit hours in approved women’s studies courses, at least two from each of the three areas listed.

Minor
The program in women’s studies also offers an undergraduate minor. Fulfillment of the minor requires completion of eighteen credit hours according to the following course distribution:
• Introduction to Gender Studies (offered every spring semester)
• Four approved courses (see partial list below)

- Independent study

To help ensure a comprehensive course of study in a particular area of interest, the specific combination of courses and structure of the independent study must be approved by the program advisor.

Available approved courses:
- ANTH 306 Anthropology of Childhood and the Family
- ANTH 309 Child Abuse and Family Violence
- ANTH 345 Ethnicity, Gender and Mental Health
- ANTH 354 Women and International Health
- ANTH 356 Gender and Sex Difference: Cross Cultural Perspectives
- ANTH 505 Women and Mental Health
- ANTH 508 Maternal and Reproductive Health
- ANTH 542 Human Body: Discourse and Experiences
- ARTH 383 Gender Issues in Feminist Art
- ECON 333 Women in the Economy
- ENGL 368J Images of Women in American Cinema
- ENGL 370 Women Writers
- ENGL 371 Topics in Women’s Studies
- ENGL 376 Images of Women in French Literature
- FRCH 376 Images of Women in French Literature
- HSTY 240 The Body in History
- HSTY 313 Women in Modern European History
- HSTY 321 Colonialism, Sex, Race and Gender
- HSTY 350 Gender Issues in the History of Technology and Science
- HSTY 353 Women in American History I
- HSTY 354 Women in American History II
- JAPN 341 Japanese Women Writers
- LAWS 356 Feminist Jurisprudence
- NURS 454 Well Woman Health Care
- PHIL 325 Philosophy of Feminism
- PHIL 334 Social and Political Philosophy
- POSC 346 Women and Politics
- PSCL 390 Women and Depression
- RLGN 207 Religion and Feminism
- RLGN 266 Bible in Fiction; Fiction In the Bible
- RLGN 366 Religion and Film
- SOCI 222 Gender in U.S. Society
- SOCI 326 Women in Societies in the Modern World
- SOCI 372 Women and Family in the United States
- SPAN 342 Latin American Women Authors
- THTR 338 Women in Theater

WORLD LITERATURE PROGRAM
103 and 106 Guilford House
Phone 216-368-8983; Fax 216-368-2216
Marie Lathers and William Marling, Co-Directors

FACULTY
(PROGRAM COMMITTEE)
Marie Lathers, Ph.D. (Brown University)
Treuhaft Professor of French and Humanities, Program Co-Director
Women and the visual arts; nineteeth century French literature and the arts; gender, science, and technology; feminist theory; space studies
William H. Marling, Ph.D.
(University of California, Santa Barbara)
Professor of English, Program Co-Director
American literature; modernism
Florin Berindeanu, Ph.D.
Visiting Assistant Professor of World Literature and Italian Medieval and Renaissance studies; mysticism; poetry; literary theory
Antonio Candau, Ph.D.
(University of Massachusetts, Amherst)
Associate Professor of Spanish
Nineteenth- and Twentieth-century Peninsular Spanish Literature; José María Merino, Luis Mateo Díez, Juan Goytisolo, and Clarín; Autobiography
Martin Helzle, Ph.D.
(Cambridge University)
Professor of Classics
Latin language and literature; Augustan and Silver poetry; paleography and textual criticism
William R. Siebenschuh, Ph.D.
(University of California, Berkeley)
Professor of English
18th- and 19th-century literature

Program
The program in World Literature 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 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.

Comparative courses and courses on individual authors, periods, and literatures are offered. Students who major or minor in World Literature learn to approach literature from a truly multi-cultural and multi-lingual standpoint. They also become conversant in the major schools of literary criticism and theory.

Major in World Literature (33 hours)
The World Literature program offers a major leading to the Bachelor of Arts degree. Majors in World Literature take three foundational courses (WLIT 211, 212, and one of the following: ENGL/WLIT 290, 291, CLCS/WLIT 203, 204); either Translation or Literary Theory (WLIT 388 or ENGL/WLIT 387); two courses in literature at the 300-level in a language other than English (see Modern Languages and Literatures and Classics offerings); WLIT 390; and 12 credits of electives, chosen in consultation with the World Literature faculty adviser.

Minor in World Literature (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 adviser. These are normally chosen from World Literature, Modern Languages and Literatures, English, and Classics offerings. At least one of these must be a course in a literature originally not in English, although it may be in translation.

UNDERGRADUATE HONORS IN WORLD

Literature
The Honors Program in World Literature is for especially talented and dedicated majors. Requirements for Honors are: 1) a grade point average of at least 3.5 in the major; 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 (WLIT 397 and 398; these count beyond the 33 hours required for the major). The thesis is supervised by a WLIT faculty adviser and must be approved by a second faculty member. It must 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 is available in the departmental offices; it must be completed by the end of the second week of classes in each of the two semesters.

GRADUATE PROGRAM
The program offers the Master of Arts degree in World Literature in cooperation with the Departments of English and Modern Languages and Literatures; the emphasis is on Francophone and Anglophone literatures. Interested students should consult with one of the program directors.

Available Approved Courses
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 (WLIT)

WLIT 203. Heroes, Myth, and Performance in Greek Literature (3)
(See CLSC 203.) Cross-listed as CLSC 203.

WLIT 204. Heroes and Hustlers in Latin Literature (3)
(See CLSC 204.) Cross-listed as CLSC 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, Sei Shonagon, Basho, and the Baghavad 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, Lusipctor, Marmon Silko, Soyinka.

WLIT 225. Japanese Popular Culture (3)
(See JAPN 225.) Cross-listed as JAPN 225.

WLIT 228. Theater History I (3)
(See THTR 228.) Cross-listed as THTR 228.

WLIT 229. Theater History II (3)
(See THTR 229.) Cross-listed as THTR 229.

WLIT 235. Asian Cinema and Drama (3)
(See ASIA 235.) Cross-listed as ASIA 235.

WLIT 245. Classical Japanese Literature in Translation (3)
(See JAPN 245.) Cross-listed as JAPN 245.

WLIT 255. Modern Japanese Literature in Translation (3)
(See JAPN 255.) Cross-listed as JAPN 255.

WLIT 285. The Hispanicophone World (3)
(See SPAN 285.) Cross-listed as SPAN 285.

WLIT 290. Masterpieces of Continental Fiction (3)
(See ENGL 290.) Cross-listed as ENGL 290.

WLIT 291. Masterpieces of Modern Fiction (3)
(See ENGL 291.) Cross-listed as ENGL 291.

WLIT 295. The Francophone World (3)
(See FRCH 295.) Cross-listed as FRCH 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.

WLIT 308. The Paris Experience (3)
(See FRCH 308.) Cross-listed as FRCH 308.

WLIT 314. Love Poetry from Sappho to Shakespeare (3)
(See CLSC 314.) Cross-listed as CLSC 314.

WLIT 335. Women in Developing Countries (3)
(See FRCH 335.) Cross-listed as FRCH 335.

WLIT 345. Japanese Women Writers (3)
(See JAPN 345.) Cross-listed as JAPN 345.

WLIT 355. Modern Japanese Novels and the West (3)
Comparing a selection of modern Japanese novels with their Western counterparts, this course will clarify Japan’s premodern sensibility and its transformation after the Meiji Restoration (1868). Comparisons will focus on a group of interrelated themes such as modernity/modernism, alienation, innocence, death, male-female relationships, and Nature. All readings are in English translation. No prior training in Japanese language or culture required.

WLIT 363H. African-American Literature (3)
(See ENGL 363H.) Cross-listed as ENGL 363H.

WLIT 365. German Literature in Translation (3)
(See GRMN 365.) Cross-listed as GRMN 365.

WLIT 365E. The Immigrant Experience (3)
(See ENGL 365E.) Cross-listed as ENGL 365E.

WLIT 365N. Topics in African-American Literature (3)
(See ENGL 365N.) Cross-listed as ENGL 365N.
WLIT 365Q. Post-Colonial Literature (3)  
(See ENGL 365Q.) Cross-listed as ENGL 365Q.

WLIT 366G. Minority Literatures (3)  
(See ENGL 366G.) Cross-listed as ENGL 366G.

WLIT 368A. Film History, Theory, and Criticism (3)  
(See ENGL 368A.) Cross-listed as ENGL 368A.

WLIT 368C. Topics in Film (3)  
(See ENGL 368C.) Cross-listed as ENGL 368C.

WLIT 375. Russian Literature in Translation (3)  
(See RUSN 375.) Cross-listed as RUSN 375.

WLIT 385. Hispanic Literature in Translation (3)  
(See SPAN 385.) Cross-listed as SPAN 385.

WLIT 387. Literary and Critical Theory (3)  
(See ENGL 387.) Cross-listed as ENGL 387.

WLIT 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. Prereq: Language other than English to the 202 level.

WLIT 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.

WLIT 395. French Literature in Translation (3)  
(See FRCH 395.) Cross-listed as FRCH 395.

WLIT 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. Permit required. Prereq: Senior status and consent of department.

WLIT 398. Honors Thesis II (3)  
Continuation of WLIT 397. Permit required. Prereq: Senior status, consent of department and WLIT 397.

WLIT 399. Independent Study (1-3)  
For majors and advanced students under special circumstances. Permit required. Prereq: Consent of department.

WLIT 400. The City in Literature (3)  
(See WLIT 300.) Prereq: Graduate standing.

WLIT 408. The Paris Experience (3)  
(See FRCH 408.) Prereq: Graduate standing. Cross-listed as FRCH 408.

WLIT 435. Women in Developing Countries (3)  
(See FRCH 435.) Cross-listed as FRCH 435.

WLIT 463H. African-American Literature (3)  
(See ENGL 463H.) Cross-listed as ENGL 463H.

WLIT 465E. The Immigrant Experience (3)  
(See ENGL 365E.) Cross-listed as ENGL 465E.

WLIT 465N. Topics in African-American Literature (3)  
(See ENGL 465N.) Cross-listed as ENGL 465N.

WLIT 465Q. Post-Colonial Literature (3)  
(See ENGL 465Q.) Cross-listed as ENGL 465Q.

WLIT 466G. Minority Literatures (3)  
(See ENGL 366G.) Cross-listed as ENGL 466G.

WLIT 468A. Film History, Theory, and Criticism (3)  
(See ENGL 468A.) Cross-listed as ENGL 468A.

WLIT 468C. Topics in Film (3)  
(See ENGL 368C.) Cross-listed as ENGL 468C.

WLIT 485. Hispanic Literature in Translation (3)  
(See SPAN 385.) Prereq: Graduate standing. Cross-listed as SPAN 485.

WLIT 487. Literary and Critical Theory (3)  
(See ENGL 387.) Cross-listed as ENGL 487.

WLIT 488. Translation (3)  
(See WLIT 388.) Prereq: Graduate standing.

WLIT 490. Topics in World Literature (3)  
(See WLIT 390.) Prereq: Graduate standing.

WLIT 495. French Literature in Translation (3)  
(See FRCH 395.) Prereq: Graduate standing. Cross-listed as FRCH 495.

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 and consent of department.

WLIT 601. Independent Study (1-18)  
For graduate students under special circumstances. Prereq: Graduate standing and consent of department.
MANDEL CENTER FOR NONPROFIT ORGANIZATIONS

The Mandel Center for Nonprofit Organizations, currently ranked among the top graduate business programs with a specialty in nonprofit organizations in the nation, offers the most comprehensive nonprofit leadership and management education programs in the United States. This university-wide academic center, founded in 1984, is a partnership of the Mandel School of Applied Social Sciences, the Weatherhead School of Management, the School of Law, and the College of Arts and Sciences. These schools have joined together to address the growing need for the professional education of leaders and managers of nonprofit organizations and to foster and disseminate research on the nonprofit sector. The Mandel Center’s mission is to enhance the effectiveness of nonprofit leaders and managers and the organizations they serve through education, research, and community service.

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 (EDM) 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 & 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 adults working in youth-serving organizations.

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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 Case’s Mandel School of Applied Social Sciences, the Weatherhead School of Management, and the School of Law.

Professional Development
Programs provide graduates of the Center and the nonprofit community with the tools to enhance nonprofit practices and address difficult social and community issues. New initiatives in this area are sometimes developed and implemented in collaboration with community groups and funders.

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 the peer-reviewed journal,

Nonprofit Management and Leadership
Founded in 1990 and administered by the Mandel Center. Nonprofit research projects and papers are also shared with students and the community through forums and lectures.

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>Course</th>
<th>Description</th>
<th>Credit</th>
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<tbody>
<tr>
<td>MAND 401</td>
<td>Introduction to the Nonprofit Sector</td>
<td>3</td>
</tr>
<tr>
<td>MAND 405</td>
<td>Ethics and Professionalism for Nonprofit Leaders</td>
<td>3</td>
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<tr>
<td>MAND 409A</td>
<td>Strategic Planning for Nonprofit Organizations: Practicum I</td>
<td>3</td>
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<tr>
<td>MAND 409B</td>
<td>Strategic Planning for Nonprofit Organizations: Practicum II</td>
<td>3</td>
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<tr>
<td>MAND 410</td>
<td>Quantitative Analysis for Nonprofit Organizations</td>
<td>3</td>
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<tr>
<td>MAND 411</td>
<td>Nonprofit Leadership Dialogs: Major Trends and Issues</td>
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<td>MAND 420</td>
<td>Nonprofit Organization &amp; Management</td>
<td>3</td>
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<td>MAND 424</td>
<td>Economics for Nonprofit Managers</td>
<td>3</td>
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<tr>
<td>MAND 425</td>
<td>Financial Accounting &amp; Reporting for Nonprofit Organizations</td>
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<td>MAND 426</td>
<td>Financial Management for Nonprofit Organizations</td>
<td>3</td>
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<tr>
<td>MAND 430</td>
<td>Managing Human Resources in Nonprofit Organizations</td>
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<tr>
<td>MAND 450</td>
<td>Law of Nonprofit Organizations</td>
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**Elective Courses (27 Credits)**

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<th>Course</th>
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<td>MAND 406</td>
<td>Nonprofit Public Policy and Advocacy</td>
<td>3</td>
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<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>
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<tr>
<td>MAND 412</td>
<td>Leadership for Nonprofit Organizations</td>
<td>3</td>
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<tr>
<td>MAND 422</td>
<td>Organizational Assessment &amp; Program Evaluation in Nonprofit Organizations</td>
<td>3</td>
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<td>MAND 423</td>
<td>Government Funding for Nonprofit Organizations</td>
<td>3</td>
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<td>MAND 427</td>
<td>International Non-Governmental Organizations</td>
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<td>MAND 432</td>
<td>Marketing for Nonprofit Organizations</td>
<td>3</td>
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<td>MAND 440</td>
<td>Management Information Systems for Nonprofit Organizations</td>
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<td>MAND 444</td>
<td>Program Design in Nonprofit Organizations</td>
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<td>Management of Community-Based Development</td>
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<td>MAND 486</td>
<td>Leading and Managing Nonprofit Arts and Cultural Organizations</td>
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<td>MAND 489</td>
<td>Trusteeship: The Governance of Nonprofit Organizations</td>
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<td>MAND 495A</td>
<td>Decision Making for Nonprofit Leaders</td>
<td>3</td>
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<tr>
<td>MAND 501</td>
<td>Special Problems and Topics (directed study)</td>
<td>1-6</td>
</tr>
</tbody>
</table>

Electives can also be selected from courses offered by other Case schools from the Mandel Center’s List of Pre-Approved Electives or other courses at the discretion of the Mandel Center faculty.

**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 below). CNM students may also wish to attend sessions of the Nonprofit Leadership Dialogs series (MAND 411). 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 managers and practitioners with at least 10 years of professional experience and five years of managerial 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 in the standard M.N.O. program will not be permitted to transfer to this option once they have matriculated in the 60-hour program.

**Graduate Certificate Programs**

The graduate Certificate programs provide a flexible foundation for students to pursue either the M.N.O. degree, the M.N.O. - Executive Option, or another Master’s degree. The Certificate programs are designed to provide a solid foundation in the professional practice of nonprofit sector management and leadership.

**Certificate in Nonprofit Management**

The Certificate in Nonprofit Management is a non-degree professional certificate consisting of 15 credit hours of graduate-level coursework. The Certificate in Nonprofit Management is designed for students who have completed an undergraduate degree and who wish to develop a foundation in nonprofit management and leadership. The Certificate program offers the opportunity to gain knowledge and skills in key areas of nonprofit management, including financial management, human resource management, and strategic planning.

**Certificate in Nonprofit Management - Executive Option**

The Certificate in Nonprofit Management - Executive Option is a non-degree professional certificate consisting of 15 credit hours of graduate-level coursework. The Certificate in Nonprofit Management - Executive Option is designed for working professionals who wish to develop a foundation in nonprofit management and leadership. The Certificate program offers the opportunity to gain knowledge and skills in key areas of nonprofit management, including financial management, human resource management, and strategic planning.

**Certificate in Nonprofit Management - Executive Option - Part-Time Option**

The Certificate in Nonprofit Management - Executive Option - Part-Time Option is a non-degree professional certificate consisting of 15 credit hours of graduate-level coursework. The Certificate in Nonprofit Management - Executive Option - Part-Time Option is designed for working professionals who wish to develop a foundation in nonprofit management and leadership. The Certificate program offers the opportunity to gain knowledge and skills in key areas of nonprofit management, including financial management, human resource management, and strategic planning.
the Master of Nonprofit Organizations degree (M.N.O.) with a degree from the Mandel School of Applied Social Sciences (M.N.O./M.S.S.A.), the School of Law at Case Western Reserve University (M.N.O./J.D.), or the Department of Music in the School of Graduate Studies (M.N.O./M.A.).

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.N.O./M.S.S.A.
This program combines the 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 either program 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 MSSA courses.

For more information on the M.S.S.A. degree, please visit the http://msass.case.edu/academic/.

M.N.O./J.D.
This program combines the M.N.O. degree with the Juris Doctor degree (J.D.). It provides preparation for students who desire to practice law within a nonprofit organizational context, serve as managers in nonprofit organizations, or work in the area of planned giving.

New students can apply to either program simultaneously or separately. 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 of law school.

For more information on the J.D. degree, please visit the http://law.case.edu/curriculum/.

M.N.O./M.A.
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.

For more information on the MA degree, please visit the http://music.case.edu/programs.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. Because of the double counting of nine credit hours of course work, students completing the CNM and M.B.A. concurrently will have a 69-hour (53-hour in the accelerated track) program requirement.

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.

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).

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, please visit http://weatherhead.case.edu/mba/.

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 excellent preparation for students who have a professional interest in economic and community development and the management of nonprofit organizations.

The program consists of five Mandel Center courses, as well as Legislative and Political Processes, a Mandel School course. MSASS students interested in the M.S.S.A./CNM should contact their advisor or the Mandel Center for more information.

Students should apply simultaneously to both the M.S.S.A. and CNM programs.

For more information on the M.S.S.A. degree, please 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 who desire to practice law as it relates to nonprofit organizations, serve as managers of nonprofit organizations, or work in the area of planned giving.

The program consists of five courses. The 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 semester in the J.D. program.

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 1.800.435.6669 or contact:

Director of Recruitment
216.368.6025
Email: mcnoadmissions@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 Form. 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 Recommendations 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). GMAT scores should be sent to the Weatherhead School of Management, Code WTJF110. 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 the following are not required:

a. A completed baccalaureate degree, since students who complete the CNM receive a credential rather than a degree. Applicants are still required to provide official sealed transcripts from each institution attended, including any current institution.*
b. A GMAT score.

d. 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 either the fall or spring semesters. The deadline for the fall semester is June 1, and for the spring semester, December 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
Email: mcnoadmissions@case.edu
http://www.case.edu/mandelcenter/grad/
CAREER DEVELOPMENT AND MANAGEMENT

The Mandel Center provides career assistance and externship and mentoring opportunities. In addition, nonprofit job openings are posted each Friday and can be accessed at the MSASS Job Bulletin website. There are also a number of career resources listed on the Case Career Center website.

Externships are optional experiences that enable students to gain valuable professional experiences, often by working on a special project, in a nonprofit setting. An externship 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.

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 either the Center's Executive Director or the Center's Associate Executive Director for personalized support and discussion around career goals, objectives and opportunities.

FINANCIAL INFORMATION

Tuition

2006-2007 tuition charges for the M.N.O. degree and CNM program are $1,171 per credit or $14,050 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.

Financial Aid

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 30th to the M.N.O. or CNM program is encouraged. Requests for financial assistance received after June 1 will be reviewed and considered based on availability of funds.

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 about registration, contact the Mandel Center at (216) 368-8566.

Course Loads

Full-time graduate students normally register for no more than 15 or less than 9 credits per semester, while part-time students typically register for 6 credits per semester.

Non-Degree Students

Please see the Weatherhead School of Management's policy.

Retention and Graduation Requirements

M.N.O. Program

Retention requirements for continued study in the M.N.O. program

- Minimum GPA after 15 credit hours of study: 2.5
- Minimum GPA after 23 credit hours of study: 2.7
- Minimum GPA after 30 credit hours of study: 3.0
- 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 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.

Time Limitation

All requirements for the M.N.O. degree must be completed within six years from the day of the student's initial registration.

CNM Program

Satisfactory completion of an approved set of five courses (15 credits), along with payment of all tuition and fees is required for graduation. Participants who complete all requirements will be awarded the Mandel Center Certificate in Nonprofit Management.

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 (http://www.case.edu/provost/registrar/transcri.htm)

COURSE DESCRIPTIONS (MAND)

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 underlie 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" experiences 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. Prerequisite: 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.

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 dialogue 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.

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 organizations 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 423. Government Funding for Nonprofit Organizations (3)
This course provides students with practical, hands-on understanding of, and experience with, government support of nonprofit 501(c)(3) organizations. Students learn about and utilize trends, tools, and techniques leading to successfully navigating the maze of government funding. The course will emphasize familiarity with sources of information, the development of effective proposal writing skills, government grant and contract management, government political processes, and an understanding of the culture of government grant review and grant making. Students will experience the advice, counsel, and wisdom of professionals involved with government grant writing review and funding. 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.

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. 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. Prerequisite: 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, (4) and evaluate the key current issues facing nonprofits in the United States.

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.

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.

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 467. Community Organization and Development Strategies (3)
(See SSWM 567.) Eligible for M.B.A. credit. Cross-listed as SSWM 567.

MAND 469. Management of Community Based Development (3)
(See SSWM 569.) Eligible for M.B.A. credit. Prereq: MAND 467. Cross-listed as SSWM 569.

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 495A. Decision Making for Nonprofit Leaders (3)
This course introduces students to decision-making strategies and techniques appropriate for use by leaders and managers of nonprofit organizations.
The Mandel School believes that advanced practitioners are strategists of change, working in partnership with others to enhance the caring capacity of communities. The school is committed to preparing advanced practitioners to become life-long 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.

The Mandel School counts among its alumni many prominent educators, government officials, accomplished practitioners, researchers, 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.

For over ninety 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 250 agencies with which the Mandel School collaborates, understanding first-hand 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 offers the most comprehensive nonprofit leadership and management education programs in the United States. This university-wide academic center, founded in 1984, is a partnership of the Mandel School of Applied Social Sciences, the Weatherhead School of Management, the School of Law, and the College of Arts and Sciences. These schools have joined together to address the growing need for the professional education of leaders and managers of nonprofit organizations and to foster and disseminate research on the nonprofit sector. The Mandel Center’s mission is to enhance the effectiveness of nonprofit leaders and managers and the organizations they serve through education, research, and community service.

ADMINISTRATION

Grover Cleveland Gilmore, Ph.D. (Johns Hopkins University) Dean and Professor
Wallace J. Gingerich, Ph.D. (Washington University) Associate Dean for Academic Affairs
Claudia J. Coulton, Ph.D. (Case Western Reserve University) Associate Dean for Research and Training: Co-director, Center for Urban Poverty & Social Change
Sarah Andrews, M.S.S.A. (Case Western Reserve University) Assistant Dean for Academic Affairs
Sandra Bolton, M.Ed. Assistant Dean for Student Services
Karen A. Powers, M.B.A Assistant Dean, Finance and Administration
David Biegel, Ph.D. (University of Maryland) Co-Director, Center on Substance Abuse and Mental Illness
Pamela Carson, B.S. Director of Development for Alumni and Allied Constituencies
Richard Cole, M.A. Manager/Director of Research & Training
Anne Marie Cronin, M.N.O. Assistant Dean for Development and External Affairs
Susan Lajoie Eagan, Ph.D.
Executive Director, Mandel Center for Non-profit Organizations
Debra Fields
Registrar
Robert L. Fischer, Ph.D.
Associate Director for Policy and Evaluation, Center for Urban Poverty & Social Change
Vallery B. Gaines, B.A.
Director of Major Gifts, Philanthropic Development
Nancy L. Graf, M.S.W., LISW
Director, Continuing Education Program
Joan Horinka, M.B.A.
Director of Recruitment
Jeffrey Hagan, B.A.
Director of Communications
Lenore A. Kola, Ph.D. (Boston University)
Co-Director, Ohio Substance Abuse and Mental Illness Coordinating Center of Excellence
Gerald Mahoney, Ph.D.
(Vanderbilt University)
Director, Center on Interventions for Children and Families
Soad Mansour, MSSA
(Case Western Reserve University)
Director of International Affairs for Social Welfare and Non-Government Organizations
Brenda G. Marshall
Associate Executive Director, Mandel Center
Sharon E. Milligan, Ph.D.
(University of Pittsburgh)
Co-Director, Center for Urban Poverty & Social Change
Lisa Nelson, M.P.A.
Associate Director for Community Information, Center for Urban Poverty & Social Change
Robyn Roche, B.A.
Director of Development and Marketing, Mandel Center
Mark I. Singer, Ph.D.
(Case Western Reserve University)
Co-Director, Center on Substance Abuse and Mental Illness
Samantha C. Skutnik, M.L.S.
Director, Lillian F. & Milford J. Harris Library
Gerald A. Strom, M.S.W.
(Howard University)
Director, Intensive Weekend Program
Elizabeth M. Tracy, Ph.D.
(University of Washington)
Chair, Ph.D. Program
Zoe Breen Wood, M.S.W.
(Virginia Commonwealth University)
Director, Field Education Program
Rebecca W. Zirm
Director of Recruitment, Mandel Center
FACULTY
Kathryn Betts Adams, Ph.D.
(University of Michigan)
Assistant Professor
Sarah Andrews, M.S.S.A.
(Case Western Reserve University)
Senior Instructor
David E. Biegel, Ph.D.
(University of Maryland)
Henry L. Zucker Professor of Social Work Practice
David Crampton, Ph.D.
(University of Michigan)
Assistant Professor
Pranab Chatterjee, Ph.D.
(University of Chicago)
Grace Longwell Coyle Professor in Social Work
Mark G. Chupp, Ph.D.
(Case Western Reserve University)
Visiting Assistant Professor
Claudia J. Coulton, Ph.D.
(Case Western Reserve University)
Lillian F. Harris Professor of Urban Research and Social Change
Susan Lajoie Eagan, Ph.D.
(Harvard University)
Mandel Professor
Kathleen J. Farkas, Ph.D.
(Case Western Reserve University)
Associate Professor
Mark S. Fleisher, Ph.D.
(Washington State University)
Semi J. and Ruth W. Begun Professor, Jerry E. Floersch, Ph.D.
(University of Chicago)
Associate Professor
Grover C. Gilmore, Ph.D.
(Johns Hopkins University)
Dean and Professor
Wallace J. Gingerich, Ph.D.
(Washington University)
Professor
Victor K. Groza, Ph.D.
(University of Oklahoma)
Professor
Merl C. Hokenstad, Jr., Ph.D.
(Brandeis University)
Ralph S. and Dorothy P. Schmitt Professor
Deborah Jacobson, Ph.D.
(Tulane University)
Assistant Professor
Mark L. Joseph, Ph.D.
(University of Chicago)
Assistant Professor
Lenore A. Kola, Ph.D. (Boston University)
Associate Professor
Jeffrey L. Longhofer, Ph.D.
(University of Kansas)
Visiting Associate Professor
Gerald J. Mahoney, Ph.D.
(Vanderbilt University)
Verna Houck Motto Professor of Families and Communities
David B. Miller, Ph.D.
(University of Pittsburgh)
Associate Professor
Dorothy C. Miller, D.S.W.
(Columbia University)
Visiting Associate Professor
Sharon E. Milligan, Ph.D.
(University of Pittsburgh)
Associate Professor
Michelle Munson, Ph.D.
(Washington University/St. Louis)
Assistant Professor
Regina Nixon, Ph.D.
(Howard University)
Instructor
Marvin L. Rosenberg, D.S.W.
(Western Reserve University)
Associate Professor
Mark I. Singer, Ph.D.
(Case Western Reserve University)
Leonard W. Mayo Professor in Family and Child Welfare
Louis Stokes, J.D.
(Cleveland Marshall Law School)
Senior Visiting Scholar in the Practice of Social Policy and Community Revitalization
Gerald Strom, M.S.W.
(Howard University)
Senior Instructor
Aloen Townsend, Ph.D.
(University of Michigan)
Associate Professor

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Elizabeth M. Tracy, Ph.D.  
(University of Washington) 
Professor

Kathleen Wells, Ph.D.  
(University of Colorado) 
Professor

Zoe Breen Wood, M.S.W.  
(Virginia Commonwealth University) 
Instructor

ACADEMIC PROGRAMS

Master's Degree Programs

Master of Science in Social Administration

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: MSASS 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.

Direct Practice Concentrations:
- Aging
- Alcohol and Other Drug Abuse
- Children, Youth and Families
- Mental Health
- Health

Health and the Alcohol and Other Drug Abuse concentrations are offered only in the full-time format.

Macro Practice Concentrations:
- Community Development
- Some advanced courses in the Community Development Concentration
- Plan of Instruction for the M.S.S.A. Degree

Two-Year Program

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 7 years.

The Twelve-Month Advanced Standing Program is available to students with a strong academic record in their BSW 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. A student in the Senior Year in Professional Studies Program is permitted to substitute the first year (32 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. Requirements for admission to the Senior Year in Professional Studies Program are as follows: attainment of a cumulative grade point average of at least 3.25 in all courses in the student’s undergraduate program; completion of three-quarters of the major and minor concentration requirements in the undergraduate program. Final 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, guaranteeing that the student will receive the baccalaureate degree from that college upon satisfactory completion of 31 semester hours at the Mandel School of Applied Social Sciences, Case Western Reserve University.

Note: This program is available to students at Case Western Reserve University, Hiram College, The College of Wooster, Baldwin-Wallace College, and John Carroll University, by joint agreement with these institutions. Interested students from other institutions are encouraged to speak with the Office of Admissions.

Intensive Weekend Program
The school offers a format of concentrated weekend learning for social workers with career experience who are employed full-time. Classes meet one weekend per month (including one Friday per course) throughout the calendar year. Courses are taken one at a time. This program allows students to complete their field education requirement at their place of employment. A student can expect to earn the degree in three years. If granted advanced standing, a student may be able to complete the program in two years.

Extended Degree Program
Students may opt to complete their degree work on a part-time basis during their first year. During the second and third years, students complete field education requirements and carry a full-time, or nearly full-time, load. Extended degree program (EDP) students select classes from the full-time weekday schedule. Employed social workers may participate in this program if they can arrange a flexible work schedule.

The EDP program may be completed in three years. Students granted advanced standing may complete the program in fewer semesters. EDP 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
Nonprofit Management (C.N.M.)
Students with an interest in management may complete the Certificate in Nonprofit Management along with one of the regular M.S.S.A. concentrations. This certificate is offered by the nationally ranked Mandel Center for Nonprofit Management and the Mandel School. The Mandel Center was one of the first university-based programs in the country focused on the education of nonprofit leaders and managers.

To obtain the Certificate in Nonprofit Management along with the M.S.S.A. degree, students must apply directly to the Mandel Center. The Mandel Center courses may be taught in the Intensive Weekend format.

This program can be completed only by two-year and eighteen-month students (not twelve-month students).

Health Systems Management
Students interested in health care delivery may be interested in the Health Systems Management Center, an interdisciplinary research, education and service center, sponsored jointly by the Weatherhead School of Management and the School of Medicine at Case Western Reserve University. The Center focuses its activities at the intersection of three critical decision making groups in health care – individual providers, institutional providers, and purchasers of health care.

This program can be completed only by two-year and eighteen-month students (not twelve-month students).

Spring Break
Independent Study in Amsterdam
Qualified students may choose to participate in a multi-disciplinary study-tour in Amsterdam
during spring break, which will help them to familiarize themselves with Dutch social policies regarding homelessness, prostitution, drug abuse, substance abuse, social services, schools, neighborhood social control, and multicultural aspects of health care. The trip includes guided tours of neighborhoods and social service institutions and daily lectures by government officials, practicing social workers, and prominent Dutch scholars. Comparing systems in Holland and the United States will help students to understand the strengths and weaknesses of social policies and human services in both countries.

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.

New students can apply to either program 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.

For more information on the M.S.S.A. degree, please visit the http://msass.case.edu/academic/

Dual 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 clinical settings, while developing the skills to assume management responsibility in those organizations.

Dual Social Work and Master of Arts in Bioethics (M.S.S.A./M.A.)
The dual 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.

Full-time students may complete this program in four semesters and two summers of study.

NON-DEGREE STUDY
Some courses may be taken on a non-degree basis with the permission of the Associate 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, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio 44106-7164 or by calling 1-800-863-6772 or by visiting our website at http://msass.case.edu.

Students are admitted in the fall semester. Applications are accepted on a rolling admissions basis, though prospective students are strongly encouraged to apply early (December/January) for admission. A $30 non-refundable application fee must be submitted at the time of application.

Advanced Standing
Advanced standing (up to 15 credit hours) 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. Students granted advanced standing are not required to complete selected social work foundation courses and the first semester of field education.

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. No credit hours are granted for passing the proficiency exams. Successful completion of the exam(s) exempts the student from the requirement to complete the course(s). Advanced or elective first semester of course work (minimum of six credits) to have their probationary status removed and continue in the program.

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; caring and compassionate qualities; 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.
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.

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:
• Transcript of all graduate social work education completed to date. If work is still in progress at time of application, you should send a list of additional courses to be completed in the first year.
• An evaluation of first-year field experience performance from the dean, field education director or faculty advisor of the school.

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 to furnish results of the Test of English as a Foreign Language (TOEFL) administered by the Educational Testing Service, Princeton, New Jersey, U.S.A. Results of this test must be forwarded to the Office of Student Services. A student from abroad whose native language is English, who has completed his or her work in a foreign university where English is the language of instruction, or who has studied at or graduated from an American institution, is exempt from this requirement. All international students must pay the health service fee and purchase the medical insurance policy. No exceptions are allowed. All international applicants must submit to the University’s Office of International Students evidence of funding sources to fully finance the cost of education, housing, and transportation. Applicants from other countries will be sent an additional form requiring them to provide evidence of financial resources sufficient to cover their anticipated expenses before acceptance can be finalized. As a guide in budgeting, the University has established a figure of approximately $41,300 (including tuition) to meet the total cost of one academic year of study.

Students holding a B.S.W. from their country of origin may be eligible for advanced standing. Applicants should contact the Council on Social Work Education (CSWE) directly and ask to have their program reviewed. Please write to CSWE, 1725 Duke Street, Suite 500, Alexandria, VA 22314-3457.

FINANCIAL INFORMATION
Tuition
In the 2006-2007 academic year, tuition for the Mandel School of Applied Social Sciences in the full-time Master’s degree program is a flat rate of $28,100, or $937 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 Academic Policies, Procedures and Financial Aid Information are available by contacting MSASS, Office of Student Services.

DOCTORAL PROGRAMS
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 practica can be arranged.

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. To the extent possible, 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, MSASS 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, including two summer sessions and one January session.

Plan Of Study–
Full Time Doctoral Program
First Summer 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 (required)

Fall 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)

January Term
• SASS 624 Models of Social Work Practice
or
• SASS 695 Social Welfare Policy and Planning Models (one is required)

Spring Semester
• SASS 616 Multiple Regression and General Liner Model (required)
• SASS 635 Methodological Issues in Qualitative Research (elective)
or
• SASS 637 Independent Study

Second Summer Semester
• SASS 617 Specialization Seminar (elective)
• SASS 618 Measurement Issues in Quantitative Research (required)
• SASS 625 Social Work Practice Applications
or
• SASS 694 Models of Service Delivery (one required)
• SASS 630 Seminar in Social Work Education (elective)
• SASS 637 Independent Study (3 courses are required)

Second Fall Semester
• 1 Elective Course **
• 3 – SASS 701 dissertation hrs.

Second Spring Semester
• 1 Elective Course **
• 3 – SASS 701 dissertation hrs.
• SASS 630 – taught every other summer
• SASS 637 Independent Study
or
• SASS 632 Research project
or
• Course outside of MSASS

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 Summer Residency Program
Course work and residency requirements for the Summer Residency Program can be completed during three summers and two January interim periods. This format is designed to accommodate social work educators and professionals who must maintain their employment commitments, but wish to pursue Ph.D. study during their summer residence. Under both formats, all students will begin the program the first week in June with an intensive six-week period of study. During this time they will take three core courses. Students must devote full time to study during this six-week period. Summer Residency Program students will have a one-week to 10-day period of study in January, a second six-week period of study the following summer, a second period in January, and finally a third six-week summer period. During the fall and spring semesters of the first year, Summer Residency Students take two graduate level statistic courses at a university in their own community that have been approved by the doctoral program, or via distance education.

PLAN OF STUDY–
SUMMER RESIDENCY
DOCTORAL PROGRAM
First Summer 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 (required)

Fall/Spring Statistics Courses
Choose two statistics courses at a local college or university. Distance education option may be available for these courses (check with doctoral program chair).

January Term
• SASS 624 Models of Social Work Practice
or
• SASS 695 Social Welfare Policy and Planning Models (one is required)

Second Summer Semester
• SASS 614 Models of Qualitative Research (required)
• SASS 618 Measurement Issues in Quantitative Research (required)
• SASS 630 Seminar in Social Work Education (elective)
or
• SASS 637 Independent Study

Second January Term
• SASS 609 Theories of Social Welfare and Social Justice (required)

Third Summer Semester –
(two courses are required the third summer)
• SASS 625 Social Work Practice Applications
or
• SASS 694 Models of Service Delivery (one required)
• SASS 617 Specialization Seminar (elective)
• SASS 630 Seminar in Social Work Education (elective)
• SASS 637 Independent Study
• 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.
• SASS 630 – taught every other summer

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
of the qualifying examination. To be admitted to candidacy, the candidate also must have maintained an average of 3.0 and received not 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. Before a candidate leaves the school as a full-time student, he or she should have formulated the topic, been assigned a dissertation advisor, and had the dissertation prospectus approved by a faculty committee constituted for this purpose.

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 practical problems; (2) basic principles and concepts applicable to a wide range of services; and (3) innovative approaches to direct services, staff development, management, and planning. Over 130 courses are offered throughout the year on campus and at selected off-campus sites. New offerings are developed in response to the demands of practice and to the needs of public and voluntary agencies at all levels.

Social Work Licensure Examination Review Courses are offered three times per year. MSASS is approved by the Ohio Counselor and Social Worker 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 (ABLE)**

**ABLE 411. Ability Based Learning Environment Seminar (1)**

The ABLE seminars are designed to support students in the successful completion of the School’s ability-based learning curriculum. Following an extensive ABLE orientation, students participate in four seminars designed to assist them in both understanding the ability-based approach and in becoming adept at self-assessment. Seminars meet three to five times per semester and focus on the School’s Eight Abilities. Instructors facilitate the assessment and self-assessment process in order to guide students in their attainment of the abilities. Students compile a portfolio and compose a final integrative paper at the conclusion of the fourth seminar.

**ABLE 512. Ability Based Learning Environment Seminar (1)**

The ABLE seminars are designed to support students in the successful completion of the School’s ability-based learning curriculum. Following an extensive ABLE orientation, students participate in three advanced seminars designed to assist them in both understanding the ability-based approach and in becoming adept at self-assessment. Seminars meet three to five times per semester and focus on the School’s Eight Abilities. Instructors facilitate the assessment and self-assessment process in order to guide students in their attainment of the abilities. Students compile a portfolio and compose a final
COURSE DESCRIPTIONS (SASS)

SASS 350. Seminars in Applied Social Sciences (1-3)
The seminar provides an opportunity for advanced students to learn about the field of applied social sciences in a small group setting. Topics vary in response to faculty and student interests. Small group discussion. Prerequisite depends on content. Prereq: Permission of instructor.

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. Prereq: 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. Prereq: Permission of instructor.

SASS 401. Field Education I (2)
This field education experience exposes students to social work experiences at the individual, community, and administrative levels. Students spend 176 hours in this field experience. A written assignment is required that reflects the student's understanding of the placement's approach to working with individuals and communities, as well as a comprehensive look at the administrative and professional focus of the placement. This course is taken concurrently with SASS 495 Field Education Seminar and SASS 495 Social Work Methods. Coreq: SASS 495 and SASS 495.

SASS 401A. Field Education I (ABLE) (1)
This field education experience exposes students to social work experiences at the individual, community, and administrative levels. Students spend 176 hours in this field experience. A written assignment is required that reflects the student's understanding of the placement's approach to working with individuals and communities, as well as a comprehensive look at the administrative and professional focus of the placement. This course is taken concurrently with SASS 495 Field Education Seminar and SASS 495 Social Work Methods. Coreq: SASS 495 and SASS 495.

SASS 402. Field Education II (4)
This course is a continuation of SASS 401. For students with advanced standing this course is the first field education experience. Advanced standing students will have this placement in their area of concentration and will be required to complete the same written assignment required of students who take SASS 401. Students spend 300 hours in SASS 402. Prereq: SASS 401 or advanced standing.

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)
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 ethically competent adoption practice are emphasized throughout the course in each content area.

SASS 510. Health Disparities (3)
(See EPBI 510.) Cross-listed as EPBI 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 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 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 sociopolitical factors that influence 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 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, whistle blowing, and other areas of great importance to social work practice today.

SASS 590. Field Practice (1-12)
SASS 594. Independent Study Abroad (1-12)
(Credit as arranged.)

SASS 598. Individual Reading (1-12)
Prereq: Special written permission needed. See MSASS registrar.

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 philosophy 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 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 are recommended.

SASS 624. Models of Social Work Practice (3)
This is the first of two required courses for students specializing in direct practice. It critically analyzes the theory-based knowledge undergirding contemporary practice. The course is designed to examine the development of practice theory, to develop a framework for the analysis of theory and to assist students in applying theory in building a conceptual model for a social issue they define.

SASS 625. Social Work Practice Applications (3)
This is the second of two courses aimed at the analysis and development of models of direct practice. Student works on the construction of an approach to practice related to his or her interests. Prereq: SASS 624.

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: SASS 614 and SASS 615.

SASS 633. 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. (This also is the course number to register for dissertation credits before passing the qualifying examination.)

SASS 694. Models of Service Delivery (3)
This course is required of all planning and policy development students. Content includes analysis of large data set to answer key policy questions. Prereq: SASS 695.

SASS 695. Welfare Policy and Planning Models (3)
This seminar focuses on the analysis of social welfare policy. Tools of policy analysis and frameworks for policy analysis are examined and critiqued. Policy alternatives are considered from an analytical and comparative perspective. Attention also is given to policy development and implementation with emphasis on program planning and evaluation.

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.

SASS 703. Dissertation Fellowship (1–8)

COURSE DESCRIPTIONS (SPPP)
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.

**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: SPPP 470.

**COURSE DESCRIPTIONS (SRCH)**

**SRCH 426. Introduction to Social Research (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 practicum setting. Students are alerted to the risks of cultural bias in research throughout the course through examples and scientific readings.

**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: SRCH 426 and SASS 401A.

**SRCH 532. Needs Assessment and Program Evaluation (3)**
This course is designed to introduce students to the design, implementation, management, analysis, and utilization of program evaluation research. The major rationales for this course are: 1) the strong need for accountability in social service delivery, 2) the need to remain current on developments in service interventions, and 3) the need to defend human service programs on the basis of effectiveness and efficiency. Students will develop their understanding and use of skills in the interpretation and conduct of different types of program evaluation, including needs assessment, monitoring/process evaluation, and outcome/impact assessments. Students will learn to determine needs of client populations, whether program objectives are being achieved, whether programs are achieving outcomes, and whether program performance is efficient. Prereq: SRCH 426 or equivalent. Coreq: Advanced field placement, SRBT 534.

**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: SRCH 426.
This seminar course is intended for students who will be a major focus of both lectures and skills lab. The issue of ethically competent and community-based social work practice with families will be stressed throughout the course for each content area. Prereq: SSWM 400 and SSBT 520.

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: SSWM 400.

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, deliverance, 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: SSWM 400.

SSWM 520. 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 SSBT 540.

SSWM 521. 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: SSWM 400 and SSBT 540.

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: SSWM 400, SSWM 544, and SSWM 545.

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: SSWM 400.

SSWM 545. Social Program Design (3)
Students develop skills and techniques for forming social agencies and designing social service programs. The course addresses the demands of multiple constituencies (clients, other agencies, legislators, the legal system, etc.) and competing values (the ability to be flexible versus the need for control and to work both inside the organization and outside its boundaries). It presents an approach that focuses on establishing outcome-based goals and interventions. Prereq: SSWM 400.

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: SSWM 400.

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 (SAMH). 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: SSWM 400.

SSWM 564. Interventions in Alcohol and Other Drug Abuse (3)
The course provides a biopsychosocial approach to prevention, assessment, and treatment of alcohol and other drug abuse 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 of alcohol and other drug treatment interventions, self-help groups, and conceptual models of addiction are presented. Students explore their own attitudes and values toward AODA problems and how these affect treatment outcomes as well as the development of programs. Emphasis is placed on current screening and assessment techniques and prevention and treatment issues in social work practice with alcohol and other drug abuse. Prereq: SSWM 400.

SSWM 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: SSWM 400.

SSWM 567. Community Organization and Development Strategies (3)
This course demonstrates the application of social science theory to the issues of economic and neighborhood development. It illustrates how social workers can refine their roles, skills, and understanding of techniques in community organization, and presents strategies for economic and housing development. Prereq: SSWM 400 and SSBT 540. Cross-listed as MAND 467.

SSWM 569. Management of Community Based Development (3)
This course examines the fundamentals of building and managing an effective community development organization. Students will develop an understanding of community development with a focus on housing, economic development, and community building. Community building integrates family development, education and health, housing, and economic development. The use of technology as a tool in community development is covered. Prereq: SSWM 400, SSWM 544, SSWM 545, and SSWM 567. Cross-listed as MAND 469.

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: SSWM 400.

SSWM 574. Integrative Seminar in Alcohol and Other Abuse (3)
This course builds upon the material presented in the methods course (SSWM 564) in alcohol and other drug abuse. It is intended as an elective course for students who are interested in developing their clinical skills in AODA and in enhancing their abilities to conduct an empirically-based practice with AODA clients. Course objectives include integrating clinical and research knowledge about AODA; strengthening the student’s clinical skills in AODA practice; focusing on the complexity of comorbidity issues of AODA practice including, but not limited to, mental health problems, sexual victimization, and domestic and family violence; and recognizing policies and practices relevant to cultural diversity, gender differences and discrimination in social work practice with AODA problems. Prereq: SSWM 400, and SSWM 564.

SSWM 575. Social Work With People Who Have Chronic Mental Illnesses (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: SSWM 400.

SSWM 577. Advocacy and Macro 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 foundations 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: SSWM 477.

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: SSWM 400.

SSWM 580. Mental Health Practice with Children and Adolescents (3)
This course will focus on developing specialized knowledge and social work techniques related to professional social work in such settings as hospitals, child guidance agencies, family service agencies, mental health centers, and residential treatment centers. Concentration will be on assessment of normal and pathological social functioning as related to age-appropriate development, adaptations of psychotherapeutic principles to social work interventions, maximizing individual, family and environmental strengths in each situation as guidelines for offering help. Prereq: SSWM 400 and SSBT 501.

SSWM 581. Social Work with Older Populations (3)
This course in gerontological social work provides advanced content in working with elderly people and their families in the community and in residential settings. Using a biopsychosocial approach, the course explores various issues of later life including, but not limited to, retirement, social roles, depression, social networks, and grief. Specific attention is paid to assessment and diagnosis, goal setting, and rationale for such treatment approach. Prereq: SSWM 400.

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: SSWM 400 and SSBT 501.

SSWM 583. Mental Health Practice with...
Adults (3)
This course builds on the content from required foundation social work methods, policy, and advanced sociobehavioral theory courses. It complements the content of advanced methods courses, including Social Work with People who Have Chronic Mental Illness (SSWM 575), Social Work in Child Abuse and Family Violence (SSWM 582), and Interventions in Alcohol and Other Drug Abuse (SSWM 564). This course explores currently prevailing theoretical perspectives to mental health practice with adults, including cognitive theory, behavior theory, crisis theory, and structural theory informing ego psychology. Specific focus of attention is on the newly evolving object relations theoretical frameworks to practice. Risk status—including the effects of poverty, gender, culture, discrimination, and oppression—is considered in the treatment process and in the utilization of mental health services to adults. The empirical and value base of interventions is examined. Prereq: SSWM 400 and SSBT 508.

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: SSWM 400.

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: SSWM 400.

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: SSWM 400.

SSWM 589. Social Work Interventions in 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: SSWM 400.
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 DMD/MD 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 twenty-five 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 schools of medicine and nursing and 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 a member of the American Association of Dental Schools 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 4,700 graduates.

**ADMINISTRATION**

Jerold S. Goldberg, D.D.S.
(Case Western Reserve University)
Dean of the School of Dental Medicine; Professor of Oral and Maxillofacial Surgery
Ronald L. Occhionero, D.D.S.
(Case Western Reserve University)
Associate Dean for Administration; Professor of Comprehensive Care
Marsha A. Pyle, D.D.S.
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(Cleveland State University)
Associate Dean for Education; Associate Professor of Oral Diagnosis and Radiology
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(Indiana University)
Associate Dean for Graduate Studies; Associate Professor of Oral Pathology and Acting Chair of the Department
Danny R. Sawyer, D.D.S., Ph.D.
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Assistant Dean for Didactic Education; Professor of Oral Diagnosis and Radiology and Chair of the Department
Heather M. Siegel, B.A., MPA
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Director of Development and Alumni Affairs
Philip C. Afoora, B.S. (University of Dayton), M.A. (Case Western Reserve University)
Director of Student Services
David A. Dalsky, B.A., M.Ed.
(Kent State University)
Director of Admissions
John W. Smolik, M.B.A., C.P.A.
(Baldwin Wallace College)
Assistant Dean of Finance, Operations & IT

**FACULTY**

Jose Araûz-Dutari, D.D.S.
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Assistant Professor of Oral and Maxillofacial Surgery
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Assistant Professor of Community Dentistry
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Associate Professor of Biological Sciences and Chair of the Department
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(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 Multi-media 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 dentistry, 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 and 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 on-line searching of more than 100 data bases.
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 & 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 may volunteer their services to any of the programs at the clinic. However, most participate in delivering dental care to the indigent; this also increases students’ skills in emergency and comprehensive patient care.

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.

MISSION STATEMENT
The mission of the Case Western Reserve University School of Dental Medicine is to efficiently provide contemporary programs in oral health education, patient care, research and scholarship, and service that are attractive to our constituents. We will accomplish this in an environment which fosters collegiality and professionalism, and that enables a diverse group of students to become competent practitioners of dentistry.

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 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.

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 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.aada.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; those applications received/completed after that date will most likely be considered for alternate list
Interview invitation only. The deadline to apply is February 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](http://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 interviewee 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 coursework 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 coursework 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 1st of each year; those completed by November 1st are reviewed by the Admissions Committee.

In addition to the completed application form and $55.00 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.

**For Students Entering the Program Prior to 2006**

**Grading Policy**
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 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 in accordance with university policy.
The following grading system is used at the School of Dental Medicine for students entering the Doctor of Dental Medicine program:

### Grades Averaged

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Quality Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.00</td>
</tr>
<tr>
<td>A-</td>
<td>3.66</td>
</tr>
<tr>
<td>B+</td>
<td>3.33</td>
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<tr>
<td>B</td>
<td>3.00</td>
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<tr>
<td>B-</td>
<td>2.66</td>
</tr>
<tr>
<td>C+</td>
<td>2.33</td>
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<tr>
<td>C</td>
<td>2.00</td>
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<tr>
<td>C-</td>
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<tr>
<td>D+</td>
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<tr>
<td>D</td>
<td>1.00</td>
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<tr>
<td>D-</td>
<td>0.66</td>
</tr>
<tr>
<td>F</td>
<td>0.00</td>
</tr>
</tbody>
</table>

#### Grades not Averaged

- **IN**:Incomplete and not averaged when received.
- **P**: Passed and not averaged for pass/fail course.
- **NP**: Failed and not averaged for pass/fail courses; Must be removed through remediation.

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 number of grade points earned during a given semester by the sum of the credit hours for all courses in which the student received letter grades of A, A-, B+... or F taken during that same semester. The cumulative grade point average is computed by dividing the total grade points earned by the sum of the credit hours for all courses included in the grade point calculation. Grade points earned when an IN grade is replaced by the appropriate course grade are credited to the semester in which the incomplete or course in progress grade was received, but action taken regarding student standing or promotion at the time of the incomplete is not affected.

**Promotion**
The general guidelines used by the Committee on Student Standing and Promotion are that each student must attain a grade point average of at least 2.0 for didactic courses and for technique/clinical courses by the end of the first semester, and each semester thereafter. 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 have 30 days after the conclusion of the course to successfully resolve incomplete or failing grades. Students cannot be graduated with any failing or incomplete grades and must have a minimum overall cumulative 2.0 grade point average. Each student’s academic performance is reviewed by the Committee on Student Standing and Promotion as soon as possible after the conclusion of each semester and summer clinic session. Additional review may occur after each eight week period or when grade reports are submitted. The committee sets standards of academic performance for promotion and standing, probationary requirements and remedial actions, and recommends candidates for graduation. The committee, at its option, may place a student on academic review, academic probation, require repeat of an academic period, or recommend to the Dean, dismissal from the program. Additionally, all students are required to pass the National Dental Board Examinations Part I and II in order to be considered for graduation from the School of Dental Medicine. The committee will notify each student in writing of their status at least twice each academic year; following the end of each semester and more frequently if necessary. The committee takes reasonable care to accurately evaluate each student and inform them of their status by letter in a timely manner. If a letter cannot be hand delivered, it will be mailed to the student’s official address. The committee reserves the right to reissue letters of standing or promotion at any time it deems necessary. It is the responsibility of the student to fulfill all academic, pre-clinical, and clinical requirements, and to abide by all official policies and protocols outlined in the student services and clinical policy manuals of the School of Dental Medicine. For each semester of enrollment, the student is expected to achieve a grade point average of at least 2.0 for didactic courses and 2.0 for clinical technique and/or clinical courses. The following categories describe student academic status:

#### Academic Commendation:
- demonstrated a high level of performance with a semester G.P.A. of 3.5 or above.

#### Academic Good Standing:
- met all academic requirements (have earned a 2.0 average and have no incomplete, “D” or “F” grades for this semester. Also, there can be no prior Incomplete or “F” grades on your transcript)

#### Academic Review I (ARI):
- 1 or 2 grades of “D” or “I”
- Academic Review II (ARI II): Second term on ARI status, or an additional “D” or “I,” or student has not completed the requirements for any previous “I” grade. Student has until 30 days into the subsequent term to complete the work in order to remove the “I” or s/he will be moved to Probation or his/her association with the School may be terminated.

#### Academic Probation:
- Semester or cumulative overall GPA is <2.0, or any failing grade. Student has 30 days to complete any incomplete coursework or to remove a failing grade through course remediation (unless the Committee on Student Standing and Promotion has approved an alternative plan for remediation). Failure to complete coursework in the appropriate time or failure to improve GPA may be cause for a student’s association with the School to be terminated. The usual response to failure to improve from Probation will be a requirement that the student withdraw from the program. A student cannot be on ARI or ARII more than two total terms during his/her educational program at Case. If a student qualifies for academic review beyond a second term, s/he will be immediately placed on Probation. For any course where the grade is “I” or “F”, it is the student’s responsibility to contact the instructor.

A student may appeal an action of the Committee on Student Standing and Promotion. The appeal must be in writing, state the basis of the appeal, and be filed within 14 days of the issuance of the notification letter sent to the student informing them of committee action. The written appeal should be directed to the chairperson of the committee. The student may request or be invited to appear before the committee at the hearing of the appeal. The committee will inform the student in writing of the results of the hearing of the appeal. The
student is advised to consult with the chairperson, the Director of Student Services, or the Associate Dean for Education for further information prior to filing the appeal so that the process can be fully explained and the student’s rights protected. The school reserves the right to dismiss a student from the school for any reason it deems sufficient. Academic or clinical failure, moral delinquency, gross misconduct, or failure to meet the specific conditions of probation or review is sufficient reason for dismissal from the school.

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 clinical 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 absence affects 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.

For Students Entering the Program as of Fall 2006

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 coursework. 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 successfully complete the Comprehensive Assessment Week 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 Week 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 coursework unless an instructor or the Committee specifies an alternative time for remediation and/or completion of coursework.

Students must sit for the National Board Dental Examination Part I (NDBE I) by Aril 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 request 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.

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 national dental board examinations
3. Insurance at low group rates (disability/major medical, equipment, professional liability, term life insurance)
4. Reduced ADA dues upon graduation.

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 Award
- General Dentistry
- American College of Dentists, Ohio Section
- International College of Dentists
- Pierre Fauchard Academy Award
- Community Dentistry
- Robert Dean Feder Award
- Comprehensive Dental Care
- Ohio Academy of General Dentistry
- Endodontics
- American Association of Endodontists
- Doctor Paul P. Sherwood/Hrutkay Award
- Operative Dentistry
- Academy of Operative Dentistry
- Oral Diagnosis, Radiology, and Treatment Planning
- American Academy of Radiology
- American Academy of Oral Medicine
- Oral Pathology
- American Academy of Oral and Maxillofacial Pathology
- Oral and Maxillofacial Surgery
- 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://dentalcase.edu/insidecase.

DOCTOR OF DENTAL MEDICINE DEGREE PROGRAM: 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 curricula, 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 student organized around 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 provides viewpoint from which students can develop life-long care plans for their patients.

Threads:
Inquiry
This thread that runs throughout the four-year program supports student growth in skills in clinical decision making. Students develop an understanding of what scientific evidence is, how to make clinical decisions, and to value scientific discovery in all aspects of dentistry.

Leadership
This thread contains curriculum for the development of students as ethical, sensitive, caring practitioners who are stewards of oral health of the individual patient, the community, and society. An important focus in Leadership curriculum is content that helps students advance
in their role as a professional. It also supports the integration of all students into the practice management curriculum centered within their clinical preceptor groups.

Year 1
This year includes curriculum describing normal healthy functioning and disease processes. Basic science content is taught in the context of clinical cases. Foundational work in understanding human structure and function is paired with learning about disease. Dental clinical sciences study the foundational elements of oral health.

Year 2
This year continues with an integrated approach to curricula in health and disease with an emphasis on the development of dental clinical skills. Further development of students as clinicians proceeds with their involvement in the clinical preceptor groups. Students will make a transition to increasing patient-centered clinical care as they demonstrate competency in clinical skills and didactic knowledge.

Year 3
This year includes didactic work related to advancing levels of knowledge and clinical experience. Students spend time in didactic classes that are directly related to clinical practice and in rotations to specialty clinical areas while accomplishing comprehensive patient care.

Year 4
Students gain clinical experience in the Comprehensive Care Clinics and finish didactic work which may include enrichment courses. They participate in practice management activities of their preceptor group, developing critical skills for general practice dentistry.

### Coursework in Year 1

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Code</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation to Small Group Learning</td>
<td>INQU</td>
<td>101</td>
</tr>
<tr>
<td>Health, Science, and Society</td>
<td>LDRS</td>
<td>111</td>
</tr>
<tr>
<td>DenSiM Laboratory</td>
<td>REHE</td>
<td>155</td>
</tr>
<tr>
<td>ACE: Outreach Preventive Dentistry</td>
<td>MAHE</td>
<td>145</td>
</tr>
<tr>
<td>Foundations of Life Sciences</td>
<td>HEWB</td>
<td>121</td>
</tr>
<tr>
<td>Preventive Periodontics</td>
<td>MAHE</td>
<td>141</td>
</tr>
<tr>
<td>Dental Anatomy</td>
<td>REHE</td>
<td>151</td>
</tr>
<tr>
<td>Dental Anatomy Laboratory</td>
<td>REHE</td>
<td>153</td>
</tr>
<tr>
<td>Preventive Periodontics Clinic</td>
<td>MAHE</td>
<td>143</td>
</tr>
<tr>
<td>Heart and Lungs in Health</td>
<td>HEWB</td>
<td>125</td>
</tr>
<tr>
<td>Heart and Lungs in Disease</td>
<td>DSPR</td>
<td>135</td>
</tr>
<tr>
<td>Facial Growth</td>
<td>HEWB</td>
<td>123</td>
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<tr>
<td>Integration Conference</td>
<td>INQU</td>
<td>103</td>
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</tbody>
</table>

### Spring

<table>
<thead>
<tr>
<th>Course Title</th>
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<tr>
<td>Renal and Hematologic Systems in Health</td>
<td>HEWB</td>
<td>122</td>
</tr>
<tr>
<td>Renal and Hematologic Systems in Disease</td>
<td>DSPR</td>
<td>132</td>
</tr>
<tr>
<td>Masticatory Dynamics</td>
<td>HEWB</td>
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<td>Masticatory Dynamics Laboratory</td>
<td>HEWB</td>
<td>126</td>
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<tr>
<td>ACE: Knowing the Patient</td>
<td>INQU</td>
<td>102</td>
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<tr>
<td>Integration Conference</td>
<td>INQU</td>
<td>103</td>
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<tr>
<td>DenSiM Laboratory</td>
<td>REHE</td>
<td>156</td>
</tr>
<tr>
<td>Preventive Periodontics Clinic</td>
<td>MAHE</td>
<td>143</td>
</tr>
<tr>
<td>Head, Neck, and Neurology in Health</td>
<td>HEWB</td>
<td>123</td>
</tr>
<tr>
<td>Head, Neck, and Neurology in Disease</td>
<td>DSPR</td>
<td>133</td>
</tr>
<tr>
<td>Body as Host</td>
<td>HEWB</td>
<td>128</td>
</tr>
<tr>
<td>Basic Procedures (BP) in Fixed Prosthetics</td>
<td>REHE</td>
<td>152</td>
</tr>
<tr>
<td>Basic Procedures (BP) in Fixed Prosthetics Lab</td>
<td>REHE</td>
<td>154</td>
</tr>
<tr>
<td>Dental Materials</td>
<td>REHE</td>
<td>158</td>
</tr>
</tbody>
</table>

### DOCTOR OF DENTAL MEDICINE DEGREE PROGRAM: Classes Entering Prior To 2006

The Doctor of Dental Medicine curriculum is a sequence of learning experiences designed to prepare the student to serve as an effective general dental practitioner. The present curriculum is a “diagonal” structure designed to give the student a broad foundation through initial instruction in the basic sciences and an introduction of limited clinical experiences during the early period of education. As the student progresses through the educational program, clinical experience increases to facilitate integration of basic science information with clinical science training.

### Methods of Instruction

The traditional methodology of lecture, seminars, laboratory, and clinical teaching is augmented by the use of teaching aids developed at the School of Dental Medicine and elsewhere. Among these aids are:

1. Television monitors for live and taped presentations
2. Slides with accompanying text (audio and visual)
3. Programmed texts and exercises
4. Sequential models
5. Computerized presentations
6. Multimedia/simulation laboratory
7. Case presentation
8. Virtual reality clinical simulation exercises

Instructional techniques utilized are intended to encourage students to be active participants in their education wherever possible, and are facilitated by small group conferences, seminars, and demonstrations. These small group settings promote personal and informal communication between students and instructors. In addition, the resources of the libraries offer the opportunity to satisfy personal interests and professional aspirations.

### 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 absentia 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 absentia 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 DMD/MD Program described below is an exception to these policies. For details, please see the DMD/MD 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 advisors in consultation with the student. The student may appeal any unfavorable decision to the Committee on Student Standing and Promotion for final resolution.

**DMD/MD 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.

**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. Students in the Six-Year Dental Program should take the test no later than April of the second year and must achieve an average of 16 or higher on both “Academic” and “PAT” portions of the test.

**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 a cumulative average of 3.0 or higher for all course work attempted and must achieve grades of “B” or higher in the required courses in biology, chemistry, and physics.

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 ten 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 a grade-point average of 3.0 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, whose catalogue 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 on line at http://dental.case.edu/admissions/gradstudies/howtoapply.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 certificate-only program in oral and maxillofacial surgery may be available at the discretion of the department.

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 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 applicable 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 an 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 chairperson 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 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:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Quality Points</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>4.00</td>
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<tr>
<td>A-</td>
<td>3.66</td>
</tr>
<tr>
<td>B+</td>
<td>3.33</td>
</tr>
<tr>
<td>B</td>
<td>3.00</td>
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<tr>
<td>B-</td>
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<tr>
<td>D</td>
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</tr>
<tr>
<td>D-</td>
<td>0.66</td>
</tr>
<tr>
<td>F</td>
<td>0.00</td>
</tr>
</tbody>
</table>

- IN = Incomplete
- S = Satisfactory (Thesis or Research)
- U = Unsatisfactory (Thesis or Research)
- AD = Successful Audit
- NG = Unsuccessful Audit
- P = Passing (Pass/Fail Course)
- NP = Not Passing (Pass/Fail Course)
- W = Withdrew class
- WD = Withdrew all classes

Transfer Credit

Transfer of credit from another university is limited to six semester hours of graduate-level courses. Such transfer requires approval from the student’s advisor, the departmental chairperson, and the Office of Graduate Studies. Courses must have been taken within five years prior or subsequent to matriculation in the graduate program at Case Western Reserve University, and only those with grades of “B” or better are transferable. No credit for thesis may be transferred from another university. Graduate credit is not awarded for 100- or 200-level courses or their equivalents.

Thesis Advisory Committee

Each master’s degree candidate is advised to consult with their program director as to when and how to form a thesis committee. The department chair, in consultation with the program director, chooses a faculty member to serve as the primary thesis advisor. This advisor also serves as the chair of the thesis committee. The primary thesis advisor will help identify other members of the faculty (at least two) to serve as secondary advisors and as members of the thesis committee. At least two members of the thesis committee must be from the department in which the student is enrolled, and one must be from another department. Additional membership is not restricted and may include persons from outside the University who have qualifications acceptable to the department chair. Members of the thesis committee continue in their capacity until the student graduates or leaves the program of study. The thesis committee will be responsible for guiding the student in the development of a thesis protocol. Once a protocol is acceptable, the thesis committee members advise the student on the conduct of the research and writing of the thesis document. Ultimately, the committee members will evaluate the student’s oral defense and final thesis document.

Research Project

For master’s degree programs, each student must carry out an original and meaningful research project acceptable to the department chairperson 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 chairperson, 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 for 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 chairperson. 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 chairperson 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 chairperson, 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 (DENC)

DENC 163. Masticatory Dynamics Lab (1)
(See DENC 162.)

DENC 172. Basic Procedures in Fixed Prosthodontics (2)
Laboratory component of DEND 172.

DENC 222. Periodontics (1)
Companion clinical component for DEND 222. 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.

DENC 229. Radiology Rotation (1)

DENC 248. Endodontics (.5)
Companion laboratory component to DEND 248. Complete endodontic treatment performed by each student on extracted teeth using gutta percha.

DENC 262. Basic Procedure Operative (1)
Laboratory component of DEND 262.

DENC 265. Basic Procedure Esthetics (.5)
Laboratory component of DEND 265.

DENC 267. Partial Denture Design Lab (1)
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.

DENC 268. BP Competency Lab (1.5)

DENC 269. Prosthodontic Technology (2)
Companion preclinical component to DEND 269. Each student constructs a complete set of dentures using laboratory manikin as patient. Although DENC 269 was conceived as a technique course, one of its principal objectives is to prepare the student for the clinical aspect of dental education.

DENC 274. Basic Procedure Fixed Prosthodontics II (1)
Laboratory component of DEND 274.

DENC 282. Orthodontics (.5)
Companion laboratory component to DEND 282. Application and fabrication of various orthodontic appliances.

DENC 322. Surgical Periodontics (1.5)
Companion clinical component to DEND 321. Clinical treatment in conjunction with residents and faculty.

DENC 328. Oral Diagnosis and Treatment Planning (1)
Treatment planning based on the correlation of fundamentals taught in diagnosis, preventive dentistry and restorative dentistry. Clinical experience in the application of didactic training consists of four components; assignments in the admitting and radiology service where students carry out examinations of the newly admitted patients and evaluate their problems and needs; radiology seminars where the technique and interpretation of the radiographs taken by the students are discussed; assignments to the emergency service; and clinical conferences with a staff member.

DENC 348. Endodontics Clinic (1.5)
Companion clinical component to DEND 348. Clinical application of endodontic techniques.

DENC 364. Operative Dentistry Clinic (2)
Clinical application of the basic principles of operative and cosmetic dentistry.

DENC 374. Fixed Prosthodontics Clinic (2)
Clinical experiences in fixed prosthodontics.

DENC 378. Pediatric Dentistry Clinic (1.5)
Companion clinical component of DEND 378.

DENC 387. General Practice Dentistry A (1.5)
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. Experience 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, student cases, techniques, and journal articles are discussed. Coreq: DENC 389.

DENC 389. General Practice Dentistry B (1.5)
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. Experience 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, student cases, techniques, and journal articles are discussed. Coreq: DENC 387.

DENC 390. General Practice Dentistry A (1.5)
Clinical application of the principles of general practice dentistry. Coreq: DENC 394.

DENC 392. General Dentistry Clinical Qualifying (1.5)
The course consists of the successful completion of the recall clinical qualifying exam and two diagnosis and treatment planning clinical qualifying exams. It is also necessary for the student to successfully fulfill the recall needs of their assigned clinic patients in order to pass this course.

DENC 394. General Practice Dentistry B (1.5)
Clinical applications of the principles of general practice dentistry. Coreq: DENC 390.

DENC 397. Quality Assurance (1)
This course entails quality assurance issues 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-dos; post-treatment evaluation of care. Prereq: DEND 394.

DENC 422. Periodontics (.5)
Clinical application of surgical and nonsurgical techniques used in the treatment of moderate periodontal disease. Students exposed to more advanced cases through clinical demonstrations by instructors. Students encouraged to gain additional experience and become more confident in the management of periodontal patients.

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 458. Clinical Oral Surgery (.5)
Clinical application of the principles of oral surgery.

DENC 464. Operative Dentistry (1.5)
Clinical application of the principles of operative dentistry.

DENC 466. 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. Coreq: 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. Coreq: DENC 487.

DENC 490. General Practice Dentistry A (2.5)
Clinical application of the principles of general practice dentistry. Coreq: DENC 494.

DENC 492. General Dentistry Clinical Competency (0.5)
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. Prereq: Completion of Basic Core Program.

DENC 494. General Practice Dentistry B (2.5)
Clinical application of the principles of general practice dentistry. Coreq: 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-dos; post-treatment evaluation of care. Prereq: DEND 394.

COURSE DESCRIPTIONS (DEND)

DEND 110. Special Topics in Dentistry (5-4)
Directed study under faculty supervision and with special permission of the Associate Dean for Education.

DEND 158. Introduction to 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.

DEND 163. Masticatory Dynamics (3.5)
(See DEND 162.)

DEND 172. Basic Procedures in Fixed Prosthodontics (2)
To introduce and familiarize the dental student to basic principles related to fixed prosthodontics. The introduction will emphasize principles of engineering and preparation designs, full coverage retains for both metal and ceramic restorations.

DEND 211. General Pathology (5)
General principles of pathology; etiology; retrograde changes; inflammation and repair; bacterial, viral, and mycotic infections, and disturbances of growth presented as an introduction to a more detailed consideration of oral pathology. The pathology of the organ systems.

DEND 214. Oral Pathology (4)
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.

DEND 215. Medical Microbiology and Immunology (5)
Fundamental concepts of bacteriology, virology, and immunology, and their interrelationships in systemic and oral disease processes.

DEND 222. Periodontics (1)
A comprehensive course in periodontology including etiology, diagnosis, radiographic, interpretations and prognosis.

DEND 225. Physical Evaluation (1)
Involves the exploration of patient database building. The scope and methods for data collection, physical examination appropriate to dental care, data recording and data interpretation are discussed in order to be able to assess the patient’s ability to receive dental care safely. The recognition of signs and symptoms of medical and dental disease and the implications for patient well-being are discussed. Systematic evaluation of the patient’s physical examination, medical history, and dental history are integrated so that differential diagnoses may be developed.

DEND 228. Treatment Planning I (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.

DEND 229. Principles of Radiography (1)
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.

DEND 230. Advanced Principles of Radiography (1)
This is a continuation of DEND 229. This course will explore alternative intraoral radiographic techniques, extraoral radiography techniques, their uses and limitation. 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.

DEND 243. 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.

DEND 248. Endodontics (1)
Introduction to methods and materials necessary for successful root canal therapy.

DEND 251. Applied Anatomy of the Head and Neck (.5)
Review of head and neck anatomy with clinical correlations.

DEND 252. Oral Surgery - Pain Control (1)
Anatomy pertaining to local anesthesia. Drugs used in local anesthesia and technique of administration. Management of complications. Slides and clinical demonstrations.

DEND 262. Basic Procedures in Operative Dentistry (2)
This course, together with DEND/DENC 265, 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.

**DEND 265. Basic Procedures in Esthetic Dentistry (1)**
This course provides formal lecture presentations and laboratory exercises to introduce the students to basic operative procedures for direct composite resin restorations.

**DEND 267. Partial Denture Design (3)**
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.

**DEND 269. Prosthodontic Technology (2)**
A lecture-demonstration-laboratory approach to complete denture prosthetic construction. Emphasis on certain fundamental biological considerations of the edentulous patient, such as the oral membranes, muscles, bones, and phonic definition and how they relate to the technical aspects of denture constructions.

**DEND 274. Basic Procedures in Fixed Prosthodontics II (3)**
This course builds upon those core elements covered in DEND/DENC 172. 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.

**DEND 282. Orthodontics (.5)**
Presents principles of orthodontics including relevant areas of applied growth and development, diagnosis methods, biomechanics, and techniques. Histological and physiological changes due to orthodontic tooth movement and biomechanics and laboratory techniques related to the fabrication and use of suitable orthodontic appliances. Biomechanical principles and the materials science and biologic background necessary for proper clinical management of these appliances.

**DEND 284. 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.

**DEND 291. Dental Auxiliary Management (5)**
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.

**DEND 312. Oral Cancer Diagnosis (1)**

**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 320. Issues and Trends (1)**
Major issues and trends that affect oral health and the mission of dentistry in the United States. Behavioral knowledge and skills essential to theoral health practitioner's ability to deliver effective patient-centered care.

**DEND 321. 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.

**DEND 326. 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.

**DEND 328. Treatment Planning II (.5)**
This course provides formal instruction designed to prepare the students for patient management, practice management, and treatment planning. Emphasis is on devising optimal, alternative and emergency diagnostic treatment plans.

**DEND 329. 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.

**DEND 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.

**DEND 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.

**DEND 340. 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.

**DEND 348. Endodontics (1)**
Recognition of endodontic pulpal health and the changes that occur in the transition from health to disease. The didactic component focuses on scientific basis for recognition of degenerative states of the dental pulp and the philosophy of endodontic therapy. The clinical component focuses on the treatment of diseased, pulpally-involved teeth of actual patients. It provides practical instruction on how to render endodontic therapy under the direct supervision of qualified endodontic personnel.

**DEND 351. Oral Surgery II (1)**

**DEND 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.

**DEND 354. Oral Surgery IV (1)**
Each student constructs a business plan specific to developing a business plan for the students' careers. 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.

**DEND 364. Esthetic Dentistry (1)**
Lectures and demonstrations. The indications, contraindications, limitations, and use of modern techniques and materials in esthetic dentistry.

**DEND 371. Occlusion Seminar (2)**
An introduction to gnathological principles: terminology, procedures and instrumentation. Correlation of history and clinical symptoms with treatment modalities emphasized. Use of bite planes, centric relation registration, and diagnostic waxup on mounted casts.

**DEND 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.

**DEND 378. Pediatric Dentistry (2)**

**DEND 379. Nutrition for Dentistry (1)**
General nutrition concepts are presented in addition to aspects pertinent to the practice of dentistry.

**DEND 394. 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.

**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)**
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 cleft-palate treatment.

**DEND 488. Case Presentations (2.5)**

**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 the approval of their Chairperson 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 dental 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 Chairperson 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 dental faculty of the School of Dental Medicine in order to assure competency in the periodologic and oral diagnostic procedures associated with general dentistry.

**DENF 484. 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 Chairperson 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 dental faculty of the School of Dental Medicine in order to assure competency in the operative procedures associated with general dentistry.

**DENF 485. 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 Chairperson 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 dental faculty of the School of Dental Medicine in order to assure competency in the oral surgery procedures associated with general dentistry.
DENT 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 Chairperson 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.

DENT 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 Chairperson 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)

DENT 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.

DENT 502. Correlative Medical Science (2)
Case-based discussion of selected systemic disease commonly encountered by the dentist.

DENT 503. Facial Growth and Development (1)
Emphasis on the qualitative, quantitative, and integrative changes during postnatal craniofacial growth and development.

DENT 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.

DENT 505. Dento-Orthodontic Anomalies (1)
This course is designed to provide the student 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.

DENT 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, split construction, set-ups, positioner construction, and the examination, diagnosis, and treatment of various TMJ disorders. Instruction is carried out by the use of lectures and laboratory and clinical exercises.

DENT 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 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.

DENT 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.

DENT 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.

DENT 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.

DENT 511. Endodontics (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.

DENT 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.

DENT 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.

DENT 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.

DENT 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 thesis research to the seminar group.

DENT 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 (.5)
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 mecanotherapy. 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. Endodontontology I (3)
Scientific rationale for endodontic practice. End-
odontic 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. Endodontontology II (3)
Second in a series of four courses. (See DENT 529.)

DENT 531. Endodontontology III (3)
Third in a series of four courses. (See DENT 529.)

DENT 532. Endodontontology 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 Speciality 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 Speciality II (3)
Second in a series of four courses. (See DENT 551.)

DENT 553. Clinical Endodontic Speciality III (3)
Third in a series of four courses. (See DENT 551.)

DENT 554. Clinical Endodontic Speciality 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 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-rational 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 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 prothetic interrelationships beginning with treatment planning and continuing with discussing the utilization of the combined treatment modalities. It focuses on provisionalization, furcation 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 III (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 roentgenography leading to a thorough understanding of craniofacial radiographic techniques. Use of x-rays and radiation hygiene, and technical and interpretive proficiency.

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 courses. See DENT 685.

DENT 688. Literature Review in Periodontics IV (1)
Fourth in a series of 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 (1-3)
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 (3)
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.

INQU 101. Orientation to Small Group Learning (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 science research will be related to functional applications in dental care.

MAHE 141. Preventive Periodontics (1)

MAHE 143. Preventive Periodontics Clinic (5)
Companion clinical component to MAHE 141. 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.
COURSE DESCRIPTIONS (REHE)

REHE 151. Dental Anatomy (3)
Descriptive anatomy of masticatory structures with emphasis on deciduous and permanent teeth and the temporomanidbular-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 153. Dental Anatomy Laboratory (.5)
Companion preclinical component to REHE 151. Laboratory exercises and assignments include drawings, waxups, tooth identification, and use of semi-adjustable articulator.

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).
SCHOOL OF LAW
11075 East Boulevard
Phone 216-368-3280; Fax 216-368-6144
Gary J. Simson, 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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Sharon Hoffman, J.D. (Harvard University), LL.M. (University of Houston)

Associate Dean for Academic Affairs, Professor of Law and Bioethics, and Co-Director of the
ADMISSION

This section relates to the J.D. programs; see below for information regarding admission to LL.M. program. 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 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.
In the second year, every student must take LAWS 375, Professional Responsibility (3) and the remaining CaseArc requirements. Otherwise, the curriculum is elective after the first year. As a requirement for graduation, every student must complete a substantial research paper.

Concentrations
For complete information about the voluntary Concentration program, see the law school’s website or contact the Academic Services Office at the School of Law.

Voluntary Concentrations:
- Business Organizations
- Criminal Law
- Litigation
- Health law
- International Law
- Law, Technology, and the Arts – Law & Technology or Law & the Arts
- Public Law – Public and Regulatory Institutions track or Individual Rights and Social Reform track

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. (Bioethics)
The School of Law and the Center for Biomedical Ethics make it possible for a student to earn two degrees in seven semesters, or in six semesters plus two summer sessions. Typically a student begins with a year of law study.

J.D./M.A. (Legal History)
Enrolling in both the law school and the School of Graduate Studies, a student can study law and legal history and earn the two degrees in seven regular semesters or six semesters plus two summers.

J.D./M.S.S.A.
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.
This program combines the Master of Nonprofit Organizations (M.N.O.) degree with the Juris Doctor (J.D.) degree. It provides preparation for students who desire to practice law within a nonprofit organizational context, serve as managers in nonprofit organizations, or work in the area of planned giving.

Students must apply and be accepted for each degree program to qualify. New students can apply to both programs simultaneously. 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. Several program study options are available.

- 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.
- M.N.O./J.D. 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
11206 Euclid Avenue, Lower Level (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 two 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. It provides preparation for students who desire to practice law as it relates to nonprofit organizations, serve as managers of nonprofit organizations, or work 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. J.D. students must apply no later than the end of the second year in the J.D. program. J.D./C.N.M students must receive both credentials simultaneously to be granted credit for specific courses taken in the other program.

For more information, contact the Director of the Nonprofit and Social Enterprise Program at 216-368-2676 or by e-mail at mcnoadmissions@case.edu.

Graduate School Option
Students in the School of Law may take up to nine hours of 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 classroom.

SPECIAL PROGRAMS
Professional Skills 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.

CICSDR (Center for the Interdisciplinary Study of Conflict and Dispute Resolution)
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 (CISCDR). CISCDR’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.

Center for Law, Technology, and 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 counterterrorism, 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.

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.

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.

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
Moot Court
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 repre-
sentatives 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 Seminar (3)
This seminar will build upon the foundation established by the first-year curriculum and focus on selected legal topics relating to education law and policy with a particular emphasis on constitutional (federal and state) issues. Such legal topics will include (but are not limited to) the regulation of educational institutions, student, teacher, and parental rights, equal educational opportunity, school finance, and the federal role in education. Enrollment is limited to 12. Grade is based on a presentation and a paper.

LAWS 003. Reproductive Law and Ethics Seminar (3)
This seminar will introduce students to philosophical and legal materials related to reproductive ethics and law.

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 005. Federalism Seminar (3)
The seminar will explore the constitutional relationships between the federal government and the states. Through additional exposure to pertinent case law and concentrated study of early historical materials in addition to scholarly writings, the seminar builds on the basic Constitutional Law course and is designed to give students a deeper understanding of the dimension and complexity of our federal system. Topics will include the reason for a federal rather than a unitary or centralized governmental system, and how a system of divided political authority imposes restraints on federal and state legislative and judicial authorities. By way of contrast, the seminar may also explore how other countries administer federal systems and, in this country, the difference between federal/state federalism and state/local federalism.

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 interpretative 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 009. Business Organizations Research Seminar (2)
An opportunity to undertake significant research and writing on the law of business organizations. Each student will be expected to complete a major paper in satisfaction of the upper level writing requirement. A satisfactory paper will meet the writing requirement for the concentration in Business Organizations. Limited to 12. Prereq: LAWS 261 or LAWS 204.

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. Prereq: LAWS 202.

LAWS 012. Constitutional Law Research Seminar (2)
This seminar permits students to write an in-depth paper, exploring an area of Constitutional Law most interesting to them. There are no explicit rules governing subject matter except that the paper must have, as its central focus, constitutional doctrine, policy, and/or analysis. Several classes will be held during the semester. The focus of these classes will be the process of writing a paper and the research tools available. A thesis statement, an outline, and at least one draft before the final paper are required. The grade will be based solely on the quality of the paper. The paper may be used to satisfy the writing requirement.

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 will read recent Supreme Court and Circuit court opinions, appellate briefs, academic commentary and supporting materials. Grade is based on class participation, final presentation, and a paper. Limited to 12.

LAWS 014. Insurance Advanced Research (2)
This seminar will allow students concurrently enrolled in Insurance (LAWS 346) to satisfy the upper-level writing requirement. Students will receive advanced instruction in legal research in insurance law and will complete a series of research and writing exercises, including drafting a statute or administrative rule and preparing and presenting a report supporting adoptions of the statute or rule. At least one oral presentation will be required. Depending on the topic area chosen in a particular year,
students may be required to write a brief in a case involving interpretation of an existing or proposed statute or rule. Limited to 12. Coreq: LAWS 346.

**LAWS 015. Research Law and Ethics Seminar (3)**  
This seminar will introduce students to philosophical, legal, and policy materials related to research ethics and law. We will consider the regulation of research involving animals, humans, fetuses, and embryos. Attendance at classes is mandatory. Grade is based on class participation, final presentation, and paper. Limited to 12.

**LAWS 016. International Environmental Law Seminar (3)**  
This seminar will explore current legal and policy controversies in the rapidly evolving field of international environmental law. The class will begin with consideration of current international environmental concerns and the nature of international law. The seminar will then proceed to consider several international environmental issues in some detail, analyzing current and proposed policy measures. The class will consider existing and proposed legal measures to address international environmental concerns and their alternatives. Special attention will be paid to high-profile international environmental treaties and the interface between domestic U.S. and international environmental law. Specific topics likely to be covered include remedies for transboundary pollution, sustainable development, climate change, and conservation of biodiversity. Weekly readings will include primary materials (treaties, court decisions, etc.) and academic commentary. Students will be expected to read and consider the assigned material, prepare questions for class discussion, and arrive prepared to talk about the relevant legal and policy issues in some detail. Class participation will be graded. Each student will be expected to complete a substantial paper on a current issue or controversy in international environmental law. This paper may be used to satisfy the writing requirement. In addition, each student will be required to give a short presentation of his or her paper. There are no prerequisites for this seminar, however, some background in environmental and/or international law may be helpful.

**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 much 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. Issues and Trends in Civil Rights Law (3)**  
This seminar will cover the Civil War era civil rights statutes (e.g., Section 1983); provisions of the Civil Rights Acts governing discrimination in programs receiving federal funds; prohibitions against discrimination in places of public accommodation; and the Voting Rights Act of 1965, among other topics. Students will achieve an understanding of the statutory framework of civil rights law as well as specific issues that are unresolved or of particular importance in each area. The seminar will also contextualize these legal issues within the larger historical and contemporary framework of racism and discrimination. Grade is based on class participation, final presentation, and a paper. Limited to 12.

**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 interactions 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. Intellectual Property Advanced Research (2)**  
This advanced research seminar is designed to provide students with an opportunity to engage in in-depth and systematic research on a topic related to intellectual property law. The topic will be chosen in consultation with the instructor. Each student will be required (1) to write a substantial research paper on his or her chosen topic; and (2) to make a presentation on his or her research to the entire class. We will meet as a class at least four times during the semester, and each student will be required to meet individually with the instructor several times during the semester.

**LAWS 023. Religion, Ethics, and the Law (3)**  
This is a seminar limited to 12 students. The course will explore the interrelationship 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. Prereq: Students must have taken and passed their RAW and Constitutional Law classes.

**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 ethical considerations of a lawyer advising clients within this domain. Grade is based on a paper, a presentation, and class attendance and participation.

**LAWS 025. Bioethics Research and Writing Seminar (2)**  
This seminar is for students interested in doing their upper-level writing requirement and/or concentration paper on a topic in the area of bioethics and law. It is a research and writing seminar, so the focus of class meetings will be on developing the papers. Students will be required to read and edit each other's drafts. Grade is based on class participation,
final presentation, and paper. All students interested must pre-register for the course. Permission of instructor required. Students will need to schedule meetings with the professor during the Spring. All topics must be approved no later than July 1.

A paper course designed to encourage students to extend their interests to the cutting edges. After an initial group meeting individual sessions will be held to select a topic and thereafter to produce a publishable paper. Students may use this paper to satisfy their writing requirement.

LAWS 027. Affirmative Action Seminar (3)
This seminar will involve an in-depth study of the U.S. Supreme Court’s recent decisions in the University of Michigan affirmative action cases, Gratz v. Bollinger and Grutter v. Bollinger, and the various types of arguments for and against the affirmative action programs considered in those cases. In the process, we will draw upon earlier affirmative action cases, secondary materials, and litigation materials (such as briefs and expert reports). Consideration will be given to general moral and pragmatic questions concerning the consideration of race in higher education admissions, including normative and empirical arguments about diversity, the use of affirmative action as a remedy for past discrimination, fairness arguments, “anti-caste” arguments and race neutral alternatives. Throughout the course, special attention will be paid to litigation strategy and evidentiary issues. Grade is based on class participation, final presentation, and a paper.

LAWS 028. Advanced Criminal Law Seminar (3)
This seminar focuses on substantive criminal law rather than criminal procedure. It uses the first-year criminal law course as a foundation and examines a number of issues not typically covered in that course. Student interests will influence the topics chosen for examination, which will include: theft offenses, conspiracy, fetal abuse, decriminalization of drug use and commercial sex, and the roles of the executive, judicial, and legislative branches in making criminal law. Grade is based on class participation, a presentation, and a research paper.

LAWS 029. Health Care and Human Rights (3)
This course combines two areas of law of increasing importance and public attention. In light of emerging medical, research, and genetic technology, courts, legislatures, administrative agencies and ordinary citizens around the world often face issues of health law. At the same time, in a world that is becoming both globalized and plagued by repeated instances of ethnic cleansing and other catastrophic abuses, issues of human rights are at the forefront of public debate. The intersection of health care and human rights, therefore, constitutes a worthy and fascinating area of study. Topics to be covered will be selected from among the following: 1) an overview of relevant human rights doctrines; 2) the concept of public health; 3) the status of the right to health care in different countries; 4) biomedical research involving human subjects; 5) genetic technologies; 6) disability rights; 7) women’s reproductive and health issues; 8) environmental abuses and human rights; 9) infectious disease, bioterrorism, and human rights; and 10) war crimes and other human rights abuses, as they impact public health.

LAWS 030. Seminar on Entertainment Law: The Motion Picture Industry (3)
The first half of the seminar will focus primarily on the legal aspects of producing and financing a motion picture. After an initial consideration of the economics of Hollywood, the class will examine in some detail the acquisition of motion picture rights in a novel or script. The class will then explore various financing vehicles used to fund motion pictures, and the securities implications of each form. Comparisons with the music and theatre industries follows. The second half of the seminar will be devoted to student oral reports on topics germane to motion pictures or some other branch of the entertainment industry. In the past, student topics have included: the role of entertainment unions, like the Screen Actors’ Guild or the American Federation of Musicians; antitrust in the motion picture industry; a film producer’s liability of imitative acts; copyright protection for parody and satire; and financing independent films, to name just a few. Students are also required to write a paper on some aspect of their oral reports to satisfy the writing requirement for graduation. Prereq: LAWS 261.

LAWS 031. White Collar Crime: Prosecution and Defense (2)
This course will engage students in a study of issues relating to the prosecution and defense of white collar crime in America, e.g., defining/understanding “white collar crime,” the role of the federal government in investigating and prosecuting white collar crime, corporate vs. individual responsibility, analyzing various white collar offenses: mail fraud and wire fraud, RICO, perjury/false statements/obstruction, securities fraud, and analysis of current white collar criminal prosecutions in the news (US v. Martha Stewart, the Adelphia prosecution, the Tyco prosecution, the Worldcom prosecution, the Traficant prosecution here in Cleveland), and exercises in prosecuting and defending white collar crime: investigations, charging decisions, and strategies in structuring a trial presentation and crafting jury addresses in complex white collar cases. As part of their final exam, students will be required to prepare and deliver a live jury summation (either for the government or the defense) in a mock white collar criminal case. Students will also sit for a short essay exam dealing with the various topics covered in class.

LAWS 032. Intellectual Property Theory Seminar (3)
This course is the study of the philosophy of intellectual property. We will explore and ask several questions such as: 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? Prereq: LAWS 229 or LAWS 235.

LAWS 033. Intellectual Property and Indigenous Peoples Seminar (3)
This course explores issues surrounding intellectual property laws and the extent to which such systems can and should be used to protect traditional and indigenous knowledge. Topics to be examined include: Intellectual Property Legal Framework: an overview of current mechanisms for protecting intellectual property and an examination of how such mechanisms apply with respect to traditional and indigenous knowledge as well as other forms of collective knowledge, Indigenous and Traditional Knowledge: overview of some characteristics of traditional and indigenous knowledge as well as ideas about the nature of such knowledge. Conceptions of Authorship and Ownership in Intellectual Property Law: explicit and implicit conceptions of authorship and ownership that are embodied in intellectual property rules and the implications of such ideas. Intellectual Property Law and Cultural Expression: how intellectual property rules affect the creative process and cultural production. Commercial Exploitation and Compensation: commercial exploitation of traditional and indigenous knowledge and biological resources, compensation for such use and aspects of the economics of intellectual property protection. Globalization and Intellectual Property Protection: the implications of globalization for the protection of traditional and indigenous knowledge. Law and Policy Implications: discussion of the relevant actors involved in current discussions on protecting indigenous and traditional knowledge and the potential consequences of current legal rules and proposed reforms. Prereq: LAWS 144.

LAWS 034. International Tax Policy Seminar (3)
The seminar will explore the policies that inform United States taxation of international transactions, with particular emphasis on issues of nationality and residence for purposes of taxation, source of income, and the tax regime applicable to foreign persons. Other topics that may be covered include tax havens, tax treaties and treaty tax shelters. Limit 12. Prereq: LAWS 282. Coreq: LAWS 212 and permission of instructor.

LAWS 035. Religion and the State (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)
Appellate Practice will examine the strategies, styles, and philosophies employed in the conduct of ap-
pellate practice. The course will focus on (1) appellate brief writing, (2) appellate oral argument, and (3) working with an appellate record. It will be co-taught by a full-time faculty member and two (or three) adjuncts. One hour of class time each week, taught by the full-time professor, will focus on brief writing and/or working with an appellate record. During the second hour of class time each week, the class will break out into small groups to work on oral advocacy. In addition, the students, will be expected to devote substantial one-on-one time with the full-time professor on their brief writing. 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)
This course is for those students who wish to fulfill the writing requirement by writing on an environmental law subject. Limited enrollment of 6 students.

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 and 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 041. Comparative Judicial Systems I (2)
Students will study and work on contemporary problems confronting national judicial systems. The academic component will cover the different ways in which judicial systems and their adjudication and dispute resolution processes are organized, with a focus on critical failures in judicial performance (political interference, corruption, delay, torture, and illegal detention). Students will also study different approaches at the binational, transnational, and international levels designed to accelerate justice reform. Uniquely, students will work in small teams of no more than four to conduct research and provide advice on active civil and criminal justice reform initiatives in up to five foreign countries, chosen from Africa (e.g., Israel, Turkey), Latin America (Brazil, Mexico), or Europe (e.g., Italy, France). (Countries and projects will be determined in the summer based on the intensity of the national reform activity and student interest.) The grade will be based on class and team participation, a paper, and bibliography. Students may satisfy the writing requirement.

LAWS 042. Comparative Judicial Systems II (2)
(See LAWS 041.)

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 (3)
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. Thereafter, the course 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, litigation strategy, 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 expert Gregory Noone, who is currently a fellow at the U.S. Institute of Peace and was previously Head of the Foreign Military Rights Affairs Branch of the Office of the Judge Advocate General at the Pentagon. Using case studies as well as simulations and role-playing exercises, the course will address the field of international humanitarian law as a whole, including the law of armed conflict, international criminal law, international human rights law, and the role of international organizations such as the ICRC and U.N. The objective of the course is to convey the reality of international law. Like humanitarian law itself, the course will not deal solely with legal disputes or judicial matters, but with practice and real life situations. The course grade will be based on a paper that will not satisfy the Writing Requirement.
LAWS 049. Expert Testimony in Civil Cases (3)
This course addresses the use of expert witnesses in civil trials, focusing on evidentiary issues. We will first examine several theoretical and conceptual issues concerning the role of experts as well as the pertinent standards of admissibility. We will give careful attention to what it means to make an argument from expert opinion. Then we will examine the use of expertise in a variety of contexts, including the proof of identity, proof of causation, proof of breach of duty, and proof of damages. Prereq: LAWS 104, 207, 212, which may not be taken concurrently.

LAWS 050. Delegation Seminar (3)
This seminar analyzes and evaluates problems that arise when one person or entity relies on another for performance (the problem of delegation). We explore this problem in various contexts throughout the curriculum, e.g., contracts, business associations, agency, commercial law, federalism, and administrative law. In order to address the problem of delegation, courts must consider doctrines relating to vicarious liability (the responsibility of one person for the acts of another), authority (the ability of one party to bind another), and agency (the responsibility of one party to faithfully fulfill the wishes of another). This seminar explores the analytical frameworks that inform our understanding of delegation problems and the theories (e.g., uncertainty and information theory, norm formation and trust) that unify our understanding of them. Each student will write a paper that uses the theories that we develop in the seminar to analyze a problem of delegation that the student chooses.

LAWS 051. Empirical Methods for Lawyers (3)
This course will introduce students to some of the most basic and important quantitative tools of the social sciences that usefully bear on many legal issues and help students develop a rough idea of how to make use of these tools. The material will be presented in a manner that is fully accessible to those with no prior quantitative training or background in the subjects covered. The course will pay particular attention to the application of empirical methods in an array of public and private law areas. Grade is based on a short paper (pp. 8-10) and a final examination.

LAWS 052. Legal Counsel to the Technology Entrepreneur (2)
This course is to be taken in conjunction with and as part of the course on Engineering Entrepreneurship offered at the Weatherhead School of Management. Engineering Entrepreneurship is a two-semester course that focuses on entrepreneurship in a technology-based setting, whereby several teams of business students study the entrepreneurial process, how to write and present a business plan, innovation processes within an organization, strategic alliances, and idea generation and the creative process. In this course, it is the role of the law student, acting in teams of two, to serve as legal counsel to each of the aforementioned business terms. Each legal team is expected to advise their respective team members on a variety of legal issues pertaining to, among other things, intellectual property, corporate structure and financing, and various transactional concerns that arise in an entrepreneurial/technology-based setting. Prereq: LAWS 085.

LAWS 053. Tax Law of Charitable Giving (2)
This course will examine the tax law that relates to charitable giving during life and at death, including the rules of deductibility of charitable gifts of cash and other kinds of property, various vehicles for planned giving (charitable remainder trusts, charitable gift annuities, and others), and the impact of other existing and proposed tax provisions on charitable giving.

LAWS 054. Wrongful Convictions Seminar (3)
This course focuses on the causes of wrongful convictions, including eyewitness misidentifications, false confessions, jailhouse informants, scientific fraud, prosecutorial misconduct, and ineffective assistance of defense counsel. Remedies to prevent the conviction of the innocent are also discussed. A paper and presentation are required. Prereq: LAWS 212 or LAWS 327, may be taken concurrently.

LAWS 055. Computer Law and Policy (2)
This course will address the ever-evolving issues that relate to intellectual property protection for computer software, with a particular emphasis on patent, copyright, and trade secret protection. The relationship of the Internet to such protection will also be explored. Throughout the semester, the course will consider the nuances of this dynamic area of the law and will also provide pragmatic approaches to common problems faced by intellectual property practitioners. Prereq: LAWS 229 or LAWS 235.

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 subject 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 5300 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 the principles of various topics within the area of family law. Two topics will be chosen each semester for in-depth study. The subjects 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-jurisdiction approach will be utilized) and the other half will be devoted to simulation exercises involving litigation or alternative methods of resolving disputes concerning the issues in the topics covered. Students will be assigned roles as attorneys for parties to a simulated case and will prepare and present evidence in a simulated hearing in the matter. The grade will be based on an examination of the substantive material covered and performance in the simulation exercise.

LAWS 064. International Environmental Law (2)
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. Venture, Capital and Entrepreneurial Financings (3)
This course will explore legal and business issues associated with venture and private financings and will examine corporate financing needs that motivate companies to seek financing, valuation issues, the process by which companies secure such financing and corporate governance issues associated with these financings. We will also discuss the financing process for private deals, looking at matters such as valuation, due diligence, securities law concerns, the negotiation process and how business deal terms are translated into legal documents. During the course of the semester, we will focus on and review deal documents from venture capital financings and private debt transactions.

LAWS 067. 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 069. 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 070. Real Estate Mortgages (2)
Real estate mortgages are widely used. In fact, just about every land purchase or land improvement (whether involving a family residence or a complicated commercial development, like a shopping center) involves the use of a mortgage. Yet, even though the rights of the parties to the mortgage, (i.e. the mortgagor (debtor) and the mortgagee (creditor or secured party)), as well as the rights of third parties claiming an interest in the land (like another purchaser or lien creditor) depend upon them, the unique equitable principles and legal rules which govern the mortgage are not well known or understood. These are studied in depth in this course. Actual problems are frequently presented and solved to assure that students obtain a strong practical capacity in as well as a theoretical understanding of mortgage law. The understandings of fundamental mortgage law gained in this course will also markedly assist the student in the study of other advanced courses. These include Secured Transactions in personal property under Article 9 of the UCC. (Article 9 actually is based on the same basic principles that govern real estate mortgages), Bankruptcy, Real Estate Transactions and Development, Banking, etc. It will also give the student some badly needed understanding of equitable principles which still pervade our current legal system. Specific topics studied include the law governing the creation of the mortgage, the limitations imposed on the mortgage contract by the fundamental anti-clogging rules developed by the courts of equity, the priority accorded a mortgage when in competition with competing interests in the same land, the legal rules governing the transfer of a mortgage, the redemption rights of the mortgagor and the foreclosure of the mortgage.

LAWS 071. The Intersection of Unfair Competition and Intellectual Property (2)
This course provides an overview of information technology terms and concepts. This course is designed to allow students to achieve an overview of information technology terms and concepts. Prereq: LAWS 327, waivable with showing of other criminal justice experience or knowledge.

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 will provide a comprehensive overview of most major federal laws relating to individuals with disabilities. The course focuses on issues of rights and nondiscrimination in the areas of employment, government programs and services, public accommodations, higher education, education, housing, health care, and health insurance.

LAWS 074. Finance, Law and Corporate Governance (3)
(See BAFI 470.) Cross-listed as BAFI 470.

LAWS 075. Business Associations for LLM 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 077. Race, Ethnicity, and Criminal Justice (2)
An examination of the disparate racial and ethnic impact of an array of criminal justice policies, and an exploration of possible causes and approaches to solutions. Students will be introduced to the scope of racial and ethnic impacts of criminal justice policy, and complete projects which, in turn, raise either public or professional consciousness of these issues. Students will also explore an array of possible roles for attorneys in policy formation and change. This course should be limited to 12 students. Prereq: LAWS 2079. Coreq: LAWS 327.

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, think tanks, 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 078.

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 081. Terror Prosecution Lab I (2)
This lab offers opportunity for continued and/or advanced work on topics explored in LAWS 079 (Counter-Terrorism Lab I) class. Prereq: LAWS 079.

LAWS 082. International Business Organizations (3)
This course is a combined classroom and field work experience designed to provide an introduction to international business and tax strategies and the
policy debate over such strategies. The purpose of the course is to provide introductory knowledge, concepts and familiarity relevant for law students who will assist clients in evaluating international business strategies. Through field work in selected tax advantaged jurisdictions (Cayman Islands, Bahamas, Liechtenstein, etc.), students will have first-hand opportunities to examine issues relating to the adoption of such strategies by firms.

**LAWS 083. Advanced Civil Procedure (2)**
This class focuses exclusively on civil claim settlements occurring both in and outside of traditional trial courts and involving both federal and state law matters. The course will cover topics addressed not only by civil procedure laws, but also by laws in such diverse areas as contract, tort, professional responsibility, and evidence. It will include consideration of settlements of civil claims which have not yet arisen; have arisen but have not yet been pursued in litigation; and have prompted litigation.

**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 alumnus 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: LAW 203, LAW 204, or LAW 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)**

**LAWS 087. Public Law and Politics (3)**
This course will explore the relationship between practical politics, the law, and government by examining the social and political context of contemporary issues of major significance, with emphasis on Ohio. Classes will include guest lecturers drawn from those professionally engaged in an aspect of the political process. Grades will be based largely on independent research and writing and class participation. The course is designed to complement, but not significantly overlap, existing courses in the public law concentration, most notably, State and Local Government and Legislation.

**LAWS 088. Regulatory Policy Research Lab (2)**
Taught jointly between the School of Law and the Weatherhead School of Management, this course offers students an opportunity to engage in hands-on work on a current policy issue concerning government regulatory activity. Specific topics will vary from year to year, but will include such topics as land use planning, local regulation of business, and state and local tax policy. The course is taught over two semesters and students must enroll in both semesters to receive credit. The P/NC option may not be used for this course. Prereq: Open to 2nd year M.B.A. students and 3rd year law students and 3rd year and 4th year J.D./M.B.A. students only.

**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 marial 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. investigatory 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 093. The War Crimes Prosecution Lab (2)**
The War Crimes Prosecution Lab is the result of a unique arrangement between CWRU Law School and the Offices of the Prosecutors of the International Criminal Tribunals for Rwanda and Sierra Leone, whereby CWRU law students undertake research and submit legal memoranda to the International Prosecutors on issues pending before the international tribunals. Students enrolled in International Criminal Law may receive 2 additional course credits and satisfy their Writing Requirement for their successful participation in the War Crimes Prosecution Lab. In addition, the International Prosecutor will send each student a personal letter of thanks at the completion of the project. Students enrolled in the Lab will be graded on their memo to the International Prosecutor and their class participation, in lieu of having to write the four papers for International Criminal Law. Coreq: Enrollment is open only to students simultaneously enrolled in International Criminal Law (LAWS 092). Students who have already participated in the International War Crimes Prosecution Seminar are not eligible for War Crimes Prosecution Lab, but may take International Criminal Law.

**LAWS 094. Jewish Law (2)**

**LAWS 095. City Law Externship (2-4)**
This externship will engage students in an integrated experience of intensive study of local municipal law and public service. Students will study basic legal disciplines at the foundation of practice in the City of Cleveland’s Law Department. Weekly classes will focus on substance, ethics, and lawyering skills. Weekly work assignments will be done within the context of a diverse array of departments, including Code Enforcement, Litigation, Health Safety and Environment, Labor and Employment, Legislation and Finance, Real Estate and Development, Utilities and Port Control, and the Criminal Division (which also handles community mediation).

**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 nation 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 (3)**
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, defamation, commercial speech, obscenity, offensive speech, expression on public property, and symbolic speech.

**LAWS 204. Business Associations II (4)**
This course is an elaboration of “corporateness” as a mode of business asset ownership and management. The functions and relationships of corporate enterprise participants, primarily promoters, shareholders, creditors, and managers, are fully investigated. The course first covers preorganizational problems and fundamental concepts of corporate financing. It then canvases the roles of ownership and management, with emphasis on the special duties (fiduciary and other) imposed on certain participants. Careful attention is paid to the allocation of prerogatives among those most intimately involved in corporate life. The discussion examines and tests the traditional view of directors as the repositories of everyday management power and shareholders as the possessors of a theoretical franchise to select management, veto fundamental changes, and enforce management responsibilities. Maintenance of the capital structure for the protection of creditors and shareholders is treated in connection with problems of recapitalization and distribution. State statutory themes are taken in the context of the ALI-ABA Model Business Corporation Act. Threads of the federal corporate regimen being developed under the aegis of the securities laws are woven throughout the course fabric. Throughout the discussion, distinctions are drawn between the requirements and policies applicable to close and to publicly held corporations.

**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 consideration 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 (3-4)**
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 (2-3)**
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 215. International Law (3)**
Examines the basic international legal processes (including the fundamental principles, international dispute resolution processes, the sources of international law, the subjects of the international legal system, nationality and jurisdiction) as well as the role and status of international law within the United States legal system. Throughout the course, use is made of contemporary international problems.

**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. credit for taxes paid abroad, taxation of foreign currency transactions and the role of tax treaties. Prereq: LAWS 211 and either 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 210 or LAWS 063.

LAWS 219. Workers’ Compensation (2)

Workers’ compensation law has a statutory basis which continues to evolve through judicial decisions. The statutes deal with benefits for work-connected injury and disability. Course material is national in scope with an emphasis on recent 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 and its effects on patient rights, institutional care, guardianship, psychiatric malpractice, suicide, psychic damages, 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)

Class is intended for (and limited to) students interested in health law who do not have training or experience in a health care profession. Instructors and guest speakers will cover the history of medicine, the scientific method, clinical research, medical ethics, techniques for researching medical and scientific questions, medical training, and medical professionalism. Letter grades will be given based on regular attendance and participation, an oral presentation, and a paper. Prereq or Coreq: LAWS 227. The course is not open to bioethics Master's degree candidates.

LAWS 224. Global Perspectives (3)

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 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, sexual psychopath, 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. Cross-listed as HSMC 427.

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 rationales 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 law 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 204.

LAWS 240. Computing and the Law (3)

Deals primarily with intellectual property issues: the patentability and copyrightability of software and the protection of interests in software by contract or by treating it as a trade secret. Issues relating to the risks of distributing computer software (i.e., the risks of products’ liability for computer software) will also receive considerable attention. Some time will be spent on the legal issues that arise when computers are interconnected by networks. Since many of the legal issues relating to computers arise because courts and lawyers do not understand how computers work and what they can and cannot do, the course begins with basic instruction in such matters as registers, central processing units, logic gates, and computer languages; this portion of the course includes ungraded homework assignments.

LAWS 243. Food, Drug, and Biotechnology 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.

LAW 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.

LAW 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-terms contracts, employment contracts and the employment at will doctrine, promissory estoppel, relational contracts, incorporation strategies in the U.C.C. and the new formalism in Contracts.

LAW 247. International Human Rights (3)
The course considers the role of human rights in a period of transition to a democratic system. This issue has been absolutely critical in newly democratic nations throughout the world. We will look at such subjects as access to secret police files, the role of criminal punishment, the eligibility of candidates for public office, and the role of “truth commissions.” Countries under examination will include Argentina, the Czech Republic, Germany, Poland, and South Africa.

LAW 248. Criminal Procedure II (2)
The adjudicatory stage of the criminal process. Pretrial release, preliminary hearings, grand jury practice, speedy and public trial, discovery, right to jury trial, guilty pleas, right to counsel, and double jeopardy are examined. Prereq: LAW 327.

LAW 249. Comparative Constitutional Law Seminar (3)
The seminar deals with constitutional law and adjudication in a comparative context. It offers an analysis of judicial review and its position in the modern world. It explores certain structural and functional differences among national systems of judicial review and discusses the relatively recent phenomenon of judicial review at the supranational level, particularly as it has emerged in Europe. May satisfy the writing requirement.

LAW 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 (LAW 359) and Discrimination in Employment (LAW 328).

LAW 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.

LAW 257. English for Foreign Graduate Law Students (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.

LAW 258. Business Torts (3)
This course builds on the foundation provided by Torts and focuses on the application of torts doctrines in the business context. Emphasis is placed on such topics as interference with economic relations, marketplace falsehoods, intangible assets, appropriation, and false light. Grade is based on a final examination.

LAW 259. Business Associations, Advanced: Representing the Internet Start-Up (1)
The course will provide students with an in-depth understanding of many aspects of representing the start-up internet or E-commerce company. The focus will be on corporate law and other law related to representation of such business organizations. Class will meet five times during the term for three hours each time. Students will prepare and present in-class exercises. Limited to 20. Prereq: LAW 261 or LAW 203 and LAW 204.

LAW 261. Business Associations (5)
This course is an introduction to the law of business associations, including general and limited partnerships, 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.

LAW 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.

LAW 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 developed 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.

LAW 265. Health Care and the Courts (3)
The seminar will examine a variety of health care issues that raise constitutional law questions. The course will focus on the following questions: (1) whether a constitutional right to health care exists, (2) what constitutional principles justify the state’s involvement in health care, and (3) how conflicts between individual liberty and state interests should be resolved. In analyzing these questions the class will address several contemporary issues including the right to parents to refuse medical treatment for a child on religious grounds, mandatory HIV and drug or alcohol testing, reproductive rights, maternal-fetal conflicts, assisted suicide, national DNA data banking, and others. Grade is based on a presentation and paper. Enrollment is limited to 12.

LAW 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 be also 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 (LAW 381) or Property Se-
curity (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 Tort (Second) sections 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. Prereq: 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.

**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 development, 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), immigrant 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 complex and office building developments, but provides insights useful to an attorney for the other side: a tenant, financial institution, or major department store. The approach is practical as well as academic; the course may be considered a capstone for students interested in real estate. Topics include negotiations and documentation; actual documents are used.

**LAWS 281. Environmental Anatomy of a Business Transaction (2)**
Students will explore how issues of environmental law affect the structure and progress of a business transaction. A case study will start with a letter of intent and will proceed through environmental due diligence; the drafting of environmental representations, warranties, indemnities and schedules; the closing of the transactions; the making of environmental claims under the contract; and mediation of those claims to resolution. Ethical issues of new information about violations discovered in due diligence that must be reported to government agencies will be examined. Students will divide class time among the following activities: (a) the presentation of short research memoranda on the issues in the transaction, (b) the critiquing of drafts of transaction and mediation documents, and (c) role playing as sellers, buyers, bankers, environmental consultants, government agency personnel and their lawyers at different stages of the transaction.

**LAWS 283. Medical Malpractice (2)**
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.

**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. Cross-listed as POSC 429.

**LAWS 286. Litigation Practice (4)**
This course will examine the lawyer's role in resolving disputes. The course will take the students through a case from the initial client through litigation in a trial court up to summary judgment and then on appeal from a grant of summary judgment. We will examine (1) issues pertaining to resolution of the dispute, including negotiation, alternative dispute resolution mechanisms, and the costs and benefits of litigating in court, (2) issues pertaining to the development and use of facts, including exploration of the lawyer's role as investigator, the use of formal discovery mechanisms, and the different burdens posed by the different levels of scrutiny applied by a court at different stages, (3) issues pertaining to the role of the lawyer, including his or her role as counselor to the client, negotiator with and warrior against the adversary, and advocate to the court. The course will consist primarily of simulations and class lectures, and will also involve substantial written assignments, including the drafting of pleadings, discovery materials, and briefs. Enrollment for both terms (LAWS 286 and LAWS 287) is required. Students who have taken or are enrolled in Alternative Dispute Resolution (LAWS 351); Appellate Advocacy (LAWS 262); Lawyering Process (LAWS 401); or Pretrial Practice (LAWS 399) may not enroll in this course. Students who take this course are free to take either Trial Tactics (LAWS 397) or Trial Practice (LAWS 395). The course satisfies the Lawyering
Process requirement that is a prerequisite for Clinic courses. Students who complete the course in their second year may—but are not required—to compete in the Dunmore Moot Court Competition in their third year. Limited to 12.

**LAWS 287. Litigation Practice (3)**
(See LAWS 286.) This course is the second semester of LAWS 286. Enrollment in both semesters is required.

**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 (mortgagee), 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 290. Federal Judicial Externship Academic Year Program (3)**
Externship opportunities are available to a limited number of second- and third-year students who have not participated in the summer judicial externship program. Participants are selected by the instructor from a pool of interested students following pre-registration. Students chosen will be placed by the instructor with a selected federal judge or magistrate in the Cleveland, Akron, Medina, or Youngstown areas. Throughout the semester, students will attend seminar classes at the law school for a total of 17.5 hours and will work in the judge's chambers for a minimum of 15 hours per week. Students must keep and submit to the instructor weekly, contemporaneous time records of their work in chambers. Topics to be covered in the seminar classes will include the role of law clerks, advanced legal research techniques, the process of judicial decision making and opinion writing, learning from observation and supervision, ethics in the judicial process, reflective lawyering, what makes effective advocacy, and other topics. Students will work in chambers under the supervision of the judge and his or her law clerks where their primary role will be to perform legal research and assist in the development of judicial opinions. Copies of the students' written work will be provided to the instructor for review. Grade is based on classroom participation and work done in the judge's chambers. Enrollment is limited to 12. Students will be notified of acceptance into the program by August 1.

**LAWS 291. Appellate Institutions and Process (3)**
This course will examine the role of appellate courts in our legal system and provide a practical introduction to appellate litigation. Topics to be covered will include: the role of appellate courts (federal and state) in the American legal system; their jurisdiction, the scope and standards of review; the function of appellate courts in relation to trial courts; the function of two appellate levels; the crisis of volume in the appellate system, and U.S. Supreme Court practice. Grade is based on a final examination.

**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 294. eEvidence (1)**
This course will focus on special problems arising from the use of electronic evidence and evidence in high-tech criminal and civil cases. Class participation, a class presentation, and an examination will be required. Prereq: LAWS 327 and LAWS 212.

**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 care 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. Prereq: 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 legal issues surrounding the actions of state and federal administrative agencies. Areas of emphasis include statutory interpretation; the availability, timing, and scope of judicial review of agency action; and control of agency discretion. The course emphasizes written work, including advanced legal research training.

**LAWS 302. 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 in damages which typically are 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 resultant from a wrongdoing. Also, the course will consider 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 emphasis on the distribution of securities by issuers and their affiliates. After an analysis of express general anti-fraud remedies, the “security” concept, and the diverse philosophies underlying “value judgment” and “disclosure” approaches to regulation of business fund-raising practices, the course proceeds to a full consideration of the impact of the Federal Securities Act of 1933 on primary and secondary distributions. Concurrent as well as independent effects of state blue sky laws, typified by the Uniform Securities Act, are also treated. To round out the total pattern of investor protection in the distributional setting, the course includes limited excursions into the anti-fraud, periodic reporting, public information availability, and broker-dealer aspects of the Securities Exchange Act of 1934. Prereq: LAWS 204.

LAWS 308. Advanced Securities Regulation (3)
This course begins by treating the security assessment process engaged in by investors, and then proceeds to a discussion of regulation designed to perfect the decision-making process and to overcome informational and other-than-informational deficiencies in the trading markets. Topics include periodic reporting; annual reports to shareholders; duties of broker-dealers and advisers in the trading markets; trading on, and selective disclosure of, nonpublic material information; and the disclosure duties of quiescent issuers. Attention is given to the regulation of tender offers and other large-scale acquisitions of securities, as a special problem of the trading markets. The course also deals with securities regulation which benefits holders of securities, including proxy regulation, securities regulation approaches to corporate mismanagement, and Exchange Act Section 16. Post-transaction relief is also discussed, and, if time allows, attention is given to the occupational licensing aspects of broker-dealer and adviser regulations. Prereq: LAWS 307.

LAWS 309. Antitrust Law (3)
A study of the implementation of federal trade regulation statutes with emphasis on the interrelationship of these laws with the competitive tensions of the contemporary economy.

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 presented 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 memoranda covering issues raised by the problem scenarios 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, recapitalizations, and repurchases of shares; sale of the corporate business; and corporate combination. Prereq: LAWS 203, LAWS 204, and LAWS 211.

LAWS 314. Selected Topics in Human Rights: International Crimes against Women (1)
This course will explore the development and implementation of newly recognized or emerging international human rights law. The course will draw upon at least three major lectures sponsored by the Klatsky Seminar in Human Rights in collaboration with the Frederick K. Cox International Law Center and the Journal of International Law. Students will read the works of the lecturer and other source materials and meet to discuss them in advance of the lectures, attend the lectures, and meet afterwards to explore the issues raised. Three short papers are required.

LAWS 315. Commercial Paper (3)
One of the basic courses in commercial law, dealing with the law of negotiable instruments and bank collections and deposits. These topics are considered 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 federal governments. Major themes include tribal sovereignty; the federal-tribal relationship; criminal, tax, and regulatory jurisdiction on reservations; and the rights of individual Indians. Does not fulfill writing requirement.

LAWS 320. Conflict of Laws (3)
Competing approaches to choice of law in cases having multi-state and/or multi-national contacts. The course also covers personal jurisdiction, constitutional and international limitations on choice of law, and enforcement of judgments. Comparative 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, execution, levy, garnishment, and creditors’ bills. The debtor’s power to resist creditors’ claims through statutory exemptions or federal bankruptcy discharge, or because the creditor has acted inappropriately 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 collective creditors’ remedies under state law, including assignments for the benefit of creditors, creditors’ arrangements, and receiverships.

LAWS 324. Bankruptcy (3)
A study of bankruptcy, with emphasis on the current Federal Bankruptcy Act. Includes Chapter 7 (liquidation bankruptcy proceedings), Chapter 11 (business reorganization), and Chapter 13 (debt adjustment by individuals). Also noted and investigated are the quite different policies and legal rules that we apply to bankrupts because they no longer are capable of conforming to the usual legal standards. Students should take UCC and debtor-creditor courses before taking Bankruptcy.

LAWS 325. Taxation of Corporate Reorganization (3)
The course will examine the federal income taxation of corporate reorganizations, including mergers, stock-for-stock exchanges, assets-for-stock exchanges, split-ups, spin-offs, triangular and reverse triangular mergers, and recapitalizations. More specifically, the course will analyze the tax consequences to the corporations who are parties to the reorganization, and their shareholders and the carryover of net operating losses and other tax attributes. Prereq: LAWS 211 and either LAWS 206 or LAWS 282.

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 exclusionary rule, the principal method for enforcing Fourth, Fifth, and Sixth Amendment rights, is considered.

LAWS 328. Discrimination in Employment (3)
The federal laws and regulations concerning discrimination in employment. 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, and federal executive orders requiring affirmative action in employment. Regulation of discrimination based on race, sex, religion, national origin, age, and disability will be studied, with a focus on practical considerations in prosecuting and defending employment-based civil rights actions.

LAWS 331. Environmental Law (3)
The course is designed to provide an overview of both the breadth and depth of environmental regulation in the United States and to consider ways our environmental regulatory system might be improved. Although all of the major environmental laws will be surveyed, several statutes will be examined 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 interest.

LAWS 335. Equity and Equitable Remedies (3)
The course provides a short introduction to the equitable jurisdiction and in particular to the concept that “equity acts in personam.” The major emphasis of the course is on the specific performance of contracts and on injunctions against continuing torts. A major concern is the doctrine that equity affords a remedy only when the remedy at law is inadequate. The course also gives some attention to the law of restitution, since restitutionary remedies, even those granted by law courts, are traditionally considered to be equitable. Equitable liens, constructive trusts, equitable enforcement of “restrictive covenants,”
and the doctrine of "equitable conversion" are considered. The defenses that apply to equitable remedies, such as laches, "unclean hands," and the doctrine that "he who seeks equity must do equity" are also considered. If time permits, some consideration is given to injunctions against governmental officers and to other extraordinary remedies that form the common law basis for administrative law and judicial review of governmental actions.

**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 disposition of individual wealth from both the property law and tax law viewpoints. Grade is based on class participation and major written project. Students may elect either to complete a research paper or to prepare an estate planning memorandum and documents for a hypothetical client. Prereq: LAWS 232 and LAWS 211.

**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 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 relations between the parties to insurance contracts. The course examines statutory regulation of the industry by state and federal agencies and includes provisions concerning the equitable conversion, the doctrine of "equitable conversion" are considered. The defenses that apply to equitable remedies, such as laches, "unclean hands," and the doctrine that "he who seeks equity must do equity" are also considered. If time permits, some consideration is given to injunctions against governmental officers and to other extraordinary remedies that form the common law basis for administrative law and judicial review of governmental actions.

**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 on Tariffs and Trade (GATT) and the World Trade Organization (WTO) as well as 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 the problem of sovereign immunity. Disputes arising from multinational business transactions will be focused on as will 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. Cross-listed as LHRP 451.

**LAWS 353. Philosophy of Law (3)**

This is an examination of the general nature of law and 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, surrogate parenthood, 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. Cross-listed as PHIL 335.

**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 356. Jurisprudence (3)**

The main themes in the history of Western jurisprudential thought. Ideas such as the nature of justice, the definition of law, the power of the state, legal and moral obligation, and the nature of the judicial process are explored through the works of such writers as Aristotle, Aquinas, Austin, Dworkin, Holmes, Hart, and Finnis, together with selected works of literature.

**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 organizing efforts, management-union interaction, and the representational 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 collective bargaining agreements in courts and by arbitrators, and the legal regulation of industrial warfare, the strike and lockout.

**LAWS 363. Land Use Control (3)**

This course analyzes the public control of land use, primarily at the local and state levels. Both legal and policy perspectives are considered. Attention is given to constitutional limitations such as the takings doctrine, equal protection, and due process. Topics considered include zoning, subdivision controls, expropriation regulations, and historic preservation.
LAWS 365. Legislation (2-3)
This course is a study of the legislative process and product. The class will examine theories of the legislative function; campaign and election regulation; the processes through which the legislature acts; and the drafting and interpreting of statutes.

LAWS 370. Intellectual Property Survey (3)
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 373. Perspectives on Law and Biomedical Ethics (3)
How the legal and policy systems reconcile competing values and interests in controversies surrounding the practice of medicine. Case law, legislation, advisory policies, and institutional policies will be examined, as well as selected commentary from the legal, medical, and philosophical perspectives. Substantive topics to be addressed include definitions of death, competent patients’ right to refuse treatment, decisions on life-sustaining treatment for incompetent patients (including children), active euthanasia and assisted suicide, hospital ethics consultants and committees, organ transplantation, and selected issues raised by genetics and by managed care.

LAWS 374. State and Local Government (3)
Examines the power of state and local governments. Among the topics considered are the purpose and role of local governments; the source and scope of local governmental power; state and federal constitutional restraints on local governmental activity; the distribution of powers between state government and local governments; and the various options by which state and local governments finance their activities.

LAWS 375. Professional Responsibility (3)
This course deals with questions underlying the responsibilities of the lawyer, as a professional, to self, society, client, and the profession. Premises concerning the lawyer’s role or roles within the context of the adversary system are examined in some detail, as is the idea of professionalism. The Model Code of Professional Responsibility and the Model Rules of Professional Conduct are analyzed as generalized statements of the aspirations and obligations of lawyers, and as applied to concrete problems. Required.

LAWS 381. Sales (3)
One of the basic courses in commercial law. It serves equally as an introduction to the general organization, structure, and appropriate application of the Uniform Commercial Code. Primarily we study the law of Sale of Goods under Article 2 of the U.C.C. Necessarily this includes a study of products liability law, which is explored under both sales warranty and strict tort liability theories. The interrelationship between these competing theories of products liability law are also investigated. Other specific topics studied are the legal rules applicable to 1) the formation of sale contract, including the battle of the forms, statute of frauds, and parol evidence rule, 2) performance of and excuse of performance from the sales contract, 3) title warranties and title transfers, and 4) remedies for breach of the sales contract. Students may not take both LAWS 381 and LAWS 266 (Sales and Secured Financing).

LAWS 383. Bioethics and Law (3)
Students will be introduced to the basic principles of bioethics and health care law, and to the ways in which these principles apply to specific problems arising in clinical and policy settings. Readings and class discussion will first examine the philosophical framework and the basic moral theories relevant to modern bioethics. After the survey, bioethical issues in the following broad topics may be covered: defining life, including human reproduction, surrogacy and fetal-maternal conflict; euthanasia and the prolonging of life including the right-to-die, medical futility, and advance directives; termination of 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 (2)
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. Prereq: LAWS 385 (may be taken concurrently).

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 and Entertainment 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 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 261 and LAWS 211. Prior course work in intellectual property, labor and employment law, or alternative dispute resolution is recommended, but not required.

LAWS 392. 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 course will cover the basics of the Supreme Court’s reproductive rights jurisprudence, and looks at a series of topics relating to the intersection of reproductive rights and First Amendment rights, including freedom of speech and freedom of religion. In addition to reading cases, students will be assigned problems to discuss in class, with a focus on the practical problems of litigating civil rights cases (such as immunities, evidentiary concerns, and remedies). While the course is not coextensive with LAWS 003, there is some overlap, such that students should probably take only one of the two. 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, which cannot be taken concurrently.

LAWS 399. Pretrial Practice (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 401 and 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; clemency; 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 arising from actual innocence, ineffective assistance of counsel, ineffective assistance of experts, prosecutorial misconduct, judicial misconduct, juror misconduct, etc. Prereq: LAWS 407.

LAWS 411. Civil Clinic I (3)
Students must be enrolled in and complete both semesters to receive credit. Students present plaintiffs or defendants in a variety of matters, including landlord-tenant disputes, domestic relations cases, small business ventures, contract preparation, and administrative proceedings. A major part of the student’s responsibility is to determine whether a legal problem actually exists and, if so, to resolve it as expeditiously as possible. The seminar sessions are devoted to discussions of matters being handled by the students and to the ethical and practical problems encountered in civil law practice. Emphasis is on the use of such tools as negotiation, litigation, and settlement procedures to accomplish specific objectives. Prereq: LAWS 401. Prereq or Coreq: LAWS 207 or LAWS 212.

LAWS 412. Civil Clinic II (3)
Continuation of LAWS 411. Both semesters must be completed before credit is given.

LAWS 413. Civil Clinic III (3)
Continuation of LAWS 412. Both semesters must be completed before credit is given.

LAWS 415. Family Law Clinic I (3)
Students must be enrolled in and complete both semesters to receive credit. Students represent parties in a variety of family law matters, including contested and uncontested divorces, domestic violence petitions, custody, support, and property division. A major part of the student’s responsibility 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 cases handled by the students. The ethical and practical problems encountered in family practice are emphasized, as well as case theory. Prereq: LAWS 401. Prereq or Coreq: LAWS 207 or LAWS 212, and LAWS 210.
LAWS 416. Family Law Clinic II (3)  Continuation of LAWS 415. Both semesters must be completed before credit is given.

LAWS 418. Health Law Clinic I (3)  Students must be enrolled in and complete both semesters to receive credit. Students represent parties in a variety of health law matters, including premature discharge or inappropriate transfer from medical facilities; informed consent and substituted consent; entitlement to public or private insurance coverage, health services, and income benefits; and mental health issues such as guardianships and involuntary hospitalization. A major part of the student's responsibility 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. Prereq: LAWS 401. Prereq or Coreq: LAWS 207 or LAWS 212; LAWS 227 or LAWS 220.

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)  This Lab will involve students in an integrated experience of academic research and public service. Students will work on research projects on laws and policies designed to ensure integrity in the operations of financial institutions in emerging markets. The focus of the lab will be on the anti-money laundering and terrorism 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). The course will engage 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 will study and research key aspects of financial integrity rules, including restrictions on ownership and control, know-your-customer rules, suspicious transaction reporting, freezing and seizing of accounts, criminal and civil enforcement, and transnational cooperation. Special attention will be paid to the importance of fashioning rules appropriate for the economic, social, and legal environment of each jurisdiction. Prereq: LAWS 211 and LAWS 307.

LAWS 430. Community Development Clinic I (3)  Students must be enrolled in and complete both semesters to receive credit. Students represent individuals and entities in a variety of community development matters which may include first time home buyer real estate purchases, construction and rehabilitation; business and non-profit entity formation; individual and entity representation in neighborhood rehabilitation projects; and group representation in other contexts. 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: LAWS 401 or LAWS 286/LAWS 287. LAWS 203 or LAWS 204 may be taken concurrently.

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 434. Intellectual Property Entrepreneurship Clinic (3)  This clinic experience will teach the third-year students/legal interns a range of legal skills through advising and representing clients who are engaged in entrepreneurial activities, concerning a variety of legal issues relating to the protection, exploitation, and commercialization of the clients' innovative ideas. Initially, the clients will be teams of engineering students enrolled in the Weatherhead School of Management's course on "Engineering Entrepreneurship," although the clientele may change and/or expand to ensure that the clinic meets as many pedagogical goals as possible. (Other possible clients are students enrolled in the Physics Entrepreneurship Program see http://pep.phys.cwru.edu/). The clinic will provide the law students with opportunities to practice legal skills such as interviewing and counseling clients on a variety of legal issues pertaining to, among other things, intellectual property protection, corporate structure and financing, and various other transactional concerns that arise in an entrepreneurial/technology-based setting. A major part of the student's responsibility is to analyze the clients' problems and determine the best way of resolving them. Seminar sessions will be devoted to discussions of applicable law pertaining to specific cases students are working on, and to development of skills necessary to represent individuals and entities.

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.

LAWS 437. Immigration Law Clinic II (3)  The Immigration Clinic will be both a real client representational 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.

LAWS 438. Digital Law and Business (3)  This 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 web site 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, ECPA and the Patriot Act, COPPA, etc. Web site Terms of Use (web development). f). Web site affiliate agreements (web development). g). Web site 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). Cross-listed as MIDS 438.

LAWS 440. International War Crimes Project (3)  Students in this unique course undertake legal research projects for the Office of the Prosecutor of the International Criminal Tribunal for the Former Yugoslavia and Rwanda related to issues pending before the Tribunal. The course sessions explore the establishment of the Tribunal, its jurisprudence, and its Rules of Procedure and Evidence. Grades are based on the quality of student papers and in-class presentation. After successfully completing
the project, each participating student will receive a personalized letter of appreciation from the International Prosecutor.

LAWS 442. Access to Justice Externship (3)
Students will spend an average of ten (10) hours working on specific projects at Legal Aid Society and two (2) hours in class weekly. They will be expected to complete a particular project such as developing specific advice and brief service materials, pro se materials and/or community legal education materials. They will conduct legal research, observe legal proceedings, work with the court clerk's office, etc., under the supervision of Legal Aid staff, in order to complete their responsibilities for the semester. The course is offered as a pass/fail externship.

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 (IIF), 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 452. Global Corporate Governance Lab II (2)
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 (IIF), 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. Prereq: LAWS 451.

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 503. U.S. Attorney Externship: Civil (3)
This externship program will expose students to federal civil law practice through seminar discussions and placement in the local office of the United States Attorney. Students will assist the attorneys in the preparation and presentations of their cases.

LAWS 505. Curricular Training: Law Field Research (1)
This course is intended exclusively for the foreign national J.D. or LL.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.

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 CMA's 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 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 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 524. Health Care Advanced Research Seminar (2)
Students will undertake significant research in health law, participating in group discussions to help refine each other's topics, identify research materials, and critique rough drafts. May satisfy the writing requirement. Prereq: LAWS 227 and permission of the instructor.

LAWS 550. Advanced Nonprofit Organizations Seminar (3)
In this seminar, students will explore selected topics related to structure, governance, tax exemption, and governmental 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 15 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 2-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 will be required to complete at least one written project as part of the externship. Students must have at least a 2.5 GPA and must be approved by the United States Attorney following completion, review and approval of a security clearance application. Prereq: LAWS 327, LAWS 372, LAWS 375.

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. Prereq: 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.

LAWS 561. International Issues in Intellectual Property Seminar (3)
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. Prereq or Coreq: LAWS 370.

LAWS 569. Constitutional Law II Laboratory (2)
Some students enrolled in Constitutional Law II (LAWS 202) may enroll in this clinical or practical seminar designed to expose them to many of the issues discussed in class as those issues arise in the context of legislative proposals and specific “client” complaints. The source of these issues will be the Ohio ACLU. Students will work in pairs and will be required to research and evaluate specific First Amendment issues, writing opinion letters, assisting in the preparation of briefs and pleadings in pending litigation, and evaluating the First Amendment consequences and implications of legislation introduced or proposed to be introduced in the Ohio General Assembly. Students need not be certified by the Ohio Supreme Court to practice as law students; second-year students may enroll. Coreq: LAWS 202.

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 LL.M. students.

LAWS 571. Jurisprudence: Selected Problems (3)
The seminar will explore classic jurisprudential questions using great works of literature as the vehicle through which the explorations will be made. The questions are: What is the nature of law? of justice? What is the nature of the obligation to obey or respect the law? Some of the texts which will be used include: “Antigone,” “The Merchant of Venice,” “Billy Budd,” “Man for All Seasons,” and “Judgment at Nuremberg.”

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 576. Advanced Evidence Seminar (3)
Examines selected topics chosen by participants and approved by the instructor. Illustrative topic areas are rape shield laws, probabilistic evidence, toxic tort cases, rape prosecutions, junk science, the residual hearsay exception, use of social science research as evidence, and jury studies.

LAWS 587. Research Seminar in Taxation (2)
An opportunity to undertake significant research and writing in taxation, with each student expected to complete a major paper and present that paper to the class. Grade is based on the paper and class participation. Prereq: LAWS 211.

LAWS 592. International Economic Integration (3)
As countries open their economies to the world economy, new strains are placed on their legal systems. This course explores how legal systems adapt to open markets and free trade. Topics covered may include intellectual property, environmental, and labor laws. We will also examine specific countries’ experiences (New Zealand, Chile, Mexico), the mechanisms for growing international trade agreements (expansion of NAFTA, for example), and methods of legal reform. May satisfy the writing requirement.

LAWS 595. American 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 LL.M. 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 LL.M. in the U.S. Legal Studies.

LAWS 601. Canada-United States Law Institute Seminar (2)
The Canada-United States Law Institute Seminar provides students with the opportunity to examine the issues presented during the Canada-United States Law Institute ("CUSLI") annual conference as well as author a paper for potential publication in the Canada-United States Law Journal. CUSLI’s annual conference held each April draws approximately 100-150 high profile legal and business practitioners, governmental representatives, and academics to two days of seminars addressing
Canada-U.S. relations. Participating students will be required to attend the annual conference.

**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 placebos. Course will meet in one per week for 2 hours throughout the semester. Grades will be given based on class participation and a series of group projects and individual short writing assignments. Cross-listed as CRSP 603.

**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 (0)**
The Health Matrix seminar will provide training in writing, editorial skills, and advanced legal research. Topics to be covered will include topic development, web-based 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 719. Health Matrix Seminar (3)**
The Health Matrix seminar will provide training in writing, editorial skills, and advanced legal research. Topics to be covered will include topic development, web-based 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 (0)**
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, selecting a topic, web-based research, advanced Lexis and Westlaw research, advanced research training in selected substantive areas, and writing techniques. Satisfactory completion of the note will satisfy the upper-level writing requirement. Grade based on the quality of the note and class participation.

**LAWS 745. Law Review Seminar (0)**
The seminar will provide training in writing, editorial skills, and advanced legal research for students writing notes for the Case Western Reserve Law Review. Topics to be covered include plagiarism, selecting a topic, web-based research, advanced Lexis and Westlaw research, advanced research training in selected substantive areas, and writing techniques. Satisfactory completion of the note will satisfy the upper-level writing requirement. Grade based on the quality of the note and class participation.

**LAWS 746. Law Review Seminar (3)**
(See LAWS 745.)

**LAWS 762. Contemporary Issues in Law & Technology: Free Speech in the Digital Era (1)**
This course will be the first Contemporary Issues in Law and Technology template course. The course will be co-taught by Craig Nard and Declan McCullagh (LTA Fellow in Law and Technology and Washington Bureau Chief for Wired News). The course will cover (1) overview of principles of First Amendment analysis and its relationship to the Internet and the Communications Decency Act; (2) filtering and private restrictions on Internet Speech; (3) threats and the compilation of personal information; and (4) tensions between the First Amendment and the Copyright clause in digital content.

**LAWS 801. Core Lawyering Skills - Part 1 (2)**
This course is the first of a sequence of required courses in the CaseArc Program which trains students in the fundamental skills of practicing law. Students are introduced to the fundamentals of legal analysis and rhetoric beginning with objective written legal analysis. In addition, they receive instruction in manual and, to a limited extent, computerized legal research. Finally, students begin to develop the basic skills of interviewing, fact gathering and client counseling. The course is taught by a combination of classroom instruction, small group discussions and through performance and critique of simulation exercises. The goal is to integrate the learning and application of legal theory, doctrine and practice in an authentic manner. Students are assigned to an instructional team consisting of a doctrinal professor, a research, analysis and writing professor, a clinical professor and a librarian. The team coordinates the assignments and exercises so that students are provided a learning experience that combines lecture, discussion, and hands-on experience. Students must take this course in the fall semester of their first year.

**LAWS 802. Core Lawyering Skills - Part 2 (2)**
This course is the second of the sequence of 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. Prereq: LAWS 801.

**LAWS 803. Core Lawyering Skills - Part 3 (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. Prereq: 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. Prereq: LAWS 801 and LAWS 802.

**COURSE DESCRIPTIONS (LLM)**

**LLM 601. Basic Federal Income Tax (2)**
The fundamental concepts of the current U.S. system. Gross income; deductions (personal and business); the computation of gains and losses; adjusted basis; basic tax accounting principles; time value of money considerations; and certain restrictions on loss deductions.

**LLM 611. Corporate Tax I (2)**
The tax consequences of the formation of the corporation; distributions of cash or property to shareholders; stock dividends; redemptions; and liquidations.

**LLM 612. Corporate Tax II (2)**
Corporate reorganizations, including acquisitive and divisive reorganizations; more details on the rules of Subchapter S. Prereq: LLM 611.

**LLM 613. Income Tax Accounting (2)**
The cash and accrual methods of accounting; inventory methods; constructive receipt issues; cash equivalents; the economic benefit; claim of right, and tax benefit rules; original issue discount; below-market loans; imputed interest.
LLM 614. Taxation of Property Transactions (2)
Gain or loss on the sale or exchange of property; the basis of property and adjustment to basis, including depreciation or amortization; the nonrecognition provisions (such as like-kind exchanges, the rollover of involuntary conversions, gain or loss on the sale of a residence); the passive activity loss rules; the at-risk rules; depreciation recapture; tax consequences to the debtor and creditor involved in the restructuring of debt.

LLM 617. Qualified Plans of Compensation I (2)
The requirements under the Internal Revenue Code of a qualified retirement plan, including the eligibility, vesting, funding, and participation requirements; defined benefit plans; defined contribution plans; and various provisions under ERISA.

LLM 619. International Aspects of U.S. Income Tax I (2)
The course develops the student’s understanding of the basic concepts of international taxation by focusing on U.S. taxation of foreign corporations and individuals with U.S. activities. Topics include the source rules, determination and taxation of “effectively connected” income, withholding taxes, branch taxation, the special rules for foreign investment in U.S. real property, tax treaties, and foreign currency.

LLM 620. International Aspects of U.S. Income Tax II (2)
The course builds on the concepts developed in International Aspects of U.S. Income Tax I (LLM 619) and focuses on the U.S. taxation of the foreign activities of U.S. corporations and individuals. Topics include the foreign tax credit, subpart F and other “anti-deferral rules,” the taxation of transfers to foreign corporations, transfer pricing, and the individual foreign earned income exclusions. No prerequisite, but students with no experience in international tax who plan to take both I and II should take International Aspects of U.S. Income Tax I (LLM 619) first.

LLM 621. Basic Estate Planning (2)
The basic Internal Revenue Code provisions of the federal wealth transfer tax law. Topics include the gross estate; the marital deduction and other deductions; the taxable estate; gift taxes.

LLM 622. Advanced Estate Planning (2)
Estate planning techniques, including marital deduction planning; generation-skipping trusts; life insurance; estate planning regarding qualified retirement plans; estate freezes (Chapter 14 of the Internal Revenue Code); other planning opportunities. No prerequisite, but the student should have a basic understanding of federal wealth transfer taxes before taking this course.

LLM 623. State and Local Taxation (2)
In addition to constitutional issues, specific topics include income and franchise taxes; property taxes; sales and use taxes; value-added and single business tax issues. Research on state and local tax problems will be discussed.

LLM 627. Advanced Partnership Tax (1-2)
LLM 628. Partnership Tax (2)
The tax consequences of the formation of the partnership; the adjusted basis of a partner’s interest; capital accounts; the receipt of a partnership interest in exchange for services; the allocation of profits and losses; partnership distributions; transfers of partnership assets and partnership interests; special rules pertaining to the death of a partner; special basis adjustments; the liquidation of a partner’s interest; the liquidation of the partnership. The substantive law and the tax aspects of limited liability companies will be analyzed and discussed.

LLM 630. Income Taxation of Estates and Trusts (2)
An examination of the different types of trusts including grantor trusts, simple trusts and complex trusts; consideration of the tax treatment of estates; analysis of the concept of Distributable Net Income and its effect on trusts and their beneficiaries; analysis of the tax treatment of split-interest charitable trusts.

LLM 632. Tax Procedure and Research Methods (2)
The procedural provisions of the Internal Revenue Code, including the provisions governing the assessment and collection of taxes; the statute of limitations; petitions to the U.S. Tax Court; the mitigation provisions governing inconsistent positions; refunds; other similar matters. Instruction on research methods, including computer research. All participants are required to perform some legal research outside class.

LLM 634. Consolidated Tax Returns (2)
Topics include the affiliated group; the election to file and discontinue filing consolidated returns; taxable years, income included in returns, and methods of accounting; consolidated taxable income; intercompany transactions, special limitations on deductions; net operating losses; excess loss accounts; intercompany distributions; the disposition of stock of a subsidiary.

LLM 638. Advanced Corporate Tax Problems (2)
A more detailed examination of corporate reorganizations (including original issue discount problems in recapitalizations), distributions, redemptions, liquidations, and S corporation taxation; personal holding companies; accumulated earnings tax; collapsible corporations; the carryover of net operating losses and other tax attributes.

LLM 640. Executive Compensation (Nonqualified Plans) (2)
Incentive stock options; nonqualified stock options; restricted stock plans; constructive receipt problems; “Rabbi” trusts; stock appreciation rights plans; other nonqualified deferred compensation methods; golden parachutes; other compensation methods and techniques.

LLM 645. Criminal Tax and Procedure (2)
The course covers the various tax and tax-related crimes under the Internal Revenue Code and Titles 18 and 31 of the United States Code. These include tax evasion and false return charges, money laundering, and currency transaction crimes. In addition, students analyze the stages of a criminal tax investigation and prosecution in both non-grand jury and grand jury settings.

LLM 648. Federal Taxation of Exempt Organizations (2)
This course will cover the basics of the taxation of tax-exempt organizations, including the following topics: the requirements for tax-exempt status (the organizational and operational requirements); an analysis of the application for exemption process; unrelated business taxable income, private inurement, public and private foundation status, intermediate sanctions, and various other topics.
CORE VALUES
The Weatherhead School of Management believes that management is a noble profession committed to the advancement of human life.

- We value 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 consequences 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 and faculty 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.
- We value partnerships with the business community and other organizations. We value meaningful service to society and strive for outcomes that influence and positively change the way people and organizations conduct themselves.
- We are a cohesive learning organization with innovative, knowledge creating approach.
- We value learning that is active and collaborative. Students and faculty together engage important management problems with an innovative, knowledge creating approach.
- We are responsive to the needs of our students.

ACADEMIC DEGREE PROGRAMS
Undergraduate Programs
Degrees granted by the Weatherhead School of Management
- 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
Degrees granted by the Weatherhead School of Management
- Master of Accountancy (MAcc)
- Master of Business Administration (MBA)
- Executive MBA (EMBA)
- Master of Science in Management (for Liberal Arts Undergraduates)
- Master of Science in Management - Operations Research (MSM-OR)
- Master of Science in Management - Supply Chain (MSM-SC)
- Master of Science in Positive Organization Development and Change (MPOD)
- Executive Doctor of Management (EDM)
- Master of Nonprofit Organizations (M.N.O.) (granted jointly by the Weatherhead School of Management and the Mandel School of Applied Social Sciences)

Joint Degree Programs
(Degrees granted by the Weatherhead School and other schools of the university)
- MBA/JD (Juris Doctorate)
- MBA/MD (Medical Doctorate)
- MBA/MIM (Master in International Management)
- MBA/MSM-OR (Master of Science in Operations Research)
- MBA/MSM-SC (Master of Science in Supply Chain Management)
- MBA/MSSA (Master of Science in Social Administration)
- MBA/MSN (Master of Science in Nursing)
- MBA/MPH (Master of Public Health)

M.N.O./J.D.
- M.N.O./M.S. in Social Administration
- M.N.O./M.A. in Music History

Graduate Programs
Degrees granted by the university's School of Graduate Studies
- PhD in Management
- PhD in Operations Research
- PhD in Organizational Behavior

Non-Degree Certificate Programs
- Certificate in Health Systems Management
- Certificate in Management Information Systems
- Certificate in Nonprofit Management
- Certificate in Operations

ADMINISTRATION
N. Mohan Reddy
Interim Dean
Timothy Fogarty
Senior Associate Dean of Faculty and Research
Robert Knight
Associate Dean of Finance and Administration
Gary J. Previts
of economics and business, and a commitment to public well being. Career opportunities in accounting include the public, corporate, government, nonprofit 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 decision 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 Principles Core as early as possible and the 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 coursework 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 (six semester hours) 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 Program Services at Weatherhead located in Wolstein Hall.

**Bachelor Of Arts In Economics**

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. A 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.

**Degree Requirements:**

- **Core Theory**
  - ECON 102 and 103
  - STAT 201 or STAT 207
  - ECON 307
  - ECON 308 or 309
  - ECON 326
- **Electives**
  - 12 ECON credits (at least 6 credit hours in each of two concentrations)

**Senior Capstone**

- Required, to be chosen from a menu of options and in coordination with your major advisor
- Economics Concentrations

**Resources & Markets**

- ECON 255 - Economic History of the United States
- ECON 332 - Economics of Labor Markets
- ECON 341 - Banking and Finance
- ECON 368 - Environmental Economics

**Industrial Organization**

- ECON 328 - Experimental Economics
- ECON 329 - Game Theory
• ECON 361 - Managerial Economics
• ECON 369 - Economics of Technological Innovation

Public Economics
• ECON 342 - Public Finance
• ECON 343 - Economics of State and Local Governments
• ECON 345 - Public Choice
• ECON 377 - Economics of Nonprofit Organizations
• 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

Minor (for BA or BS degree)
A minor in economics consists of 15 credit hours, as follows:
• ECON 102, ECON 103, and three additional economics courses (9 credit hours) selected in consultation with the minor advisor, with at least two of the courses in one concentration.
• Social Science Sequence (for BS based upon Engineering Core Curriculum)
  • The sequence requirement is satisfied by taking ECON 102, ECON 103, and one other 200- or 300-level ECON course.
  • Social Sciences/Social Institutions Requirement (for BA or BS degree based on Arts and Sciences General Education Requirements)
  • The three-credit minimum may be satisfied by taking any one of the courses below. The six-credit sequence may be satisfied by taking any two of the courses listed below:
    • ECON 102, ECON 103, or ECON 205.

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. To respond to students’ diverse interests and goals, three elective sequences are offered: finance, information systems and marketing; leading to careers in a vast array of areas including consulting, banking and finance and operations management. Each management student is required to obtain a concentration by completing one of the three elective sequences. In addition, each student must consult with an advisor in the Office of Undergraduate and Integrated Study Program Services at Weatherhead located in Wolstein Hall.

Management Concentrations

Concentration I: Finance
Required Courses (9 credit hours):
• BAFI 356 - Investments (3 credit hours)
• BAFI 359 - Intermediate Corporate Finance (3 credit hours)
• BAFI 372 - International Finance (3 credit hours)
Choose (2) Elective Courses from the following (6 credit hours):
• BAFI 357 - Financial Modeling, Analysis & Decision Making (3 credit hours)
• ACCT 300 - Corporate Reporting I (3 credit hours)

Concentration II: Information Systems
Required Courses (15 credit hours):
• MIDS 326 - Systems Analysis & Design (3 credit hours)
• MIDS 327 - Database Management (3 credit hours)
• MIDS 385 - Web Systems Integration (3 credit hours)
Choose (2) Elective Courses from the following (6 credit hours):
• MIDS 307 - Computer Programming & Problem Solving Using JAVA (3 credit hours)
• MIDS 310 - Technology of Information Systems (3 credit hours)
• MIDS 315 - Multimedia Systems (3 credit hours)
• Approved EECS Course (3 credit hours)

Concentration III: Marketing
Required Courses (15 credit hours):
• MKMR 310 - Market Research (3 credit hours)
• MKMR 311 - Consumer Behavior (3 credit hours)
• MKMR 312 - Selling and Sales Management (3 credit hours)
Choose (2) Elective Courses from the following (6 credit hours):
• ANTH 102 - Being Human: Introduction to Social/Cultural Anthropology (3 credit hours)
• ANTH 314 - Cultures of the United States (3 credit hours)

Minor Areas of Concentration
Accounting Minor (15 credit hours)
• ACCT 101
• ACCT 102
• ACCT 300
At least two additional 300-level courses approved by the Department of Accountancy.

Banking and Finance Minor (15 credit hours)
• BAFI 355
• BAFI 356
• BAFI 357

One of the following courses:
• BAFI 341 or BAFI 359

One of the following courses:
• ACCT 300, ECON 326, ENTP 310, BAFI/ECON 342

Entrepreneurial Studies Minor (15 credit hours)
• One of the following courses: ACCT 102 or ACCT 303
• MKMR 301
• ENTP 295, 310, and 311

Management Information & Decision Systems Minor (15 credit hours)
• MIDS 301
One of the following courses:
• ENGR 131 or MIDS 307
• Three additional MIDS courses approved by the minor advisor.

Marketing Minor (15 credit hours)
• MKMR 301, 310, 311, 312
One of the following courses:
• ANTH 102, 314; ECON 326, 328, 373; ENTP 301; MIDS 315; PSCL 315, 357
Other Minors
Consult Weatherhead Office of Undergraduate Services in the Weatherhead School of Management.

Integrated Study Programs in Accountancy
Integrated study programs enable attainment of a BS in Accounting and a Master of Accountancy (MAcc) degree in five years or less. These programs are strongly recommended for those individuals planning to obtain professional certification. Certified public accountant (CPA) candidates must have completed 150 semester hours of study at the university level in order to qualify to sit for the CPA examination. There are two programs that integrate graduate and undergraduate coursework in accountancy, the Joint B. in Accounting/MAcc and the Accelerated BS in Accounting/MAcc.

Application to either integrated study program should be made during the junior year directly to the Master of Accountancy program. The GMAT (Graduate Management Admission Test) is required for admission to the MAcc program and should also be completed during the junior year. Once admitted, students in an integrated study program are required to design a comprehensive study plan with the both the Weatherhead advisor and the Director of the MAcc program.

Joint BS in Accounting/Master of Accountancy (MAcc)
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 beginning the Master’s degree.

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 course work)
• 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.

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 Case 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 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.

Program Requirements
To be eligible, a student must:
• 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 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 UGIS may serve as Practicum Advisor for summer practica.

All practica developed through the 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, they will neither have the benefits of full-time student status nor do they represent the Practicum program in any official capacity.
# Undergraduate Course Offerings

## Bachelor of Science in Accounting

### Fall Semester

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
<th>Credits</th>
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<tbody>
<tr>
<td>First Semester Credits</td>
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<tr>
<td>MATH 125</td>
<td>Calculus I</td>
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<tr>
<td>ACCT 101</td>
<td>Intro to Fin Accounting</td>
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<td>MGMT 250</td>
<td>Managing Orgs and People</td>
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<td>ACCT 300</td>
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<td>BAFI 355</td>
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<td>BLAW 331</td>
<td>Business Law</td>
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<td>Fourth Semester Credits</td>
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<td>ACCT 202</td>
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<tr>
<td>MGMT 251</td>
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<td>ECON 103</td>
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<td>ACCT 301</td>
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<td>ACCT 305</td>
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# Bachelor Of Science In Management

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<td>ECON 326</td>
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GRADUATE PROGRAMS

The MBA Program

The Weatherhead School of Management’s innovative MBA program is based on the underlying philosophy that our graduates must create value for organizations and society. The Weatherhead MBA curriculum emphasizes the assessment and development of management skills along with knowledge of the functional areas of business, and offers a liberalizing experience through exploration of the diverse contexts of management.

The Weatherhead core curriculum enhances the potential of each student to create value by:

• drawing from different perspectives to identify, analyze and resolve complex problems;
• being creative and agile in designing systems and adapting to change;
• developing and enhancing organizational leadership;
• making a personal commitment to life-long learning;
• adding value in a special area of expertise;
• contributing to the betterment of communities and society.

MBA Program Structure

The full-time MBA is delivered as either a 21-month program for candidates with diverse academic backgrounds or as an 11-month program for students with undergraduate business degrees from U.S. universities. Part-time instruction is available as a 48-hour program for candidates with diverse academic backgrounds or as a 42-hour program for students with undergraduate business degrees from U.S. universities. Both programs involve the same required courses. The part-time curriculum has fewer elective options. The MBA program is divided into management assessment and development, the core curriculum, and the elective sequence. See the Departmental Course Offerings section for detailed course descriptions.

Full-Time MBA Program

Twenty-one-month Curriculum

Core Courses (33 credit hours)

Incoming full-time MBA students may elect to take a waiver exam to exempt from any core course in the program if they have completed equivalent coursework in another degree program. Passing the waiver exam does not shorten the program but allows students to replace the core course with an elective. The only courses that are not waivable are MGMT 403 and MGMT 498.

• MGMT 403 - Leadership Assessment and Development I (3)
• MGMT 499 - Strategic Issues and Applications (3)
• MGMT 413 - Human Value in Organizations (3)
• QUMM 414 - Statistics and Decision Modeling (3)
• ACCT 401 - Finance and Managerial Accounting (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 of Management (3)
• MGMT 498 - Action Learning Consulting Course (3)

Eleven-month Curriculum Core Courses (17 credit hours)

Because of the integrative nature of the full-time core, no courses may be waived, regardless of undergraduate equivalent courses.

• MGMT 403 - Leadership Assessment and Development I (3)
• MGMT 499 - Strategic Issues and Applications (3)
• MGMT 413 - Human Value in Organizations (3)
• QUMM 414 - Statistics and Decision Modeling (1)
• ACCT 401 - Finance and Managerial Accounting (1)
• BAFI 402 - Financial Management I (1)
• MIDS 409 - Information Design and Management (1)
• MKMR 403 - Marketing (1)
• OPMT 405 - Operations Management (1)
• ECON 403 - Economics of Management (1)
• MGMT 498 - Action Learning Consulting Course (3)

Advanced Electives

Students in the 21-month MBA program take 24 credit hours of electives, while students in the 11-month MBA program take 30 credit hours of electives. See the Departmental Course Offerings section for detailed course descriptions.

Concentrations

There are no requirements to achieve a concentration to complete degree requirements; however, some students may wish to pursue a concentration. More detailed information is available at www.weatherhead.case.edu/mba.

Independent Study

MBA students are limited to 6 credit hours of elective credit as independent study. Any hours greater than six will be subject to petition and approval by the Associate Dean for Academic Administration.

Other courses at the University may be eligible for MBA elective credit. Contact the registrar for additional information.

Non-Credit Supplemental Instruction in Computer Familiarization.

The Weatherhead School offers noncredit supplemental instruction to MBA students in computer familiarization.

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 workshop, in advance of starting the MBA program. The workshops are offered during the two weeks before the start of full-time orientation in August.

There is a cost of $300 to attend both workshops.

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 by taking evening and Saturday courses. The majority of these students work full-time for organizations in the Cleveland area. The same full-time faculty members teach evening, Saturday and daytime classes.

The full-time, evening and Saturday programs have the same admission standards and both are accredited by the AACSB.

Evening and Saturday instruction is available as a 48 credit hour program for candidates with diverse academic backgrounds, or as a 42 credit hour program for students with undergraduate business degrees from a US institution. With one “overload” semester, the 48 credit hour program can be completed in three years. With two overload semesters, the 42 credit hour program can be completed in two years.
Evening and Saturday Core Course Curriculum (48 credit hours)

Students who have completed undergraduate equivalent course work of an MBA core course may substitute an elective for the course. Substitution of four or more electives will qualify students for the 42 credit hour track (see below).

- MGMT 403 - Leadership Assessment and Development (3)
- MGMT 499 - Strategic Issues and Applications (3)
- MGMT 413 - Human Value in Organizations (3)
- QUMM 414 - Statistics and Decision Modeling (3)
- ACCT 401 - Finance and Managerial Accountancy (3)
- BAFI 402 - Financial Management I (3)
- MIDS 409 - Information Design and Management (3)
- MKMT 403 - Information Management (3)
- OPMT 405 - Operations Management (3)
- ECON 403 - Economics for Management (3)
- Evening and Saturday Core Course Curriculum (42 credit hours)

Students with undergraduate business degrees who can waive from or replace four or more courses from the list above are eligible for the 42 credit hour track. The only courses that are not waivable are MGMT 403 and MGMT 499.

Evening and Saturday Advanced Electives (15 hours 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.

Concentrations

There are no requirements to achieve a concentration to complete degree requirements; however, some students may wish to pursue a concentration. More detailed information is available at www.weatherhead.case.edu/mba.

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.

Scholars will also:

- Receive a tuition scholarship of $15,000 per year
- Take courses at Cleveland Clinic and Case Weatherhead
- Complete prestigious paid summer internships at Cleveland Clinic
- Participate in seminars featuring Cleveland Clinic managers as guest speakers

For additional information about this program or to apply please call 216/368-2143 or email hsmc@case.edu.

Executive Master Of Business Administration

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 manager and executive responsibility. A qualified applicant must have 10 years of experience, 5 of those in a management capacity, company endorsement, and an in-person interview. The program is divided into five integrated semesters. Each semester contains modules that deal with a particular theme. Action learning projects throughout the program allow participants to work on real issues that affect their sponsoring organizations and provide instant ROI. Each semester starts with a four-day residency. After that, participants come to campus one contiguous Friday and Saturday each month. These sessions are combined with technology enhanced learning elements that enable participants to “attend class” on their own schedules. For more information call Jennie Lahman, Director, EMBA program at 216/368-2554.

Executive Doctor Of Management

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 and conducting issue-oriented research. For further details, a program brochure and information on applying to the EDM Program can be obtained by contacting Sue Nartker, 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 must have an undergraduate degree in accountancy from an accredited US program or the equivalent. Students who do not have an accountancy degree may still be admitted, but will need to take 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 an accountancy 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, organizational behavior, operations management and statistics

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 accountancy 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 Accountancy may be eligible to accelerate their completion of the BS in Accountancy 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)
- Accountancy Electives (12 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 3 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 of the Master of Accountancy Program, 216/368-2065; larry.parker@case.edu, or Tiffany Welch, Coordinator of the Master of Accountancy Program, 216/368-2058; tiffany.welch@case.edu for further information.

Master Of Science In Management (For Liberal Arts Undergraduates)
In the Weatherhead Master of Science in Management (MSM) program, students gain the entry-level management and business skills needed for success. Unlike most other graduate business degrees, this two-semester degree program is specially designed for recent bachelor of arts graduates with no prior business coursework. The MSM curriculum is designed to give students a broad experience of all major areas of the current business spectrum and provides a solid foundation for thorough, informed decision-making in today's business environment.

Students will work with the University Office of Career Development and the Weatherhead School of Management Career Services office for opportunities that require marketing, financial analysis and other analytical skills. Job opportunities will range from market research to financial analysis positions, as well as other functional responsibilities that typically require an undergraduate business degree.

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)
- QUMM 414 - Statistics and Decision Modeling (3)
- ACCT 401 - Financial Reporting and Control (3)
- BAFI 402 - Managerial Finance (3)
- MIDS 409 - Information Design and Management (3)

is a 42 credit hour program which takes three semesters to complete. Courses are taught by the highly ranked Case School of Engineering and Weatherhead School of Management.

MEM Admission Requirements
Students enrolled in accredited baccalaureate engineering programs who hold junior or senior level status will be considered for admission. In addition, students with less than 5 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.

International Institute (3)
Statistics and Finance Preparation Workshops
All admitted students in the 9-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 two weeks before the start of full-time orientation in August. There is a cost of $300 total to attend both workshops.

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 for liberal arts undergraduates, contact Cassie Solis at 216/368-2031 or cassie.solis@case.edu.

Master Of Science In Management Operations Research (Msm-or)
Operations research (or management science) 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 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 performs as predicted by the model.

The MSM-OR Program trains students in the techniques and applications of operations research and provides them with basic understanding of business fundamentals in order to contribute value to organizations and communicate effectively with professionals in other business disciplines.
MSM-OR Curriculum
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 full-time or part-time. For more detailed information e-mail msm-oper@case.edu or visit the Department website at http://weatherhead.case.edu/orom.

The MSM-OR curriculum comprises 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
- Regression and Forecasting
- Simulation Design
- Simulation Models with Applications
- Integrated Problem Solving
- Computer Programming
- 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 In Supply Chain (MAM-SC)
Supply chain management deals with the coordination of all activities that impact 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.

MSM-SC Curriculum
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 full-time or part-time. For more detailed information e-mail msm-oper@case.edu or visit the Department website at http://weatherhead.case.edu/orom.

The MSM-SC 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)
- Required Courses
- Quantitative (1.5 credit hours each):
  - Linear Programming
  - Deterministic Models with Applications
  - Probability and Statistics for Management Science
- Regression and Forecasting
- Simulation Models with Applications
- Simulation Design
- Integrated Problem Solving
- Managerial (3 credit hours each):
  - Marketing through Supply Chain
  - Supply Chain Logistics
  - Supply Management in the Supply Chain
  - Enterprise Resource Planning in Supply Chain

Master Of Science In Positive Organization Development And Change (Mpod)
The context of organizational development (OD) 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 in between residential periods. This distinct learning atmosphere offers Weatherhead a unique opportunity to advance its 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 and Emotional Intelligence and personal coaching. In addition, participants complete two team consulting projects in the field and an individual application project in their workplace. The program also offers a multi-cultural experience with OD students and practitioners in countries outside the United States.

Residency One
- History of OD; Foundations of Positive OD; Relational Skills Lab

Residency Two
- Appreciative Inquiry Practicum; Coaching and Leadership Assessment and Development I; Foundations of Strategy I; Team Development

Residency Three
- Action Research; Systems Thinking & Sustainability; Strategy II; Coaching and Leadership Development II; Organizational Design I

Residency Four
- Building the Sustainable Enterprise I; Organizational Design II; Coaching and Leader-
Admission to the 45-credit Executive M.N.O. program requires a minimum of 5 years or more of professional experience and 5 years or more of management or supervisory experience. The foundation for this option is the curriculum of the Master of Nonprofit Organizations program. 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. For further information, contact the Mandel Center’s Director of Recruitment at (216) 368-6025.

Admission to the 45-credit Executive M.N.O. degree option will be considered only at the time of the initial admission into the master’s program. Students may not apply for this option once they have matriculated into the 60-hour program.

Admission Requirements
For additional information concerning the M.N.O. program (including scholarship information), contact the Director of Recruitment at (216) 368-6025, by e-mail at mcnoadmissions@case.edu, by mail at Mandel Center for Nonprofit Organizations, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio 44106-7167, or on the web at: www.case.edu/mandelcenter.

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 M.N.O. degree program. A grade of at least B must have been earned. A Mandel Center faculty member must make written approval of 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 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 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 6 credit hours.

Substitution
An additional 9 credit hours may be approved for substitute credit. Substitute courses replace required M.N.O. 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 M.N.O. 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 M.N.O. 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 M.N.O. 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 30 credit hours of study: 3.0
• 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 M.N.O. program.

Non-Degree Students
Please see the Weatherhead School of Management's policy.

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 school 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 admission requirements of both schools, including taking both the LSAT and the GMAT and completing separate applications to both schools (indicating in the section 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. The JD contact for joint degree candidates is Andrew Morriss, 216/368-4911. The MBA contact for joint degree candidates is Deborah Bibb, 216/368-6702. For more information about the School of Law at Case Western Reserve University, please go to: http://law.case.edu.

**Registration**

Throughout the joint degree program, JD/ MBA 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.

**JD/MBA Curriculum Structure**

For more information about the JD/MBA curriculum structure, please visit the website: http://weatherhead.case.edu/joint_degree/joint_mbaJd.cfm.

**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.

**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.

**Registration**

- Year 1—Register at the School of Medicine (9 MBA credit hours) Standard Medical School curriculum, with 7 credit hours of MBA electives taken as overloads in the evening.
- Year 2—Register at the School of Medicine (9 MBA credit hours) Standard Medical School curriculum, with 9 credit hours of MBA electives taken as overloads in the evening.
- Years 3 and 4—Register at the School of Medicine (6 MBA credits) Standard Medical School curriculum, with 6 credits of MBA electives taken as overloads in the evening.

**MBA/MD Curriculum Structure**

Please visit the MBA/MD website http://weatherhead.case.edu/mba/jointDegree/joint_mbaMd.cfm for complete information about the joint degree curriculum structure.

**Option 1:** One year as a full-time MBA student prior to entering Medical School. Remaining MBA requirements are completed during the first two years of Medical School.

**Advantage:** After the first year at Weatherhead, MD students complete the four-year MD degree program without interruption.

**Option 2:** One year as a full-time MBA student between the second and third years of Medical School. During the first two years of medical school, students complete up to 24 credit hours of MBA requirements. After a third year of full-time MBA studies at Weatherhead, students complete the final two years of Medical School.

**Advantage:** The start of Medical School is not deferred. MD students may apply to the joint MBA/MD program up until the end of the first year of Medical School.

**Option 3:** (for students with an undergraduate major or minor in management only) One full-time summer semester of MBA studies, taken during the summer before or after the first year of Medical School. Students may complete the MBA portion of the joint degree entirely on a part-time basis by enrolling at Weatherhead during the summer semesters prior to and immediately after the first year of Medical School and completing the remaining MBA requirements during the first two years of Medical School.

**Advantage:** For students with appropriate undergraduate management coursework, the MBA core can be completed in one summer, with electives taken as overloads during the fourth years of medical school.

**MBA/MLM Joint Degree Program**

The Weatherhead School and the American Graduate School of International Management—better known as the Thunderbird School—in Glendale, Arizona, 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:

• A unique management skills assessment and development process and strong functional concentrations in finance, marketing, MIS, operations, human resource management, entrepreneurship and health care management available 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.

• 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 coursework 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 must enroll 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 has no bearing upon admission to the other.

Students who have already been 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 the application catalog of each school for information regarding tuition, financial aid, etc.

To request application materials, please contact:

Director of Admissions
Weatherhead School of Management
Case Western Reserve University
10900 Euclid Avenue
Cleveland, OH
44106-7235 216/368-2030 800/723-0203
Fax: 216/368-5548
e-mail: MBAinfo@case.edu

Dean 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

Thunderbird Director of Admissions
Judy Johnson
Director of Admissions
602/978-7131
e-mail: admissions@t-bird.edu

MBA/MIM Curriculum Structure
For information about the MBA/MIM curriculum, please visit the MBA/MIM website: http://weatherhead.case.edu/mba/jointDegree/joint_mbaMim.cfm

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.

Program Structure
Students may pursue the MBA/MSM-OR or MBA/MSM-SC on a full-time 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-time and part-time students who already have begun the MSM or MBA program must complete their application to the joint degree program no later than upon completion of 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
The MBA/MSM-OR and MBA/MSM-SC programs share a common goal: to prepare quantitatively competent graduates to work in organizations creating highly technical products and services, providing technical support for managerial planning and control efforts, and acting as consultants. Graduates of both MSM tracks are skilled in the use of computers, mathematical models and statistics to solve practical business problems and in the principles and concepts associated with a busi-
ness specialty. They also possess a basic understanding of managerial functions, facilitating practical problem solving and effective communication with non-technical management personnel.

For more information, visit the MBA/MSM-OR website: http://weatherhead.case.edu/mba/jointDegree/joint_mbaMosMgmtOperResearch.cfm or the MBA/MSM-SC website: http://weatherhead.case.edu/mba/jointDegree/joint_mbaMosMgmtSupplyChain.cfm

MBA/MSA Joint Degree Program
The MBA/Master of Science in Social Administration (MSSA) joint degree program is designed for candidates who wish to prepare for advanced social work practice in a variety of clinical settings, while developing the skills to assume management responsibility in those organizations.

Program Structure
MBA/MSA students may begin the joint degree in either the Mandel School of Applied Social Sciences or the Weatherhead School of Management. Students will continue to register in the school at which they began the program, regardless of the school they are attending. Students who prefer to be considered for an internship between the first and second years of the program may prefer to begin the curriculum at Weatherhead.

There are 102 credit hours in the joint MBA/MSA Program (51 credit hours at MSASS, 51 credit hours at Weatherhead), compared with 124 credit hours if both degrees were completed separately. By integrating the course work, completing some course work over the summer, and reducing the elective requirements in each program, joint degree students may complete the MBA/MSA in three years, instead of the four years required if both degrees were to be completed separately.

Admission to the MBA/MSA 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/MSA. For more information about the MS degree, please go to: http://fpb.case.edu

MBA/MSN Joint Degree Program
The MBA/MS in Nursing (MSN) joint degree program 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.

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 semesters.

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, please go to: http://fpb.case.edu

MBA/MSN Curriculum Structure
For details about the curriculum structure, please visit this website: http://weatherhead.case.edu/mba/jointDegree/joint_mbaMosNurs.cfm

MBA/MPH Joint Degree Program
The joint MBA/Master’s 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;
- 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 credit 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 coursework 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:

Scott H. Frank, M.D, MS
Program Director, MPH Program
School of Medicine
216/368-3197
scott.frank@case.edu

MBA/MPH Curriculum Structure
The Master Of Business Administration/certificate In Nonprofit Management Dual Program (MBA/CNM)

MBA 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 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 fulfill 15 credits toward the CNM certificate and 63 or 47 hours (traditional or accelerated full-time curriculum) toward the M.B.A. 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 69-hour (53 in the accelerated track) program requirement.

Courses in the CNM/M.N.O. curriculum 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, please visit this website: http://weatherhead.case.edu/mba/certificates/cert_default.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 request, in writing, for consideration and approval by the MBA/CNM faculty advisor.

Admission/Enrollment Procedures for the dual MBA/CNM Program

Candidates must complete both applications and be admitted to each program separately. 63-hour MBA students must apply to the CNM program no later than the end of the first year in the MBA program, or at the end of the first semester in the 47-hour accelerated curriculum). MBA/CNM students must receive both credentials simultaneously to be granted credit for specific courses taken in the other program. Candidates who have previously completed the MBA degree or the Certificate in Nonprofit Management may not apply for the dual MBA/CNM program.

M.S.S.A./ CNM

The M.S.S.A./CNM combines the Master of Science in Social Administration (M.S.S.A.) with the Certificate in Nonprofit Management. The M.S.S.A./CNM provides excellent preparation for students who have a professional interest in economic and community development and the management of nonprofit organizations.

The program consists of five Mandel Center courses, as well as SPPP 512 (Legislative Political Processes), a Mandel School course. Candidates must complete both applications and be admitted to each program separately. M.S.S.A./CNM students must receive both credentials simultaneously to be granted credit for specific courses taken in the other program.

For more information, contact the Director of Recruitment at 216-368-6025 or by e-mail at mcnoadmissions@case.edu.

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 who desire to practice law as it relates to nonprofit organizations, serve as managers of nonprofit organizations, or work 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. J.D. students must apply by no later than the end of the second year in the J.D. program. J.D./CNM students must receive both credentials simultaneously to be granted credit for specific courses taken in the other program.

For more information, contact the 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 J. B. Silvers, Faculty Director of the Health Systems Management Center (216/368-5417).

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 credits)
• HSMC 421/ECON 421 – Health Economics and Strategy (3 credits)
• HSMC 422/MKMR 420 – Health Care Marketing (3 credits)
• HSMC 427/LAWS 227 – Health Law (3 credits)
• HSMC/MIDS 432 – Health Care Information Systems (3 credits)
• HSMC 446/IIME 446 - Models of Health Care Systems (1.5 credits)
• HSMC 447/IIME 447/BIOS447 - Regulatory Affairs for the Biosciences (1.5 credits)
• HSMC 456 – Health Policy and Management Decisions (3 credits)
• HSMC 501 G – Medical School Electives (1-3 credits)
• HSMC 502 – Health Care Executive Education Series (3 credits)
• Related Courses (Weatherhead School of Management)
• ECON 436 – Economics of Organizations: Structuring Incentives and Investing in Relationships (3 credits)
• OPMT 422 – Management of Service Operations with E-Commerce (3 credits)
• Additional Health Courses (School of Law)
• LAWS 295 – Health Care Organization and Finance (2 credits)
• LAWS 298 – Health Care Transactions (2 credits)
• Additional Health Courses (Graduate School/School of Medicine)
• MPHP 429 - Introduction to Environmental & Occupational Health (3 credits)
• MPHP 439 - Public Health Management and Policy (3 credits)
Please visit this website: http://www.weatherhead.case.edu/mba/cert.hlthmgmt.htm for more information about
course descriptions, certificate requirements and recommended sequence of study in the health care management certificate

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 Professional Degree Programs Administrative 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 requirement.

Certificate In Nonprofit Management (Cnm)
The Certificate Program in Nonprofit Management is designed for practicing managers and leaders in human service, fine and performing arts, cultural, educational, community development, religious, civic and other nonprofit organizations who aspire to senior-level executive positions.

CNM students must satisfactorily complete a set of five approved courses (15 credits), including one required course, Introduction to the Nonprofit Sector. Admission criteria include satisfactory undergraduate work, the ability to master graduate-level course work, familiarity and experience with nonprofit organizations, and leadership potential for executive-level management and leadership.

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:
Director of Recruitment
Mandel Center for Nonprofit Organizations
Case Western Reserve University
10900 Euclid Avenue
11206 Euclid Avenue, Lower Level (visitors)
Cleveland, Ohio 44106-7167
(216) 368-6025
mcnoadmissions@case.edu
www.case.edu/mandelcenter

Certificate in Operations Program Objective and Requirements
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.

Suggested curriculum, application procedures and sequence of courses
For more information about the certificate requirements, application procedures and course descriptions, please visit this website: http://weatherhead.case.edu/orom/certificate.cfm

Upon completion of all requirements below, the student should request the certificate through the Registration Staff in the Professional Degrees Program Administrative Office.
1. Completion of 15 credit hours of the courses selected in collaboration with the Department’s Director of Graduate Programs.
2. Maintain a B (3.0) grade point average through all course work. The program must be completed within six years.

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, policy-making 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 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.

Specific requirements for completion of the program are detailed in its rules and regulations; fundamentally, the requirements are:
A full-time commitment to the program.

• Completion of prerequisite courses deemed essential to the student’s area of specialization.
• Involvement in classroom activities to develop teaching skills.
• A minimum of 12 courses covering the student’s major and minor fields and foundations courses supporting the major field. The foundations courses include a three-course, required sequence in research methods. Some of this work might be fulfilled through courses in the Departments of Operations or Organizational Behavior, or outside of the Weatherhead School of Management in areas such as sociology and computer science.
• Successful completion of written and oral general examinations, typically within two years of admission.
• Completion of a satisfactory dissertation.

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.

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 (216/368-3845) or e-mail at phd-oper@case.edu. You may also visit the department website at http://weatherhead.case.edu/orom.

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, contact David Cooperrider, Chair, Department of Organizational Behavior at 216/368-2121.

WEATHERHEAD CENTERS
Weatherhead Executive Education creates and maintains educational linkages between the Weatherhead School and regional organizations and executives. Program offerings include, The Weatherhead Affiliate Program Open Enrollment Seminars, Health Care Executive Education, Physicians’ Executive Institutes, Mental Health Executive Leadership, Custom Programs and two-degree programs: the Executive MBA and Executive Doctor of Management. For more information, contact Betty Vandenbosch Associate Dean of Executive Education at 216/368-2120.

The Health Systems Management Center (HSMC) is an interdisciplinary education and research center jointly sponsored by the Weatherhead School 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 is a partnership of the Mandel School of Applied Social Sciences, the Weatherhead School of Management, the School of Law and the College of Arts and Sciences. Among its diverse programs in education, research and community service, the Mandel Center offers the Master of Nonprofit Organizations degree program and the Certificate in Nonprofit Management program as well as several dual degree and dual credential options. For more information, contact Susan Lajoie Eagan, Executive Director at 216/368-2275.

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 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 is inducting its first members in the fall of 2006.

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 and Cleveland communities.

Graduate Business Student Association (GBSA)
The Graduate Business Student Association (GBSA) is a partnership of the Mandel School of Applied Social Sciences, the Weatherhead School of Management, the School of Law and the College of Arts and Sciences. Among its diverse programs in education, research and community service, the Mandel Center offers the Master of Nonprofit Organizations degree program and the Certificate in Nonprofit Management program as well as several dual degree and dual credential options. For more information, contact Susan Lajoie Eagan, Executive Director at 216/368-2275.

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connection between student life activities and professional development and networking. Led by students and an advisor, these clubs provide an excellent way to build networking relationships, share insights and information, and have some fun! Current Weatherhead student clubs include:

BizArt
Black MBA Student Association The Black MBA Student Association provides business, academic, and social support for students at WSOM through sponsored seminars, forums, and social activities. For more information visit http://wsomstudents.cwru.edu/bmbasa/

Consulting Club
The Consulting Club assists and empowers students with resources and opportunities in their preparation for a consulting career. For more information visit http://wsomstudents.case.edu/wcg/

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. For more information visit http://wsomfaculty.case.edu/eva/

Finance and Investment Club
The Finance and Investment Club is a club designed to provide guidance to Weatherhead students pursuing a career in finance. For more information visit http://wsomstudents.case.edu/FinanceClub/

Weatherhead Friends and Family Network
Health Systems Management and BioScience Club The Health Systems Management and BioScience Club is a graduate student organization designed to promote understanding and awareness of the business aspects of medicine and health sciences. The mission of the HSMBC is to promote interaction between healthcare industry leaders and WSOM students. For more information visit http://wsomstudents.cwru.edu/hsmbc/

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. For more information visit http://wsomstudents.cwru.edu/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; provide an introduction to innovative business models, best practices and cool companies that can make an impact. For more information visit http://wsomstudents.cwru.edu/netimpact/

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! For more information visit http://wsomstudents.cwru.edu/scma/

Weatherhead Women in Business
The mission of the WWIB is to provide professional and social development opportunities for women at the Weatherhead School of Management and to share the diversity of women’s experiences and perspectives with the WSOM community. The association represents women’s issues to the WSOM administration and facilitates an exchange of ideas and information with the student community and with other women’s organizations and business groups in Cleveland. For more information visit: http://wsomstudents.cwru.edu/wwib/

Wine Society
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 that encourage professional development provide for the exchange of ideas and stimulate social interaction. Each year, the Association selects a graduating student to receive the Scott S. Cowen Award as well as other honors and an incoming MBA student to receive the WSOM Alumni Association scholarship. In addition to a very active Weatherhead School Alumni Association, numerous Case Western Reserve University alumni chapters throughout the country are open to all University graduates. For more information visit http://weatherhead.case.edu/alumni/

Honorary Societies
Beta Gamma Sigma is a national scholarship honorary 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. Beta Alpha Psi is a national professional honorary accountancy fraternity. The Weatherhead School of Management is home to the Pi Chapter, which was chartered in 1930. The organization’s primary purpose is to encourage higher standards in accountancy education and to develop a closer relationship among professional accountants, faculty and students. 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.

Student Leadership Awards
The Scott S. Cowen Student Leadership Award is presented to a Weatherhead School of Management student who serves as a leader and as a model for Weatherhead students. The recipient promotes the Weatherhead 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 may make nominations.

The Theodore M. Alfred Distinguished Service Award is presented to a Weatherhead School
of Management 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 may make nominations.

The Student Life Award is presented to a Weatherhead School of Management 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 student at the Weatherhead School of Management. 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, contributes to one or more professional societies or organizations, demonstrates leadership qualities advocated by the Weatherhead School and promotes 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.

The Heart and Soul Awards the School’s administrative staff created these awards to recognize students who have given their “heart & soul” to the School. These awards are presented at the Graduation Awards Reception in May. 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 are approved by Academic Support Services Coordinators.

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 will need to be registered. Students can register by completing a course schedule form or on-line using SOLAR. Students who wish to apply for federal loans can do so online at www.fafsa.ed.gov. Course registrations are processed with a 5-digit course registration number (CRN). CRN numbers are produced as follows: 1st digit = department letter (A=Acct or Blaw, B=Bafi, E=Econ, H=Hsmc, I=Entp, U=Lhrp, G=Man or Mgmt, S=Mids, K=Mkmr, P=Pcly, T=Tropm, R=Opre, Z=Orbh, Q=Qumm) 2nd-4th digit = course number 5th digit = section number.

For example: Acct 401, section 2 = A4012, Plcy 418, section 1 = P4181. Independent study courses will have system assigned CRN numbers. Please indicate course, professor, and number of credit hours (i.e., Plcy 501 Feldman 3 hrs.) on your course schedule form.

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 appropriate 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 on-line (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 Student Services Office (WSS) in person or by phone, 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. 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
- 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)

Incomplete Grade Assignment of the Incomplete Grade
The grade of Incomplete (‘I’) is assigned at the discretion of an instructor, provided that two criteria are met:
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 which prevent completion of the course.
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.

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.

Changing the Incomplete Grade
The amount of additional time allowed to make up incomplete work should serve to accommodate the student while being fair to the other students in the course. It should be proportional to the duration of the student’s illness or absence and may be no more than a few days or weeks. In the absence of a specific deadline set by the instructor, the School deadline for making up Incomplete grades from the previous semester is the last day of class for the next full semester (Fall or Spring).

If the student fails to submit the work required for removing the Incomplete by the established date, the instructor shall submit a final grade that assumes a failing performance in the missing work. In the absence of the assignment of a grade by the instructor, the University Registrar will convert the Incomplete to F when the deadline for making up Incomplete grades from a previous semester has passed.

If the student wishes to petition to extend an I grade beyond the stated university deadline of the next regular semester, the student must obtain approval from the faculty member who assigned the incomplete grade and the Associate Dean before the School 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 initiated 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.

Withdrawn Grade
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 the Weatherhead School of Management, there are valid reasons for recording the grade of W.

Audit Grade
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 circumstances.

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.

Satisfactory Grade
The grade of S indicates passing performance only in designated courses approved by the Professional Degree Programs 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 grades of A, B, C or D.

No student can receive credit for more than 6 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 changing one regular grade to another. However, faculty may replace or substitute assignments for individual students in a course, depending on extenuating circumstances.

RETENTION REQUIREMENTS
For retention in the MBA, EMBA, MSM and MAcc, and MS 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; and (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 the School of Graduate Studies section for retention requirements for other degree programs.)

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 pre-requisite.

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 award 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 of Management must complete an application for graduation and submit it to the WSS 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 WSS will verify that the student is eligible to graduate at the time.
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 done 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;
- 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 Assistant Dean for Professional Program Management. 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. Approval of course work is 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:

1. 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.
2. In the MBA program, elective courses may be double counted within the limits of Item 1 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.

DEPARTMENTAL COURSE OFFERINGS
Department of Accountancy
Peter B. Lewis Building
Larry Parker, Chair
Phone 216/368-2065; Fax 216/368-6244

The Accountancy Department prepares students for professional careers in public accounting, financial management and academia. The faculty offers course work leading to the Bachelor of Science in Accounting and the Master of Accountancy. The PhD in Accounting degree is also offered, but applications are not being accepted at this time. In addition, the faculty provides service courses to MBA students seeking elective course work in financial accounting, managerial accounting, taxation, and business law. Specified advanced undergraduate major courses, numbered on the 300 level, are open to graduate students. When these courses are taken for graduate credit, the instructor assigns additional work, usually research. Graduate courses are numbered 400 and above. Listed below are all graduate course offerings for the master’s and doctoral degree programs and the certificate programs described earlier in this bulletin.

FACULTY
Francisco Badua, PhD (Rutgers University)

Visiting Assistant Professor
Leon Blazy, BBA
(Western Reserve University), CPA
Senior Lecturer of Accountancy
Karen Braun, PhD
(The University of Connecticut), CPA
Senior Lecturer of Accountancy
Robert J. Bricker, PhD
(Case Western Reserve University), CPA
Ernst and Young Faculty Fellow; Professor of Accountancy; Associate Dean for Graduate Programs
Timothy J. Fogarty, PhD (Pennsylvania State University), JD (State University of New York at Buffalo), CPA
KPMG Peat Marwick Faculty Fellow; Professor of Accountancy; Associate Dean for Faculty and Research; Undergraduate Accountancy Program Director
Julia E. S. Grant, PhD (Cornell University), CPA
Associate Professor of Accountancy, Associate Dean for Professional Programs
Larry M. Parker, PhD
(University of Houston), CPA
Associate Professor of Accountancy; Chair, Accountancy Department, Master of Accountancy Program Director
Paul Polinski, PhD (University of Alabama), CPA
Assistant Professor of Accountancy
David Pearson, DBA (Indiana University), CPA
Professor for the Practice of Accountancy
Gary J. Previts, PhD (University of Florida), CPA
Professor of Accountancy; Associate Dean for Undergraduate and Integrated Studies

ACCOUNTING (ACCT)
Undergraduate Courses
Graduate Courses
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 decisions and control 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 postretirement 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 or accounting majors nor enrolled in the Weatherhead School of Management. This course cannot be substituted for ACCT 202 without a waiver from the chairman.

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 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) This course examines the underlying framework of financial and managerial accounting, 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 financial results of the organization.

ACCT 401. Finance and Managerial Accountability (3) The accounting component will cover the use and application of 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.

ACCT 403. Survey of Accounting (3) (See ACCT 303.)

ACCT 450. 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 452. Seminar in Management Accounting (3) (See ACCT 306.)

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 or MBAC 415.

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, and which has proved useful in the financial analysis of organizations. Prereq: ACCT 401 or MBAC 415.

ACCT 418. Fraud, Governance and Reporting (3) This course examines managerial fraud, primarily that 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 or MBAC 415; BAFI 402 or MBAC 416.

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: MBAC 415 or equivalent.

ACCT 429. Social Ethics and Taxes (1.5) This course engages students as tax compliance volunteers for lower-income people in the Greater Cleveland area. This "hands-on" experience provides a means for managers to better understand the concerns of "rank-and-file" employees that may be affected by corporate action.

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. This course is specifically designed for students preparing for careers in management as opposed to accounting or tax. Prereq: ACCT 401 or MBAC 415 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 alterna-
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 amount of additional education necessary in order to become qualified as a Certified Financial Planner. Prereq: ACCT 405.

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 or consent of instructor.

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 topic areas include ethics, analytical review, fraud, and the role of technology. Prereq: ACCT 314 or permission of instructor.

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 data base and periodical research and to provide frequent written and oral research reports. Prereq: ACCT 304 or consent of instructor.

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 accounting 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)
ACCT 703. Dissertation Fellowship (1-8)

DEPARTMENT OF BANKING AND FINANCE

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Scott Fine (Stanford)
Professor for the Practice of Management in Banking & Finance
Anurag Gupta, PhD (New York)
Associate Professor of Banking and Finance
C.N.V. Krishnan, PhD (Wisconsin)
Assistant Professor of Banking and Finance
Leonardo Madureira PhD (Wharton)
Assistant Professor of Banking and Finance
Claudia E. Moise (Chicago)
Assistant Professor of Banking and Finance
Ralitsa Petkova, PhD (Rochester)
Assistant Professor of Banking and Finance

J. B. Silvers, PhD (Stanford)
Professor of Banking and Finance; Elizabeth M. & William C. Treuhaft Professor of Health Systems Management
Ajai Singh, PhD (Iowa)
Associate Professor of Banking and Finance
Sam Thomas, PhD (Wharton)
Senior Lecturer, Banking and Finance

BANKING AND FINANCE (BAFI)
Undergraduate Courses

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. Prereq: ECON 102 and ECON 103. Cross-listed as ECON 341.

BAFI 342. Public Finance (3)
(See ECON 342). Prereq: ECON 102. Cross-listed as ECON 342.

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: ACCT 202.

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 predetermined set of objectives. Descriptive, institutional 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)
This class explores financial problems found in business and reviews several methodologies for analyzing them. Settings will include a variety of managerial situations, not just in finance. The course leverages the foundation learned in corporate finance but applies concept learned to actual business problems. Students will be exposed to financial analysis of historical and projected financial statements using a variety of methods, including modeling in Excel.
In addition, students will be exposed to the case method in solving real-world financial problems. Approximately one quarter of the sessions will be conducted in the computer lab. 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)
(See ECON 372.) Cross-listed as 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: MBAC 415 or 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.

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: ACCT 401, BAFI 402 & QUMM 414 or MBAC 415, MBAC 416 & MBAC 414. Prereq or Coreq: ECON 403 or MBAC 426.

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 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 402.

BAFI 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. Prereq: ACCT 401 or MBAC 415 or consent of instructor. Cross-listed as HSMC 420.

BAFI 421. Management of Financial Institutions (3)
This course applies the principles of financial management to financial institutions, especially commercial banks. The impact of monetary and fiscal policies and the changing regulatory, legislative, and technological environments are studied. Specific problem-solving techniques and decision-making are emphasized. Prereq: MBAC 416 or BAFI 402 or consent of instructor.

BAFI 424. Managerial Finance II-E.M.B.A. (3)
This course emphasizes theoretical and empirical issues pertinent to the fields of investment management, derivative assets, and international finance. The course will span the topics of modern portfolio theory, market efficiency, equity markets, debt markets, derivative assets, financial engineering and risk management, international financial markets, and others.

BAFI 426. Applied Security Analysis (3)
This is a course for those seeking an in-depth examination of equity investment decisions. The course is funded by a grant and involves the continuing analysis, review and reinvestment of the funds in an actual portfolio dedicated to this course. There is active involvement with members of The Cleveland Society of Securities Analysts, including attendance at Corporate Investor Relations presentations. The course emphasizes the application of particular analytical models of stock selection. Prereq: BAFI 403, ECON 403, MBAC 414 or QUMM 414.

BAFI 428. Financial Strategy and Value Creation (3)
The intersection between the theory of perfect markets and the reality of market imperfections provides the basis for the exploration of value creation in this course. Opportunities in both product and financial markets are explored using case studies to develop a framework for strategic financial decisions. Prereq or Coreq: BAFI 403.

BAFI 429. Investment Management (3)
This course explores the characteristics of financial investments and markets and develops modern techniques of investment analysis and management. The goal is to help students develop a level of analytical skill and institutional knowledge sufficient to make sensible investment decisions. Topics include: an overview of stock, debt and derivative asset markets, practical applications of modern portfolio theory, equilibrium and arbitrage-based approaches to capital market pricing, the debate over market efficiency, the term structure of interest rates, bond portfolio management, and uses of derivative assets in investment portfolios. Prereq or Coreq: BAFI 403.

BAFI 430. Options and Futures (3)
This course is intended to give students an understanding of options and futures markets both in theory and practice. The emphasis is on arbitrage and hedging. The course concentrates on listed common stock and index contracts as well as commodity markets. Various theories for trading strategies are studied. Prereq or Coreq: BAFI 403.

BAFI 431. Fixed Income Markets and Their Derivatives (3)
This class is concerned with fixed income securities, interest rate risk management, 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 course is designed to be of use to executives of all corporations, financial and nonfinancial, across all functional areas. The emphasis of this course is on state-of-the-art corporate risk management practices rather than on the technical details of pricing/hedging derivatives. The course takes the approach of identifying/understanding risks and then developing strategies and solutions to manage those risks optimally. Several cases and exercises are used to put participants in the position of a firm with a strategic risk management problem. Some notable risk management disasters are analyzed throughout this course, with the objective of understanding mistakes that others have made in the past, so that they can be avoided in the future. A central theme in this course is to understand how risk management strategies and solutions can create value for the firm. Understanding the precise source of value creation is vitally important for designing appropriate risk management strategies. It is also critical for con-
vining top management that strategic risk management is not just an expense on risk reduction, but can also be an extremely important source of value creation for the firm. Prereq or Coreq: BAFI 403, MBAC 416, BAFI 402.

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 441. Global Banking (3)
Financial institutions currently operate in a ‘Global’ market place owing to recent changes in regulation, market integration and political action. This course will provide an understanding of the role banks play in the financial system and thus facilitate a comparative analysis of banking systems across the globe (Japan, Korea, Latin America, South Asia and United States). The effect of recent changes in the banking environment on the provision of services like loan origination, underwriting, insurance, and asset management will also be covered. The final part of the course will focus on the anatomy of financial crises, their origins and their effects. In particular, the recent crises in East Asia and Argentina will be used as case studies. Prereq: BAFI 402 or MBAC 416. Coreq: BAFI 403.

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, how senior lenders and equity investors structure their loans and/or investments, and how investors realize the gains through different exit strategies. The legal and tax ramifications of various forms of M&A activity are also discussed. The course gives the student an excellent understanding of the role that senior commercial banks, insurance companies, pension funds, LBO funds, investments banking firms, and venture/growth capital investors play in mergers and acquisitions and will strengthen the students’ ability to value a business enterprise. Prereq: BAFI 403.

BAFI 460. Investment Banking (3)
This course covers the role of the investment banker as a strategic financial advisor, primarily to corporate clients. The course is divided into three sections, roughly equal in length: (1) industry structure, key players, services and strategies, (2) the capital acquisition process, with a particular focus on initial public equity offerings, and (3) mergers and acquisitions, with a focus on advising financial and strategic buyers and financing these transactions. Students will gain extensive experience in applying financial models that support valuations in various markets. Prereq: BAFI 403 or permission of instructor.

BAFI 470. Finance, Law and Corporate Governance (3)
Motivated by recent financial crises and by countries’ attempts to remake their financial systems, financial economists and legal scholars have investigated the importance of both specific laws and of entire legal systems for the development of securities markets, banking systems, accounting standards, dispersed share ownership, and even economic growth. Some of the research shows directly how law, ownership, boards and management compensation all play interconnected roles in corporate governance. Other strains of this research examine the importance of law for specific financial outcomes related to corporate governance, including venture capital, takeovers and corporate control, securities trading, and the value added (or destroyed) by business lawyers’ activities. This seminar course will use readings, presentations, discussion and writing to learn about these matters. Prereq: BAFI 402 or MBAC 416 or LAWS 293. Coreq: BAFI 403. (fall) Cross-listed as LAWS 074.

BAFI 480. International Financial Management (3)
This course introduces students to international finance and foreign exchange risk management by corporations. Topics include foreign exchange markets and international financial institutions; fx contracts; exchange rate risk and corporate risk management; and international aspects of long-term financing. Prereq: BAFI 403.

BAFI 501. Special Problems and Topics (1-18)
This course is offered, with permission, to students undertaking reading in a field of special interest.

BAFI 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.

BUSINESS LAW (BLAW)
Undergraduate Courses
Graduate Courses
BLAW 331. Legal Environment of Management (3)
This course is designed as a survey course in the area of basic business law. It covers the fundamental legal principles and laws that underlie any business decision. The major topics include: contracts, the Uniform Commercial Code (sales), torts, real and intellectual property, business organizations, Securities Regulation and Agency.

BLAW 417B. Legal Environment for Managers - M.B.A. (3)
This course will provide an overview of the legal environment in which business transactions take place. Through coverage of a number of topical areas, the student will be given a broad understanding of how the law impacts upon the daily decisions of managers. More specifically, the student will be better able to identify and understand how the legal issues facilitate or hinder the conduct of business. Topics covered will include contracts, property, products’ liability, employment law, and corporate law. Special emphasis is placed on those regulatory areas of greatest interest to modern business.

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Asim Erdilek, PhD (Harvard University) Professor of Economics
Susan Helper, PhD (Harvard University) Professor of Economics
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Heather Royer, PhD (University of Michigan) Assistant Professor of Economics
Justin Sydnor, PhD (University of California) Assistant Professor of Economics
James B. Rebitzer, PhD (University of Massachusetts) Frank Tracy Carlton Professor of Economics; Chair of Economics Department
Scott Shane, PhD (University of Pennsylvania) Professor of Economics
ECONOMICS (ECON)  
Undergraduate Courses

ECON 102. Principles of Microeconomics (3)  
This course is an introduction to microeconomic theory, providing a foundation for future study in economics. In particular, it addresses how individuals and businesses make 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. The Economic History of the United States (3)  
(See HSTY 255.) Cross-listed as 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 class 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, and testing them 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 this technique, the consequences of violating these assumptions, and the corrections that can be made. Students will have a chance to formulate and test their own hypotheses using econometric software available for personal computers. Prereq: ECON 102; ECON 103; one semester of statistics.

ECON 328. Experimental Economics (3)  
This course introduces students to the methods of studying Economics using laboratory experiments and to examine some of the major insights that have been gained through experiments and to examine some of the major insights that have been gained through experimental economics. Students will examine the three related branches of experimental economics: market institutions, game theory, and individual choice problems. The course presents known robust findings from the past 50 years of experimental economics, some of which conform tightly with economic theory while others have led to significant modifications in the way economists view markets and behavior. Prereq: ECON 102.

ECON 329. Game Theory: The Economics of Thinking Strategically (3)  
The term "game theory" refers to the set of tools economists use to think about strategic interactions among small groups of individuals and firms. The primary purpose of this course is to introduce students to the basic concepts of game theory and its applications. The class will stress the use of game theory as a tool for building models of important economic phenomena. The class will also include a number of experiments designed to illustrate the game theoretic results, and to highlight how reality may depart from the theory. The course will stress the value of thinking strategically and provide students with a framework for thinking strategically in their everyday lives. Rather than approaching each strategic situation they encounter as a unique problem, students will be taught to recognize patterns in the situations they face and to generalize from specific experiences. 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 differentials 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 341. Money and Banking (3)  
(See BAFI 341.) Cross-listed as BAFI 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 "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. Prereq: ECON 102. Cross-listed as BAFI 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 combines 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 361. 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 364. Competition and Public Policy (3)
This course covers alternative market structures and their performance in terms of profit, prices, and productivity, as well as antitrust laws and regulations and their importance to industrial organization. Prereq: ECON 102.

ECON 367. 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 368. 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. Prereq: ECON 102 and ECON 103. Cross-listed as BAFI 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; ECON 103.

ECON 377. Economics of Nonprofit Organizations (3)
The purpose of this course is to familiarize students with the private nonprofit sector of the U.S. economy, with economic theory contributing to our understanding of this sector, and with the policy and management issues affecting nonprofit organizations. Topics include understanding the different types of nonprofit organizations; the size, scope and economic significance of the nonprofit sector; the different parts of the economy in which nonprofits operate; economic theories of why nonprofit 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. nonprofit 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 395. Public Policy Case Competition (3)
This course introduces 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 teams. 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. Approved SAGES capstone. Prereq: Junior or Senior standing.

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. Approved SAGES capstone. Prereq: Junior standing; minimum GPA of 3.3 in ECON major, 3.0 overall. Coreq: Declared ECON major.

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. Approved SAGES capstone. Prereq: ECON 397. Coreq: Declared ECON major.

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 the basic principles of micro and macroeconomics. Topics covered in microeconomics include supply and demand, the theory of production and costs, 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.

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. Prereq: ECON 403 or MBAC 426. Cross-listed as HSMC 421 and MPH 421.

ECON 424. Innovation, Markets, and Organization in the Pharmaceutical Industry (3)
The global pharmaceutical industry is one of the most profitable and fastest growing industries in the world. While the industry is dominated by a few large firms, smaller biotech startups are competing aggressively with new product development and management issues governing the industry. In addition to examining how pharmaceutical companies respond to competitive pressures, we will explore the role of government regulation in the development process and the role of insurance as a demand driver. Topics were chosen to benefit those wishing to gain a general familiarity with a view to consulting, as well as those seeking to enter the industry. Open to undergrads with permission. Cross-listed as BIOS 424, HSMC 424, and MPH 424.

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. Cross-listed as 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, MBAC 416 or BAFI 402, ECON 403 or MBAC 426, and QUMM 414 or MBAC 414.

ECON 450. Health Care Economics for the Biosciences (1.5)
(See BIOS 450.) Cross-listed as BIOS 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 organiz-
tional 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 or MBAC 426.

ECON 464. Technology Entrepreneurship (3)
This course is designed to help students to identify, evaluate, and obtain control over technology opportuni-
ties that they can successfully exploit by starting new companies. The course focuses on four themes: (1) the source, discovery, and evaluation of technical 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. Cross-listed as ENTP 446.

ECON 474. International Trade (3)
This course deals with the causes and effects of international trade and investment. Its coverage 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 or MBAC 426.

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 or MBAC 426.

ECON 476. Fundamentals of International Business—E.M.B.A. (3)
This course deals with the fundamentals of business activities that cross national boundaries. It focuses on not only exports and imports, but all other issues, such as foreign direct investment, international technology transfer, organizational structure, and financial management, that required a corporate strategy in establishing and maintaining global competitiveness. It covers the basic international business activities within an interdisciplinary framework, drawing from economics, finance, accounting, marketing, organizational behavior, political science, and history. Its aim is not only to enable an understanding of such technical issues as how the effects of tariffs and quotas differ or how foreign exchange rates are determined, but also to provide a systemic view of how government policies and corporate strategies interact in changing the environment of international business. The basic premise of the course is that to formulate successful global corporate strategies, we must comprehend and cope with the political, cultural, and economic environment of international business.

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: MBAC 426 or ECON 403 or equivalent.

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 compe-
tition (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 analy-
FACULTY

Paul F. Gerhart, PhD
(University of Chicago)
Professor of Labor and Human Resource Policy

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 manufacturing, transportation, and service industries. The course is focused on U.S. managerial practice, but public policies and practices among selected major trading partners are also considered briefly. Ordinarily an all-day collective bargaining simulation is part of the course. Students enrolling in the 2.0 credit version of the course develop an independent reading assignment on grievance arbitration and attend and analyze a live grievance arbitration hearing.

LHRP 413. Economics of Negotiation and Conflict Resolution (3)
(See ECON 431.) Cross-listed as ECON 431.

LHRP 421. Strategic Human Resource Management (3)
The effective motivation and management of hu-
man resources within the enterprise is treated in this course with special emphasis on the integration of Human Resources strategy into the overall competi-
tive strategy of the enterprise. Implications of the inevitable conflict of goals and interests among or-
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: MBAC 413 or 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. Cross-listed as ENTP 425.

LHRP 431. Advanced Negotiations (3)
This course builds negotiation concepts and principles introduced in the Negotiations Lab (MBAC 413L or MGMT 413L). 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. 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 role-play and simulations to introduce the main ideas developed in the course. There is no prerequisite for the course. The first week of the course is devoted to a review of concepts introduced in the 1.0 credit hour Negotiations Lab for students who have not taken it.

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 (MBAC 413 or 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)
(See LAWS 351.) Cross-listed as LAWS 351.

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.

LHRP 701. Dissertation Ph.D. (1-18)

LHRP 703. Dissertation Fellowship (1-8)
Division of Management Policy
Vasudevan Ramanujam, Head
Phone 216/368-5100; Fax 216/368-4785

Faculty
Sayan Chatterjee, PhD
(University of Michigan)
Professor of Management Policy
Steven P. Feldman, PhD (The Wharton School, University of Pennsylvania)
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Leonard H. Lynn, PhD
(The University of Michigan)
Professor of Management Policy
Richard L. Osborne, MS
(Case Western Reserve University)
Professor for the Practice of Management
Simon J. Peck, PhD (University of Leeds)
Assistant Professor of Management Policy
Vasudevan Ramanujam, PhD
(University of Pittsburgh)
Associate Professor of Management Policy
Peter Gerhart, JD
Professor of Law; Professor of Management Policy

MANAGEMENT POLICY (PLCY)
Undergraduate Courses
Graduate Courses

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)
Prereq: Consent of instructor.

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. New 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. Cross-listed as ENTP 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. Cross-listed as ENTP 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. Cross-listed as ENTP 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. Prereq: ACCT 401 and BAFI 402 and MKMR 403 and MIDS 409 and consent of instructor. Cross-listed as ENTP 422.

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. Cross-listed as ENTP 426.

PLCY 427. Entrepreneurial Strategy (3)
This course focuses on the entrepreneurial process from a behavioral perspective by defining and developing the skills and behaviors necessary to be entrepreneurial in both the start-up and in the established firm setting. From the readings, case material and from interviews, you will develop a definition of the skills and competencies of entrepreneurs. You will also focus on developing your own competencies through exercises and a personal assessment of your entrepreneurial strategy. Finally, you will acquire strategies that will promote innovative thinking, idea championing, and change in established firms. Cross-listed as ENTP 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. Cross-listed as ENTP 429.

PLCY 439. Intrapreneurship - Entrepreneurship within the Corporation (3)
(See ENTP 449.) Cross-listed as ENTP 439.

PLCY 440. Entrepreneurial Finance (3)
This course explores the financing of entrepreneurial new ventures. The primary focus of the course will be the various financing methods and mechanisms available to entrepreneurs. This will involve understanding: estimation of capital requirements, bootstrap financing, angel investors, venture capitalists, private placements, firm valuation and initial public offerings. Cross-listed as ENTP 440.

PLCY 445. Business Development in the Bioscience Sector (1.5)
(See ENTP 445.) Cross-listed as ENTP 445.

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 473. E-Business Strategies (3)
This course will develop a basic understanding of how e-commerce firms have developed a strategy for providing value to both consumers and businesses. The course will build on the basic strategy frameworks that the students have learned in their course strategy classes. The pedagogy will involve short lectures and case discussions. Prereq: MBAC 411 and MBAC 421.

PLCY 481. Strategic Planning - E.M.B.A. (2)
This course develops an understanding of the long-term strategic view of the firm. The ability to analyze types of business strategies and capabilities is emphasized. Readings and cases examine alternatives, including internal growth, acquisitions, divestitures, and other emerging forms of corporate development. This course is limited to students in the Executive M.B.A. program.

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: MBA 411 or its part-time equivalent 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, man-
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 worldwide marketplace. Prereq: ACCT 202 or ACCT 303.

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 focuses 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 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.

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 or MBAC 424.

MKMR 406. Sales Force Management (3)
The best laid plans of marketing managers must be implemented in the trenches by the field sales force. This course provides a conceptual framework and analytical tools to profitably manage a firm's field sales force. It first focuses on assessing key sales force outcomes: productivity of investment in the sales force, performance of individual salespeople, and turnover. Students then examine how to structure, deploy, motivate and compensate the sales force to maximize individual performance, manage turnover and provide a solid return on sales force investment. Specific issues covered include design and management of selling teams and independent agents, national account management, and managing the relationship between the marketing department and the sales force. Prereq: MKMR 403 or MBAC 424.

MKMR 407. Marketing Through the Supply Chain (3)
This course views the supply chain (including the
MKMR 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: Evening M.B.A. students: QUMM 414 and MKMR 403. For full-time M.B.A. students: MBAC 414 and MBAC 424 (or MBAC 424 as a corequisite).

MKMR 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 or MBAC 424.

MKMR 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 e-commerce models. The course incorporates both business-to-business and business-to-consumer outlooks.

MKMR 420. Health Systems Marketing (3)
This course stresses the practical application of marketing technique to health care products and services. The major components of the industry and the interrelationships among health care customers, payers, providers and equipment suppliers are examined. Also addressed are ethical issues of health care marketing. Prereq: MKMR 403 or MBAC 424 or consent of instructor. Cross-listed as HSMC 422.

MKMR 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 and deploy their repertoire of quantitative and qualitative marketing decision skills. Prereq: MKMR 403 or MBAC 424.

MKMR 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.

MKMR 450A. Entrepreneurial Marketing - E.M.B.A. (2)
This course addresses the entrepreneurial/innopreneurial 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. Prereq: MKMR 403 or MBAC 424. Cross-listed as ENTP 450.

MKMR 460. Marketing Communications Management (3)
This course provides a sound understanding of management of an organization’s total marketing communications. The focus is on identifying appropriate strategies and tactics for effectively communicating with end consumers and other stakeholders/publics, in order to manage the firm’s brand equity and its market, industry and societal positioning. Students examine the roles of advertising, sales promotion, point-of-purchase efforts, and public relations, and emerging direct marketing technologies. They work with developing and managing these elements as part of an overall, synergistic communications strategy. Marketing communications for ongoing as well as crisis situations are developed. Multiple perspectives on evaluation of the effectiveness of marketing communications are introduced. Topics addressed include: integrated marketing communications, brand equity management, corporate communications strategies, public relations management, and crisis management. Prereq: MKMR 403 or MBAC 424.

MKMR 475. Supply Chain Logistics (3) (See OPMT 475.) Cross-listed as OPMT 475.

MKMR 476. Supply Management in The Supply Chain (3) (See OPMT 476.) Cross-listed as 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)

MKMR 703. Dissertation Fellowship (1-8)

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Adjunct Faculty
Alan F. Dowling, Jr., PhD
(Massachusetts Institute of Technology)
Adjunct Professor of Information Systems

INFORMATION SYSTEMS (MIDS)
Undergraduate Courses
Graduate Courses

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 307. Computer Programming and Problem Solving Using Java (3)
The objective of this course is to help students gain proficiency in computer programming using an object-oriented programming language. Emphasis is placed on a modular, structured approach to developing programs; the use of workbench tools (IDE, dynamic debuggers, etc.) for increasing productivity in the development and testing of programs; and the use of the various packages in Java to facilitate rapid application development including JDBC and Swing. UML will be presented as a modeling tool and interfaces, thread management, and exception processing will be covered. Applications will be developed using classes, applets, servlets, and JavaBeans. Prior experience or coursework with procedural programming is recommended.

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 telecommunication systems. 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 web sites, CD-ROMs, and films. 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)
Technical and managerial issues of database management, especially the features of database management systems (D.B.M.S.) and the role of the database administrator (D.B.A.). D.B.M.S. using the three major data models are presented. Techniques for database designs at the logical and physical level are discussed. Students will have hands-on experience in using a D.B.M.S. 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. Prereq: Ability to program in Pascal or C, or consent of the instructor.

MIDS 360. Independent Study (1-18)

MIDS 385. Web Systems Integration (3)
This course focuses on using standards-based technology to help solve the complex information problems present in modern business organizations. It brings together component-based development approaches in the context of doing business on the global Internet and on corporate intranets. Our enabling technologies are based on published and de facto Internet standards including HTTP and HTML, CGI/ISAPI and Perl, CSS, JavaScript, XML, and SSL/SET.

MIDS 401. Leadership Dialogues: The CIO’s Perspective (1)
The purpose of this course is to engage M.B.A. students in issues facing today’s technology leaders. The course will be facilitated by Lev Gonick and will bring technology executives from industry into each session. The issues will focus on such things as technology vision and planning, change management, assessing emerging technologies, economics of technologies, personnel and contractor issues, and the strategic use of information technology. The course is designed to prepare students to take a proactive role in managing information technology, to understand the importance of technology to the overall competitive positioning of the firm, and to understand how technology and systems permeate every aspect of the organization.

MIDS 407. Computer Programming and Problem Solving Using Java (3)
The objective of this course is to help students gain proficiency in computer programming using an object-oriented programming language. Emphasis is placed on a modular, structured approach to developing programs; the use of workbench tools (IDE, dynamic debuggers, etc.) for increasing productivity in the development and testing of programs; and the use of the various packages in Java to facilitate rapid application development including JDBC and Swing. UML will be presented as a modeling tool and interfaces, thread management, and exception processing will be covered. Applications will be developed using classes, applets, servlets, and JavaBeans. Prior experience or coursework with procedural programming is recommended.

MIDS 409. Information Design and Management (3)
Organizations are technology- and knowledge-intensive systems. All their functions are driven by the flow and use of information. This course will enable students to develop the models, analytic techniques, and critical attitudes needed to design effective, adaptable organizations. Students will learn to employ information technologies and new organizational forms to improve a firm’s functions and strategies.

MIDS 409A. Information Design and Management (1)
Organizations are technology- and knowledge-intensive systems. All their functions are driven by the flow and use of information. This course will enable students to develop the models, analytic techniques, and critical attitudes needed to design effective, adaptable organizations. Students will learn to employ information technologies and new organizational forms to improve a firm’s functions and strategies.

MIDS 410. Information Technology Architecture (3)
Just as a craftsperson 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 or MBAC 423.
MIDS 411. Advances in Information Systems Technology (3)
This course examines advanced and emerging information technologies, and evaluates their potential uses. Topics include: advanced computer architectures, massively parallel computers, networking, graphics, machine learning, and new programming paradigms. Prereq: MIDS 409 or MBAC 423.

MIDS 415. Multimedia Systems (3)
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 CD’s, and virtual reality.

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)
This course presents principles of system development using both relational and object-oriented databases. State-of-the-art tools are employed for developing both client and server system components. Object orientation is stressed as a design philosophy. Both prototyping and more conventional life-cycle methodologies are studied.

MIDS 429. 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 to learn system design techniques that take full advantage of this technology. Students develop competence in programming in an object-oriented language. Prereq: Ability to program in Pascal or C or consent of instructor.

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. Cross-listed as HSMC 432 and MPHP 532.

MIDS 433. Managing Electronic Teams in Global Economy (3)
This course covers technical, behavioral, and managerial bases that are necessary to build and manage high-performance global teams whose members are communicating primarily through electronic channels. Students will be working with students at other countries (or other schools) to learn various aspects of cross-functional “electronic” teams via various communication technologies, including electronic mail, groupware, and desktop videoconferencing. Fundamental group processes such as leadership, negotiation, communication, and decision-making will be revisited in the context of electronic teams.

MIDS 438. Digital Business and Law (3)
The course provides M.B.A. and Law students an understanding of legal issues that need to be addressed in the development of digital business at the level of web site 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 its legal enforcement and regulation. Covered topics include: web site development and contractual issues related to it, business transactions and their enforcement, security, privacy, intellectual property rights, consumer protection, international jurisdictional issues, and e-business regulation. Cross-listed as LAWS 438.

MIDS 445. Technologies of E-Business (3)
Emerging concepts and principles in the practice of electronic commerce are presented in a hands-on, experience based approach. Topics covered include: the role of e-commerce in the global economy, key underlying technologies, business-to-business and business-to-consumers applications, knowledge management, security, electronic payments and privacy. Strategic and policy-level implications will be emphasized. Students will complete a team-based e-commerce design and development project. This course complements electives in Multimedia Management and E-Marketing. Prereq: MIDS 409 or MBAC 423.

MIDS 446. Managing E-Business Technologies (3)
The digital economy reshapes the way we manage and do business. For example, companies like Amazon and e-bay have changed some industries, and Dell, Cisco, and Wal-Mart owe their success to innovative uses of e-business solutions. Nowadays, e-business pervades every industry. Harnessing the latest technologies to support it is not optional but a necessity for all—from established industry leaders to small startups. Managers must understand how to apply, integrate, and take advantage of these technologies to attain and sustain competitive advantage and to develop successful business models around them. Successful companies have implemented e-business strategies with innovative business models to build cutting-edge enterprises that serve and retain customers, manage suppliers, and integrate business processes better than ever before. Others, unfortunately, are lured into ill-fated adventures with bleeding-edge technologies by the ongoing flood of hot buzzwords and fads. This course aims to provide you with the ability to make the right choices in creating value and wealth by identifying the fundamental design principles for building successful e-business models and solutions.

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. Prereq: MIDS 409 or MBAC 423. Cross-listed as MGMT 447.

MIDS 448. Managing Corporate Knowledge (3)
Knowledge management has emerged as an important management practice in organizations and many firms use advanced information technology to support effective knowledge creation and sharing. This course covers technical, behavioral, and organizational bases for effective management of knowledge in organizations. Topics that are covered include: knowledge management systems, knowledge creation, knowledge transfer, communities of practice, managing mobilized knowledge, knowledge management and corporate strategy, and knowledge management in multinational corporations. Prereq: MIDS 409, MBAC 423.

MIDS 449. Software Engineering (1.5)
This course presents process activities necessary for supporting highly effective software development. Software systems in organizations still fail at highly unacceptable rates. By attending to the details of risk evaluation, documentation, quality assurance, and version control, we can create high quality systems that will not fail. And by using robust methodologies that take advantage of the economics of reuse, we can do so on time and under budget. We also discuss issues of ethics and professionalism that systems professionals are likely to encounter as they progress in their careers. Prereq: Enrollment in M.S.M.-IS or MIDS 409 or MBAC 423.

MIDS 460A. Communication and Negotiation (1.5)
Through a combination of lectures, discussions, simulations and projects, students develop their
communication and negotiation skills. Topics include: facilitation, interviewing, report writing and presentation, meeting management, negotiation, making demands and persuasion. This course is taken for one and a half credit hours per semester and is integrated with projects and materials being covered in the other courses. Prereq: MIDS 460A.

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 area. 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 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.

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)

MIDS 703. Dissertation Fellowship (1-8)

DEPARTMENT OF OPERATIONS
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The Department of Operations offers the Master of Science in Management in Operations Research, the Master of Science in Management in Supply Chain, and a PhD degree in operations research. The Department offers courses in operations research, operations management, quantitative methods, and courses pertinent to the MBA and undergraduate programs.

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Associate Professor of Operations and Chair
Hamilton Emmons, PhD (The Johns Hopkins University)
Professor Emeritus of Operations
A. Dale Flowers, DBA (Indiana University)
Associate Professor of Operations
Harvey M. Salkin, PhD (Rensselaer Polytechnic Institute)
Professor of Operations
Matthew J. Sobel, PhD (Stanford University)
Professor of Operations; William E. Unsworth Professor; Professor of Electrical Engineering and Computer Science

Daniel Solow, PhD (Stanford University)
Associate Professor of Operations
George Vairaktarakis, PhD (University of Florida)
Associate Professor of Operations

Secondary Appointments
Peter Ritchken, PhD (Case Western Reserve University)
Professor of Banking and Finance; Professor of Operations; Kenneth Walter Haber Professor of Finance

OPERATIONS RESEARCH (OPRE)
Undergraduate Courses

OPRE 300. Undergraduate Projects in Operations Research (1-18)
Individual operations research projects are carried out by qualified students. Prereq: Consent of instructor.

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. Prereq: STAT 207 or introductory statistics.

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 or consent.

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 425A and OPRE 425B.

OPRE 404. Data Analysis (3)
This course presents selected topics in applied data analysis focusing on the fundamentals of time series analysis, categorical data analysis and experimental design. The course emphasizes what the statistical process is all about: how to conduct studies, what the results mean and what can be inferred about the whole from pieces of evidence. Modules include the analysis of data from designed experiments through the analysis of variance and covariance, fundamental models for the analysis of time series data, including smoothing techniques, classical decomposition, and Box-Jenkins ARMA, and the analysis of categorical responses through measures of association, log-linear models, and logistic regression. Prereq: OPRE 405 or OPRE 428B or MBAC 414/QUMM 414 or consent of instructor.

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 interpret computer output obtained from the simplex algorithm and how to use that output to answer “What happens if...” questions. Prereq: One semester of undergraduate linear algebra or consent of instructor.

OPRE 411B. Deterministic Models with Applications (1.5)
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 MBAC 414/QUMM 414 or consent of instructor.

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 MBAC 414. Other quantitative tools will be introduced “just-in-time” in context to particular application area. Prereq: MBAC 414 or QUMM 414. Coreq: MBAC 425 or 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. Prereq: Linear Algebra and Calculus. Coreq: Linear Programming.

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 sets, various optimization problems. Prereq: MATH 223 or consent. Cross-listed as MATH 427.

OPRE 428B. Regression and Experimental Design (1.5)
This course covers the fundamentals of regression analysis and generalized linear 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 MBAC 414 or QUMM 414, or consent.

OPRE 431. Simulation Modeling and Analysis (1.5)
The course covers the modeling and analysis of computer simulation systems. 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. Coreq: A course in basic statistics (QUMM 414 or MBAC 414, or OPRE 428A and OPRE 428B) or consent of instructor.

OPRE 432. 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 428A and OPRE 428B 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. Prereq: 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 425A or OPRE 433A or consent of instructor.

OPRE 434. Regression and Forecasting (1.5)
The first part of this course covers the fundamentals 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 MBAC 414 or QUMM 414, or consent.

OPRE 435A. Computer Programming (1.5)
The objective of this course is to provide the student with the ability to write object-oriented 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. Prereq: Programming experience with one of the following programming languages: Pascal, FORTRAN, C, or permission of the instructor.

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:
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 or consent of instructor.

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 or equivalent or consent.

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. Prereq: OPRE 435A, OPRE 435C and OPRE 410. Cross-listed as EECS 454.

This course is offered, with permission, to students undertaking reading in a field of special interest. Prereq: Consent of instructor.

This course is offered, with permission, to students undertaking reading in a field of special interest. Prereq: Consent of instructor.

This course introduces the basic principles of discrete time financial markets. The focal points are the method of no arbitrage asset pricing, its applications in valuation of contingent claims. Specific topics include basic utility theory, single 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 425A, and OPRE 425B.

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.

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 510 and OPRE 411A or consent of instructor.

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 problem, (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 or consent of instructor.

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 410 or consent.

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 or consent.

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, OPRE 412A or consent.

This course analyzes probabilistic models of phenomena which evolve over time. Modules include birth-and-death processes (including the Poisson process), renewal theory, renewal-reward and regenerative processes, Markov chains (discrete- and
continuous-time), semi-Markov processes, system properties of queuing models, martingales, and Brownian motion. The course frequently explores the queuing theory consequences of general stochastic processes. Prereq: OPRE 425A and OPRE 425B.

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. Prereq: Consent of instructor.

OPERATIONS MANAGEMENT (OPMT)

Undergraduate Courses

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. Prereq: Consent of 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 or MBAC 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.

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. Cross-listed as MKMR 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 management include revenue management, queuing models, and simulation. A recurring theme is the integration of service operations with marketing, finance, and information systems. Prereq: MBAC 425 or OPMT 405 or equivalent.

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: MBAC 414, QUMM 414 or consent of instructor.

OPMT 475. Supply Chain Logistics (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 design 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. Prereq: OPMT 405, MBAC 425, or OPMT 423. Cross-listed as MKMR 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 design 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. Prereq: OPMT 405, MBAC 425, or OPMT 423. Cross-listed as MKMR 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. Prereq: MBAC 425, OPMT 405, OPMT 423, or consent of instructor.

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 or MBAC 425.

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. Coreq: OPMT 405 or MBAC 425.

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. Prereq: Consent of instructor.

OPMT 501. Special Problems and Topics (1-18)
This course is offered, with permission, to students undertaking reading in a field of special interest. Prereq: Consent of instructor.

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. Coreq: OPRE 412A, OPRE 419, OPRE 426, OPRE 513A or consent.

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.

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. Prereq: Consent of instructor.

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: Consent of instructor.

DEPARTMENT OF ORGANIZATIONAL BEHAVIOR

Peter B. Lewis Building
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FACULTY
Diane Bergeron, PhD (Columbia University)
Assistant Professor of Organizational Behavior
Diana Bilimoria, PhD
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David A. Kolb, PhD (Harvard University)
Professor of Organizational Behavior
Eric H. Neilsen, PhD (Harvard University)
Professor of Organizational Behavior
Sandy Kristen Piderit, PhD
(University of Michigan)
Associate Professor of Organizational Behavior
Melvin Smith, PhD
(University of Pittsburgh)
Assistant Professor of Organizational Behavior
Suresh Srivasta, PhD
(University of Michigan)
Emeritus Professor 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, MS, ODA
(Case Western Reserve University)
Director Leadership Development, Cleveland Clinic Foundation, Cleveland, OH

Peter Whitehouse, MD, PhD
(Johns Hopkins University)
Professor of Bioethics, Neurology, Neuroscience, and Psychiatry, School of Medicine; Professor of Organizational Behavior

Adjuncts
Hilary Bradbury, PhD (Boston College)
Harlow Cohen, PhD
(Case Western Reserve University)
Tony Lingham, PhD
(Case Western Reserve University)
Senior Lecturer of Organizational Behavior

ORGANIZATIONAL BEHAVIOR (ORBH)
Undergraduate Courses
Graduate Courses

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 choice 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)
The 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 frame works 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 (3)
This course explores and develops the art of understanding social systems in ways that help us imagine, design and develop organization 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. 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 multidivisional enterprises toward spider web structures, trans-organizational networks and communities of practice. (Part-two of a two-section course.) Prereq: ORBH 414A.

ORBH 415. Residency Periods - E.M.B.A. (2)
The primary objective of the residency periods is to create and maintain relationships among the E.M.B.A. participants and faculty that enable and accelerate learning throughout the program. This includes the formation, maintenance and development of effective Study Groups. Another primary objective is to develop behavioral management skills in leadership, teamwork, conflict negotiation, decision making and problem management that are best studied through sustained periods of experiential learning, simulations and exercises available in a residential setting. This course is limited to students in the Executive M.B.A. Program.

ORBH 416A. 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 one of a three-section course.) Prereq: Open to MPOD candidates only.

ORBH 416B. 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 two of a three-section course.) Prereq: ORBH 416A.

OTHER COURSE OFFERINGS

MBA CORE COURSES (MBAC)

MANAGEMENT COURSES (MGMT)
Undergraduate Courses
Graduate Courses

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 002. Supervised Professional Practicum - Semester 2 (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. Opportu-
nities for diverse cultural and language experiences which result from the institute are added benefits of these programs. Prereq: ECON 102, ECON 103, ACCT 101, 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. Approved SAGES departmental seminar.

MGMT 397. Undergraduate Research Project (3–6)
This course provides a supervisory structure for students completing and a capstone research project in the Weatherhead School of Management. Arrangements should be made by consultation with a faculty member selected and the Senior Capstone Committee of the School of Management. Open to all management and accounting majors and other qualified students with instructor approval. A written report, presentation to the faculty department most closely related to the student’s topic, and an approved public presentation are required. Approved SAGES capstone. Prereq: Consent of department.

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. Approved SAGES capstone. Prereq: ACCT 202, BAFI 355, and MKMR 301. Coreq: Senior standing.

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.

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. Prereq: Permission of the instructor.

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 441. Planning for Personal Learning (3)
This course is designed for mid-life, mid-career professionals (health care, law, science and technology, management and the like) who may be moving into executive coaching is provided. An individualized development plan and an organizational project are completed. Prereq: MGMT 441.

MGMT 443. Planning for Personal Learning II (3)
This course is the second of a two-part sequence on personal and professional assessment, learning, and development. Part II includes a three-day resident retreat in January, a two-day retreat in May, and six half-day weekend sessions (February, March, April) for goal setting and action planning. Executive coaching is provided. An individualized development plan and an organizational project are completed. Prereq: MGMT 441.

MGMT 444. 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. Prereq: MIDS 409 or MBAC 423. Cross-listed as MIDS 447.

MGMT 455. Issues in Public Policy (3)
This course will introduce students to the primary frameworks and tools of public policy analysis. Such skills have become essential to business managers, who are increasingly called upon to perform quasi-public functions, especially at the CEO and vice-presidential levels. The course will begin by presenting analytical frameworks, drawn mostly from political science and economics. It will proceed to illustrate these frameworks using three public policy cases. Current plans are to discuss telecommunications regulation, urban development policy, and conflicts in the arts. This course is required for students enrolled in the M.B.A. certificate in public policy. It will also be open to graduate students from throughout the university, on the theory that a classroom with diverse professional backgrounds will better simulate the public arenas in which managers must increasingly operate.

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 460A. 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 460E. Managing in a Global Economy-E.M.B.A. (3)
This course is open for enrollment by E.M.B.A. students only. The course is designed to present 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. The course is offered during the Spring semester of the second year (referred to as Semester V in the program). Faculty responsibility rests with the Faculty Director of the E.M.B.A. Program as well as a “Resident-Faculty” specific to each field trip. Such faculty are drawn from the Weatherhead community and vary by the design and destination of the trip. In addition, the course is staffed by an administrative assistant from the complement of Dively CMDR staff. Occasionally and where appropriate, there is also “in-tourist” assistance in some of our foreign locations. This course is part of our overall management offerings and is designated as MGMT 460, Section E.

MGMT 460K. 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 460P. Managing in a Global Economy (3)

MGMT 461. Development of American Business (3)
The major theme of this course traces the development of concepts relating to business structures and capital markets and workplace values in the United States and other countries. Attention is given to the emergence of the professional manager and the exploration of current business issues from a societal and historical perspective.

MGMT 462A. Technology and Society: Progress and Problems (3)
Summer offering.

MGMT 462B. Technology and Society: Progress and Problems (1.5)
Fall offering. Prereq: MGMT 462A.

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, consult 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 prospective course credit.) Prereq: Permission of instructor.

MGMT 466. Seminar in International Business (3)
This course is a continuation of MGMT 465 and includes an independent study component. (Approval for course credit in the student’s area of concentration may be approved by the instructor at the time of registration.) (Summer only.) Prereq: Permission of instructor.

MGMT 496. Action Learning Preparation: Introduction to Systems Thinking (1)
In preparation for MBAC 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. Prereq: MGMT 496.

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. Prereq: Second year full-time M.B.A. status.

MGMT 498A. Action Learning (6)
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. Prereq: 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 explores student 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 quan-
titative 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 571. Measurement Theory and Method (3)
This doctoral seminar focuses on the theoretical and methodological issues involved in social science measurement. Specifically, the course will cover topics in basic principles of measurement including Classical Test Theory, Reliability, Validity, and Item Response Theory, as well as related tools for measurement analysis including Exploratory and Confirmatory Factor analysis. In addition, the course will expose students to analytical methods that model measurement error in simultaneous equations including models with mediation and moderation effects. This course involves extensive use of statistical packages including SPSS, LISREL, and EQS. Prereq: Ph.D. standing.

MGMT 573. Applied Multivariate Data Analysis (3)
The objectives of the seminar are to provide students with an understanding of the substantive and methodological issues involved in applied multivariate data analysis. The seminar aims to expose students to the assumptions, principles and applications of a selected set of multivariate techniques including Logistic Regression, MANOVA/Discriminant, Profile, Multilevel and Latent Growth Model analysis. This course involves extensive use of statistical packages including SPSS, LISREL, and EQS. 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 coursework 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. Prereq: Consent of instructor.

HEALTH SYSTEMS MANAGEMENT COURSES (HSMC)

HSMC 420. Health Finance (3)
(See BAIF 420.) Prereq: ACCT 401 or permission of instructor. Cross-listed as BAIF 420.

HSMC 421. Health Economics and Strategy (3)
(See ECON 421.) Cross-listed as ECON 421 and MPH 421.

HSMC 422. Health Systems Marketing (3)
(See MKMR 420.) Prereq: MKMR 403 or MBAC 424 or consent of instructor. Cross-listed as MKMR 420.

HSMC 424. Innovation, Markets, and Organization in Pharmaceutical Industry (3)
(See ECON 424.) Cross-listed as ECON 424.

HSMC 427. Health Law (3)
(See LAWS 227.) Cross-listed as LAWS 227.

HSMC 432. Health Care Information Systems (3)
(See MIDS 432.) Cross-listed as MIDS 432.

HSMC 446. Models of Health Care Systems (1.5)
(See IIME 446.) Cross-listed as IIME 446.

HSMC 447. Regulatory Affairs for the Biosciences (1.5)
(See IIME 447.) Cross-listed as IIME 447.

HSMC 450. Health Care Economics for the Biosciences (1.5)
(See BIOS 450.) Cross-listed as BIOS 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. Cross-listed as MPH 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 501G. Medical School Electives (1-3)
Students complete requirements for three six-week electives offered by the Medical School and complete a paper to receive 3 hours of credit. For detailed information about this course, contact the Health Systems Management Center advisor in 443 Peter B. Lewis Building (368-6403).

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 Barbara Bolek (barbara.bolek@case.edu; 216-368-6403).
EDMP 614. Business as a Dynamic System (3)
This seminar 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 different countries. The seminar also studies technological and regional innovation systems as well as the New Economy: what its main features are, what is genuinely new, and what the implications are for public policy and corporate strategy.

EDMP 615. Conceptualizing a Personal Research Topic (3)
Continuation of the prior semester course, Identifying a Personal Research Domain, this class explores ways to conceptualize an object of study, and it supports formulation of students’ conceptual work and their research reports at the end of the first program year. The seminar conveys how to generate research ideas by critically reviewing literature, and it develops ideas about contributing to the problem or issue of interest by working with theory and extending previous research. The practicability of conducting certain kinds of research is evaluated and the length, intensity, and ethical constraints of different research efforts are examined. The course engages with faculty conducting research in areas similar to students’ interests. Each student produces a report at the end of the semester communicating and supporting a conceptualization of the phenomenon of interest involving independent, mediating, and dependent variables. This paper defines a problem or issue for research and presents, both visually and in narrative form, the concepts shaped by field experiences and by prior writing for understanding the problem.

EDMP 616. Global Economic Systems and Issues (3)
This seminar examines recent structural changes occurring in the world economy and how countries and international institutions are responding. Evolving patterns of global investment and trade are analyzed, especially the emergence of regional trade and investment blocs, and the changing roles of international economic institutions, such as the World Bank, the International Monetary Fund, and the World Trade Organization.

EDMP 617. Technology and Social System Design (3)
Intensification of electronic technology, especially communication and computing technology, generates issues of technology assessment and social system design. Technology assessment concerns broad questions of how managers can anticipate and evaluate the potential consequences of existing and emerging technology, including social, economic, and political implications. As technologies intensify, questions of social system design will replace parochial concerns with organization design. Interorganizational networks, citizen action networks and financial government structures will become primary management concerns. This seminar will draw on historical studies of communication technologies and their impact on society.

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 areas. Sequences will be designed according to the interests of participant groups. For example, a sequence for participants with special interest in Nonprofit Management may consist of courses in Constitutional Issues, Nonprofit Organizations in the Marketplace, or The International Nonprofit Sector. A sequence designed for participants interested in Technology Management may include Foundations for Technology Management Leadership plus an additional course that integrates topics in Information Systems, Management Policy, Operations Management, and Organizational Behavior.

EDMP 623. Thematic Elective II (1-3)
(See EDMP 622.)

EDMP 624. Applied Research II (1-4)
(See EDMP 621.)

EDMP 625. Thematic Elective III (1-6)
(See EDMP 622.)

EDMP 626. Applied Research III (1-9)
(See EDMP 621.)

EDMP 627. Applied Research IV (3-9)
(See EDMP 621.)

EDMP 628. Qualitative Research Methods I (3)
This course builds upon the students’ first year of work in conceptualizing a problem driven topic or phenomenon of interest. The aim of the second year is to ground the student’s conceptual model in rigorous qualitative inquiry through semi-structured interviewing, developing, refining, and clarifying the understanding of one’s problem. In addition to a continuing synthesis of literature and field experience, the seminar deals with specific issues of designing research questions, sampling, interviewing, structural interviewing techniques, and anticipated data analysis. Students prepare a complete research proposal by the end of the semester.

EDMP 629. Social Policy Development (3)
Multiple forces shape the development of social policies that often have profound consequences for individuals, communities, and the nation as a whole. This seminar is dedicated to enable participants to develop a deeper understanding of the social, political, and economic forces shaping policy development and to identify critical questions which should be addressed in assessing the consequences of new policy initiatives. The seminar explores various mechanisms for influencing policy development and their efficacy. Literature relevant to the analysis and implementation of social policy and study will be read.

EDMP 630. Applied Research V (3-9)
This course is dedicated to student-identified directed study during the Fall semester. Individually, in pairs, or in trios, students develop objectives and plans of study to deepen their understanding in particular topics, either through initiating a new writing project, extending a previous project, engaging in a directed reading program, or undertaking new field research. CWRU faculty are invited to advise projects in their areas of interest. Sharing of interests and learning among students in a dedicated seminar.

EDMP 631. Synthesis and Application of Knowledge (3)
This seminar evaluates the potential consequences of existing and new technologies. It intensifies the seminar’s concern with broad questions of social system design. The seminar will draw on historical studies of communication technologies and their impact on society.

EDMP 632. Thematic Elective IV (1-3)
(See EDMP 631.)

EDMP 633. Applied Research VI (1-9)
(See EDMP 631.)

EDMP 634. Thematic Elective V (1-3)
(See EDMP 631.)

EDMP 635. Applied Research VII (1-9)
(See EDMP 631.)

EDMP 636. Thematic Elective VI (1-3)
(See EDMP 631.)

EDMP 637. Social Policy Development (3)
Multiple forces shape the development of social policies that often have profound consequences for individuals, communities, and the nation as a whole. This seminar is dedicated to enable participants to develop a deeper understanding of the social, political, and economic forces shaping policy development and to identify critical questions which should be addressed in assessing the consequences of new policy initiatives. The seminar explores various mechanisms for influencing policy development and their efficacy. Literature relevant to the analysis and implementation of social policy and study will be read.

EDMP 638. Qualitative Research Methods II (3)
This seminar represents the second semester of a year-long sequence in qualitative methods during the second program year. Fieldwork is conducted, qualitative data are analyzed, and the student’s conceptual model of the topic or problem of interest is revised. Emphasis is placed on inductive coding of semi-structured interviews and quantification of data and its statistical manipulation where appropriate. The aim of the semester is to revise and specify one’s conceptual model based on the fieldwork and to integrate new literature arising as a result of the fieldwork. Hypotheses for third year quantitative analysis are developed. Completed projects are reviewed and assessed for quality and readiness for quantitative evaluation.

EDMP 640. Qualitative Research Methods III (3)
This seminar is intended to enable participants to develop a deeper understanding of the social, political, and economic forces shaping policy development and to identify critical questions which should be addressed in assessing the consequences of new policy initiatives. The seminar explores various mechanisms for influencing policy development and their efficacy. Literature relevant to the analysis and implementation of social policy and study will be read.

EDMP 641. Directed Studies Seminar (1-9)
This course is dedicated to student-identified directed study during the Fall semester. Individually, in pairs, or in trios, students develop objectives and plans of study to deepen their understanding in particular topics, either through initiating a new writing project, extending a previous project, engaging in a directed reading program, or undertaking new field research. CWRU faculty are invited to advise projects in their areas of interest. Sharing of interests and learning among students in a dedicated seminar.

EDMP 642. Directed Studies Seminar (1-9)
This course is dedicated to student-identified directed study during the Fall semester. Individually, in pairs, or in trios, students develop objectives and plans of study to deepen their understanding in particular topics, either through initiating a new writing project, extending a previous project, engaging in a directed reading program, or undertaking new field research. CWRU faculty are invited to advise projects in their areas of interest. Sharing of interests and learning among students in a dedicated seminar.
EDMP 643. Foundations for Quantitative Inquiry (3)
This seminar will focus on basic foundations for designing generalizable (quantitative) studies. The participants will be able to use these skills in framing and designing their own research work. Basic foundations will be covered including survey, experimental/longitudinal, and secondary research design issues, sampling, control over confounding variables, selection/survey error and generalizability issues. Also covers scaling and measurement of social science phenomenon with emphasis on reliability and validity of constructs.

EDMP 644. Multivariate Data Analysis (2)
This seminar builds on instruction in univariate statistics from year two. The seminar covers the assumptions, principles, and applications of co-variance, test for mean difference, multiple comparisons, and regression/ANOVA. This seminar develops the use of SPSS and/or EQS software for statistical analysis.

EDMP 645. Critical Applications and Research Project Issues (4)
This seminar addresses common application issues that may arise during the participants’ execution of individual research projects. In addition, it focuses on critical analyzing selected pieces of published applied research to allow participants to develop an appreciation of application issues that have wide applicability and relevance. Application to the participant’s own research work will be encouraged and supported by sharing and discussing common themes and problems.

EDMP 646. Advanced Analytical Methods for Generalizable Studies (3)
This seminar will focus on building the methodological skill base for rigorous analysis of quantitative data. This covers the assumptions, principles, and application of multivariate statistics including multiple regression analysis, moderator-mediator analysis, factor analysis, and path analysis. Also includes implementation of multivariate procedures using SPSS/EQS.

EDMP 647. Introduction to Statistics (2)
This seminar reviews basic statistical concepts such as probability, distributions, sampling, and hypothesis testing. It covers them in the context of social research and provides an introduction to applying these concepts using SPSS. The topics constitute a foundation to the multivariate analysis class offered later in the EDM program.

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 developed 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 665. Research Methods (3)
The seminar 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 699. 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)

Undergraduate Courses

ENTP 301. Entrepreneurial Strategy (3)
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 (bootstrap, 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. New 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 en-
Intrapreneurs are the entrepreneurs within corporations. Cross-listed as PLCY 418.

ENTP 419. Entrepreneurship and Personal Wealth Creation (3)
(See PLCY 419.) Cross-listed as 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. Cross-listed as 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. Prerequisites: ACCT 401 and BAFI 402 and MKMR 403 and MIDS 409 and consent of instructor. Cross-listed as PLCY 422.

ENTP 425. Managing Human Resource Issues in Entrepreneurial Firms (3)
(See LHRP 425.) Cross-listed as LHRP 425.

ENTP 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. Cross-listed as PLCY 426.

ENTP 427. Entrepreneurial Strategy (3)
(See PLCY 427.) Cross-listed as 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. Cross-listed as PLCY 429.

ENTP 439. Intrapreneurship - Entrepreneurship within the Corporation (3)
Intrapreneurs are the entrepreneurs within corpor-
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.

• Corinelle 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 for 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 Case 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 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 twenty-acre site was secured for a medical center in University Circle, the current home of Case, 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.

**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 Center, 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. 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 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 chairpersons 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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Vice Dean for Education and Academic Affairs
Vice Dean for Education for the Cleveland Clinic Lerner College of Medicine
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Peggy-Jeanne St Clair M.D.
Penola P. Jones M.D.
Rhoda Goldschmidt M.D.
Richard C. Harlan M.D.
Robert Lucas M.D.
Samir Ahuja M.D.
Sandhya Varyani M.D.
Sandra L. Bellin M.D.
Sarah Spengler
Scott Stephen Tigert M.D.
Shahid H. Butt M.B.B.S.
Sherilyn Sage M.D.
Shin E. Huang M.D.
Stanley Post M.D.
Steven M. Klein M.D.
Thomas L. McGrew M.D.
Tia Melton M.D.
Timothy S. Barrett M.D.
Tonya S. Heyman M.D.
Yolanda Annette Thigpen M.D.

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Mark Sewell M.D.

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Khalid Ataya M.D.
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Gretchen Fisher M.D.
John P. Iafélice M.D.
Mark Binstock M.D.
Michael Anderson M.D.

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Bruce J. Averbook M.D.
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Charles S. Modlin M.D.
Debra Graham M.D.
Fitrouz Daneshgari M.D.
Gregory Edward Plautz M.D.
Hani A. Hennein M.D.
Holly Louise Thacker M.D.
J. Stephen Jones M.D.
Joel R. Peerless M.D.
John Jeffrey Alexander M.D.
Jonathan Harry Ross M.D.
Julian A. Kim M.D.
Julie Clayman M.D.
Kenneth W. Angermeyer M.D.
Kresmir M. Milas M.D.
Marjie L. Persons M.D.
Matt J. Likavec M.D.
Milton M. Lakin M.D.
Paul P. Pribe M.D.
Peter Alan Rasmussen M.D.
Peter Aver Cohen M.D.
R. Matthew Walsh M.D.
Raymond P. Onders 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.

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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 Heekeren M.D.
David Magnuson M.D.
Diana Whitlesey 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 Jeremain Egleton M.D.
Michael J. Prokopius M.D.
Michael Joshua Rosen M.D.
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Nicholas Boulis M.D.
Nina N. Desai Ph.D.
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Peter T. Hallowell M.D.
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Rosemary Leeming M.D.
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Amitabh Goel M.D.
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Donald W. Lenhart M.D.
Elmer Perse M.D.

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Hanna Lisbona M.D.
Haysam El-Dalati
Henry Eisenberg M.D.
Isadore Lidsky M.D.
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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.
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Michael P. Binder M.D.
Richard V. Dowden M.D.
Roland S. Philip M.D.
Ronald L. Price M.D.
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Gerald Jonson M.D.
Gordon A. Bodzin M.D.
Howard L. Darvin M.D.
Ihor John Danko
Jeffrey W. Kosman
Jessica Ann Perse M.D.
John D. Brownlee M.D.
John Dorsky M.D.
John L. Prather
John M. O’Toole M.D.
Leonard L. Brzozowski M.D.
Lisa Moreschi Rock M.D.
Paula Schaffer-Polakof M.D.
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Sina Erkan M.D.
Stanley A. Berman
Vladimir Dubchuk M.D.
William A. Evanko
William J. Petraiuolo M.D.

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Jerald S. Brodky M.D.
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Charles Michael Miller M.D.
Christopher P. Brandt M.D.
Christopher R. McHenry M.D.
Conor Patrick Delaney Ph.D.
Craig W. Newman Ph.D.
 Drogo K. Montague M.D.
Edward C. Benzel M.D.
Edward G. Mansour M.D.
Elroy Kursh M.D.
Eric A. Klein M.D.
Ezra Steiger M.D.
Gene H. Barnett M.D.
George Frederick Muschler M.D.
Gordon Blackstone Hughes M.D.
Inderbir Singh Gill M.B.B.S.
Isador H. Lieberman M.D.
James A. Schulak M.D.
James E. Zins M.D.
Jeffrey A. Goldstein M.D.
Jerome L. Belinson M.D.
Jerry Goldstone M.D.
Jerry M. Shuck M.D.
John Michael Henderson M.B.B.S.
John Patrick Spinnak M.D.
Joseph P. Iannotti M.D., Ph.D.
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Maria Siemionow M.D.
Marshall Strome M.D.
Patrick J. O’Hara M.D.
Peter C. Weber M.D.
Philip R. Schauer M.D.
Ramon Mitra Esclamado M.D.
Raymond Rackley M.D.
Richard B. Fratianne M.D.

Richard D. Parker M.D.
Richard Lee Drake Ph.D.
Robert F. McLain M.D.
Robert J. White M.D., Ph.D.
Steven C. Campbell M.D., Ph.D.
Stuart M. Flechner M.D.
Suyu Shu Ph.D.
Thomas A. Stellato M.D.
Thomas W. Rice M.D.
Tommaso Falcone M.D.
Victor Warren Fazio M.B.B.S.
Walter Jakob Chwals M.D.
Yoshio Takaoka M.D., Ph.D.

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Charles B. Hurst M.D.
Derrick D. McElroy M.D.
Donald Stephens M.D.
Ivan P. Tewarson
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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.
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Layton Kest M.D.

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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, Case 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 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 campus. The Clinic includes the twelve-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 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 chairspersons from the School of Medicine, and key VAMC officials.

The Cleveland VAMC is a part of the VA Healthcare System of Ohio, linking VA healthcare 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 medical specialties.

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 (CWRU). 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 CWRU 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 hospi-
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 photocopiers, 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 network access, black-and-white and color photocopiers, 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 network access, black-and-white and color photocopiers, 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 network access, black-and-white and color photocopiers, and quiet study areas. The Health Center Library, which in 2003 underwent a $2.5 million renovation, offers network access, black-and-white and color photocopiers, and quiet study areas. There is wireless network access throughout both libraries, and electrical outlets are available at study tables.

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 Siegal College of Judaic Studies Library. Classes on using these electronic resources are offered through the CaseLearns program (http://library.case.edu/caslearns/).

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 anesthesiology (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 alumnuus 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 F. 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 Oglebay 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 Kaiser Permanente Endowed Lectureship In Bioethics
This lecture is presented by a distinguished visiting lecturer with the goal of advancing the study of bioethics. It was established in 1994.

The Rita Ann Kicher Lecture
In this annual lecture, established in 1996, a distinguished visiting lecturer promotes quality health care by emphasizing new developments in the identification and treatment of life-threatening cardiac arrhythmia. Rita Ann Kicher was the daughter of Thomas Kicher, Ph.D., a triple alumnus, long-time faculty member, and dean (1992-1997) of the Case School of Engineering. At the time of her death, she was a systems analyst at University Hospitals of Cleveland’s Center for Quality Assessment and Utilization Management.

The Clifford L. Kiehn, M.D., And John Desprez, M.D., Visiting Lecturers In Plastic And Reconstructive Surgery
These lecturers are distinguished visitors whose presentations advance the study of plastic and reconstructive surgery. The lectureship was established in 1994. Dr. Kiehn is the former head of plastic and reconstructive surgery, and Dr. Desprez followed him in that role.

The Jerome I. Kleinerman, M.D., Lectureship In Pulmonary Pathobiology
This lectureship is named for an internationally respected lung specialist and professor emeritus of pathology at the School of Medicine. Established in 2000 by the late Dr. Kleinerman’s daughters, friends and colleagues, the lectureship each year supports a distinguished visiting lecturer whose presentation advances the study of pulmonary pathobiology. The lecturer is selected by a faculty committee that includes members having appointments at MetroHealth Medical Center. The members of the committee are chosen by the dean of the School of Medicine.

The Robert R. Kohn Lecture
The lecture honors an alumnus of the Class of 1957 and was established in his memory in 1989 by family, friends and colleagues to advance the study of pathology.

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 Alan Moritz, M.D., Endowment Fund
This fund was established in 1991 by friends and colleagues of the late forensic pathologist, medical school faculty member, and university provost.

The Olof H. Pearson, M.D., Lecture
Established in 1999 by family and friends of the late endocrinologist, oncologist and faculty member, this lecture features a cancer-related topic at the School of Medicine.

The Robert S. Post, M.d., Visiting Lectureship
Established in 1995 by Dr. Post’s friends and colleagues in the Community Dialysis Center, in memory of the former faculty member and head of nephrology, this lecture features a distinguished visiting expert in the field of nephrology.

The Edward W. Purnell Endowment Fund
Established in 1991 by family and friends of Dr. Post’s late medical school head of ophthalmology, this lecture features a visiting expert in the Department of Ophthalmology.

The Frederick C. Robbins Lecture In The Department Of Medicine Visiting Lecturer
Established in 1995 by the Department of Medicine in honor of Frederick C. Robbins, M.D., dean emeritus of the School of Medicine, university professor emeritus, and Nobel Prize winner, this lecture features a distinguished visiting expert each year in the Department of Medicine.

The Henry Z. Sable, M.d., Ph.d., Endowment Fund
Established in 1997 by Mrs. Florence M. Sable in honor of her late husband, who was professor emeritus of biochemistry, this lecture advances the study of biochemistry via a visiting expert selected by the chairperson of the Department of Biochemistry.

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.

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. Lecturers 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 de-
livered 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 of Cleveland.

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 produces 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
cc lcm@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/amcas/start.htm. Those interested in the Medical Scientist Training Program http://mstp.case.edu to learn how to apply to this program.

Admissions Process
Here’s how the admissions process works at the Case 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.

Those interested in the Cleveland Clinic Lerner College of Medicine of Case Western Reserve University or Case’s Medical Scientist Training Program should gain experience in research before applying. Applicants must have taken these prerequisites at an accredited, four-year, degree-granting American or Canadian college or university. As an undergraduate, students should pursue a major in a subject of their own choosing; they should not structure their undergraduate experiences in an attempt to sway the medical school admissions committee. Research strongly indicates that the choice of a major has little bearing on ultimate acceptance into medical school. Most applicants to medical school, however, are chemistry or biological science majors.

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 sciences 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 though its Dean’s Scholars program and David Satcher, M.D., Ph.D.-Rubens Panies, 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 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 College Program (Cleveland Clinic Lerner College of Medicine of Case Western Reserve University), and the Medical Scientist Training Program. Students in all three programs:

- are introduced to clinical work and patients almost as soon as they arrive on campus.
- learn medicine using an integrated, organ system-based approach.
- are treated as junior colleagues by faculty
members.
• are taught the science of medicine infused with the skills of communication and compassion.
• learn how to learn, a skill they will call on throughout their careers in the quickly changing field of medicine.

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 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 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 Apprenticeship 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 (CPCP). Each student works with a community physician one afternoon a week for the next year.

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.

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.

The 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 five-year College Program in detail” section on subsequent pages of this publication for additional information.

OVERVIEW OF THE MEDICAL

MOLECULAR MEDICINE (MMED)

Graduate Course

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. 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

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<thead>
<tr>
<th>Year</th>
<th>Course Curriculum and Experience</th>
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<tbody>
<tr>
<td>1</td>
<td>College Program basic science and research curriculum, ICMClinical Research Curriculum and Experience</td>
</tr>
<tr>
<td>2</td>
<td>College Program basic science and research curriculum, ICM</td>
</tr>
<tr>
<td>3</td>
<td>Research thesis required for graduation</td>
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</tbody>
</table>

#### MSTP Program Research Rotations

<table>
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<tr>
<th>Year</th>
<th>Course Curriculum and Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>University Program MD curriculum Summer research rotation One graduate course or research rotation each semester (fall and spring)</td>
</tr>
<tr>
<td>2</td>
<td>University Program MD curriculum Summer research rotations (1 or 2) Graduate course or research rotation in the fall semester</td>
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</table>

#### 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 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.

**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 – Capstone 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 investi-
gation 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 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 assess-
ments will occur in the final week of blocks 2-6 and will integrate anatomy, histopa-thology and radiology through clinical sce-narios 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

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<tr>
<td>Foundations of Medicine and Health</td>
<td>Research and Scholarship</td>
<td>Advanced Clinical and Scientific Studies Capstone: Return to “Becoming a Doctor”</td>
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<tr>
<td>(20 months, including vacation)</td>
<td>(4-month block plus electives, flexible scheduling)</td>
<td>(10 months, flexible scheduling)</td>
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<tr>
<td>Core Clinical Rotations (48 weeks, flexible scheduling)</td>
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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.

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 advisers.

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 ad-
address a question he or she developed during the summer. By the end of year two, each student must select a research project and adviser 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 adviser 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 engagement 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 adviser, who works with a total of six to eight students throughout all five years of the curriculum. Students build a learning portfolio that demonstrates their mastery of the clinical, basic science and research objectives of the curriculum. The physician adviser reviews the student's portfolio regularly, helps the student identify learning goals to address relative weaknesses or build on areas of relative strength, and assists 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 advisers, 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 adviser 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 adviser 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 advisers 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 PhD program)
- Cell Biology
- Chemistry
- Developmental Biology (through the Genetics and Neuroscience PhD programs)
- Genetic and Molecular Epidemiology
- Genetics: Molecular, Developmental and Human Genetics
- Immunology Training Program (through the Pathology PhD 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 PhD 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
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, MD, 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@cwru.edu) or R. Tyler Miller, MD, 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 CWRU.

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. Students 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.

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 Licens ing 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.

LICENSURE

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 CWRUnet 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 PhD-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'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://casmc.case.edu/CRSP or contact Carol Tolin, Program Coordinator, The Clinical Research Scholars Program at Case, c/o MetroHealth Medical Center - Bell Greve 3-45, 2500 MetroHealth Drive, Cleveland, Ohio 44109-1998, e-mail: carol.tolin@case.edu.

CLINICAL RESEARCH SCHOLARS PROGRAM (CRSP)

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. Prereq: 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. Prereq: 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. Prereq: 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, CRSP 406 or consent of instructor.

CRSP 408. From Bench to Bedside and Beyond, and Back (3)
This course highlights the complementarities of different research paradigms—from the biomolecular to the public health dimensions of scientific discovery. It emphasizes the increasingly bi-directional relationships and motivations for clinical research and creates an environment in which student scholars and faculty think together to conceive interdisciplinary research in specific clinical problem areas. Small-group discussion sessions follow lectures on particular methods in a general clinical area of research. Examples include different perspectives on umbilical cord blood banking (stem cell transplantation, trials, economics, biotechnology, ethics), inflammation and cardiovascular disease (prostaglandins and human disease, C-reactive protein and risk of cardiovascular disease, epidemiology, drug trials, economics, ethics and regulation), diabetes mellitus (epidemiology, economics, electronic medical records and cluster-randomized trials, genetics, treatment trials), and asthma (genetic susceptibility, inflammatory mediators, environment-gene interactions, epidemiology, race, and risk). Evaluation includes student scholar participation and construction of cross-disciplinary projects in one or more subject areas. Prereq: CRSP 401-403 or consent of Co-Directors.

CRSP 411. Genetics, Cell and Molecular Biology for Clinical Investigators (3)
This course is an overview of state-of-the-art genetics, cellular and molecular biology as applied to clinical investigation. It is an intensive course designed to broadly familiarize students with the language, techniques, and concepts used in these fields while emphasizing the practical application of such
CRSP 412. Communication in Clinical Research (Part 1) (3)
Parts 1 and 2 of this course builds basic knowledge and develops 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. Prereq: CRSP 401 or equivalent and consent of instructor.

CRSP 413. Communication in Clinical Research (Part 2) (1)
Parts 1 and 2 of this course builds basic knowledge and develops 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. Prereq: CRSP 401 or equivalent and consent of instructor.

CRSP 500. Observational Studies (3)
An observation 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, CRSP 406 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. Prereq: K12 Appointment or permission of instructor.

CRSP 503. Innovation and Entrepreneurship (3)
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 (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. Prereq: Consent of instructor.

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, 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. Cross-listed as EPBI 510.

CRSP 515. Large Database Management and Analysis (3)
This course is designed to introduce the student to the use of large datasets for clinical, health services, and health policy research. The student will be introduced to representative types of available data including administrative and vital statistics files, national survey data collected for research, and local data of a registry nature. The student will learn to prepare analytic data for statistical analysis using SAS and STATA. The course will emphasize the strengths and the limitations of conducting research using secondary data, as well as the legal issues that surround access to such data. Session topics will include accurate and confidential movement of data, data formatting, use of hierarchical data, management of weighted data, transformation, merging, cleaning of data, and the management of missing data. Laboratory sessions will allow hands-on experience with the techniques presented in the course. Prereq: EPBI 431, CRSP 401, CRSP 406 or consent of instructor.

CRSP 603. Research Ethics and Regulation (2)
(See LAWS 603.) Cross-listed as LAWS 603.

CRSP 651. Clinical Research Scholars Thesis (1-18)
CRSP Thesis M.S. Prereq: Permission of program faculty.

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 University’s 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)

Graduate Courses

MPHP 303. Moving Public Health Forward: Critical Analysis Skills Dept Seminar (3)
Public health professionals, researchers, clinicians and consumers are inundated with overwhelming amounts of information. How do you separate sensationalistic headlines from scientific findings? How do you identify good science from bad? Every scientific endeavor begins with the researcher examining reports of previous studies related to his or her topic of interest. Without this step, researchers cannot achieve progress by building on the work of others.
This departmental seminar course is the first in a series of 3 classes leading to the completion of the Capstone project. In this course, undergraduate students with junior-class standing will develop critical analytic literature skills allowing them to read, understand, synthesize and write public health research. Through seminar-style activities and exercises, students will learn to pose reasonable scientific questions and review literature to better answer those questions. The course will help students develop the focus of their senior-year Capstone project. The final product of the course will be a paper which will serve as the background section for the Capstone project. Approved SAGES departmental seminar. Coreq: MPHP 404.

MPHP 304. 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 those 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.

MPHP 313. Peer Health: Advanced Course in Health Educ, Communication & Advocacy (3)
Through interactive learning, students will study important topics in adolescent and young adult health, focusing on how to conduct effective health promotion and health advocacy regarding these issues. Students will learn principles of health communication and health education that will allow them to devise and participate in a strategic health promotion campaign. A diverse set of health communications opportunities will allow creation of print, audio, and video health promotion materia-

als. Students will be instructed in an evidence-based youth development curriculum and will present modules from this program to teens in the community. Participants in the course will gain knowledge about their own health, the health of their peers and about how to effectively influence the health of their community.

MPHP 401. Epidemiologic Methods for Public Health Research (3)
This course provides a general introduction to epidemiology in the context of public health research. The course covers the basic methods (study design, measures of disease occurrence, measures of association, and causality) necessary for epidemiologic research and evaluation of public health programs. It is intended for students who have a basic understanding of the principals of human disease and statistics. Prereq: STAT 201 or PSCL 282 or ANTH 319; BIOL 216 or 116; MATH 125 or 121.

MPHP 402. Statistical Methods in Public Health (3)
This one-semester survey course for public health students is intended to provide the fundamental concepts and methods of biostatistics as applied predominately to public health problems. The emphasis is on interpretation and concepts rather than calculations. Topics include descriptive statistics; vital statistics; sampling; estimation and significance testing; sample size and power; correlation and regression; spatial and temporal trends; small area analysis; statistical issues in policy development. Examples of statistical methods will be drawn from public health practice. Use of computer statistical packages will be introduced.

MPHP 403. 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 those 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.

MPHP 404. Public Policy and Aging (3)
(See EPBI 408.) Cross-listed as EPBI 408.

MPHP 405. 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. Cross-listed as EPBI 411.

MPHP 406. Public Policy and Aging (3)
(See EPBI 408.) Cross-listed as EPBI 408.

MPHP 408. Substance Abuse Prevention in Public Health (3)
This course presents an overview of public health approaches to substance abuse prevention. First, it provides a biological understanding of a variety of abused drugs (nicotine, alcohol, marijuana, heroin, hallucinogens, steroids, and prescription drugs) as well as a review of epidemiologic data reflecting use and abuse of these substances. Issues that affect the success of prevention strategies such as dual diagnoses, data collection, stigma, and cross cultural differences will be discussed. The majority of the course will be devoted to best practices (programs and policies) in prevention examining lessons learned from practices implemented domestically and internationally as well as those targeting adolescents.

MPHP 409. Health Economics and Strategy (3)
(See ECON 421.) Cross-listed as ECON 421 and HSMC 421.

MPHP 410. Innovation, Markets, and Organization in Pharmaceutical Industry (3)
(See ECON 424.) Cross-listed as ECON 424.

MPHP 411. Community Health Advocacy (3)
The objective of this course is to acquaint students with basic theoretical and practical aspects of community health advocacy (including foundations, needs assessment, post assessment and priority setting, ethical issues, and approaches and strategies) and to explore the roles that they can play as health professionals. The course will be taught using an intensive weekend format.

MPHP 413. Peer Health: Advanced Course in Health Educ, Communication & Advocacy (3)
(See MPHP 313.)
MPHP 433. Community Interventions and Program Evaluation (3)
(See EPBI 433.) Cross-listed as EPBI 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)
(See EPBI 442.) Prereq: MPHP 432. Cross-listed as EPBI 442.

MPHP 444. Law, Sexuality, and Public Health (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 445. Current Issues in Queer Health (LGBTQI Health) (3)
The course is devoted to an examination of health status and health care access among gay, lesbian, bisexual, and transgender/transsexual individuals in urban settings. The objective of this course is to acquaint student with current issues in LGBT (lesbian, gay, bisexual, and transgender) health, public health law, HIV/AIDS in the U.S., intentional injury, and environmental health and environmental justice.

MPHP 450. Clinical Trials and Intervention Studies (3)
(See EPBI 450.) Cross-listed as EPBI 450.

MPHP 451. Principles of Genetic Epidemiology (3)
(See EPBI 451.) Cross-listed as EPBI 451.

MPHP 456. Health Policy and Management Decisions (3)
(See HSMC 456.) Cross-listed as HSMC 456.

MPHP 458. Statistical Methods for Clinical Trials (3)
(See EPBI 458.) Cross-listed as EPBI 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. Cross-listed as EPBI 460.

MPHP 463. Survey Design and Data Collection in Health Research (3)
This course takes an in-depth look at survey/ questionnaire design and issues related to collecting and using survey data. Specifically, the course focuses on four major areas: (a) survey design; (b) developing and writing survey questions; (c) assessing reliability and validity; and, (d) scale development and psychometric exploration (factor analyses). Students receive practical experience at writing survey questions, as well as analyzing survey data using existing databases. Basic statistical background is required for this course. Prereq: EPBI 431. Cross-listed as EPBI 463.

MPHP 467. Cost-Effectiveness Analysis in Health Care (3)
This course provides an introduction to the concept of cost-effectiveness analysis and its application in health care decision-making. It includes an overview of the methods and concepts used to evaluate the cost-effectiveness of health care interventions, with a focus on 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 will be placed on case studies, course projects, and evaluation of publications. Some decision analysis and policy implications will also be included. Cross-listed as EPBI 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. Prereq: Consent of instructor. Cross-listed as EPBI 468.

MPHP 475. Management of Disasters Due to Terrorism (3)
The course will cover the conceptual framework underlying 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. Prereq: Consent of instructor.

MPHP 477. Internship at Health-Related Government Agencies (3)
(See EPBI 477.) Prereq: EPBI 515. Cross-listed as EPBI 477.

MPHP 484. Geographic Medicine and Epidemiology (1-3)
(See EPBI 484.) Cross-listed as EPBI 484.

MPHP 485. Adolescent Development (3)
(See ADHT 485.) Cross-listed as ADHT 485.

MPHP 486. Adolescent Health Care Policies (3)
(See ADHT 486.) Cross-listed as ADHT 486.

MPHP 487. Launch Program: Reaching Goals in Research and Community Projects (3)
(See ADHT 487.) Cross-listed as ADHT 487.

MPHP 488. Gender, Ethnicity, and Health Research (3)
The 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. Cross-listed as EPBI 488.

MPHP 489. (See EPBI 489.) (3)
Cross-listed as EPBI 489.

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. Cross-listed as EPBI 490.

MPHP 491. Epidemiology: Application of Theory/Methods (3)
(See EPBI 491.) Cross-listed as EPBI 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. Prereq: EPBI 431 and EPBI 490. Cross-listed as EPBI 492.

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. Prereq: MPHP/EPBI 490. Cross-listed as EPBI 493.

MPHP 494. Infectious Disease Epidemiology (1-3)
(See EPBI 494.) Cross-listed as EPBI 494.

MPHP 495. Psychiatric Epidemiology (3)
(See EPBI 495.) Cross-listed as EPBI 495.

MPHP 499. Independent Study (1-18)
Cross-listed as EPBI 499.

MPHP 500. Medical Elective Independent Study (1-6)
Students combine medical school Type A electives into a 3 credit hour graduate course by selecting from a pre-approved list (available in the MPH Office) of Type A electives deemed relevant to the public health curriculum. Students select 1-6 electives for the same number of credits and combine them to fit with their chosen MPH concentration track. Students attend the class, fulfill its requirements, and write a paper (for each Type A elective taken) addressing the public health aspects of the elective and connecting the elective to their chosen concentration track. The paper is turned into MPH Program Director who will evaluate the student’s performance in consultation with a specific Type A elective instructor. Students will also have to sign up for the course through the med school’s internal system in addition to registering for MPHP 500. Students’ choices of combination of Type A electives will have to be approved prior to their registration for MPHP 500, so a permit must be required for course registration.

MPHP 501. Graduate Seminar (0)
Students and faculty have the opportunity to meet on a weekly basis to discuss papers in the literature. Each week a paper is reviewed in detail by a graduate student in a formal presentation. Discussion of the strengths and weaknesses of the work gives insight into the complexities of investigations in the Public Health arena. Cross-listed as EPBI 501.

MPHP 502. International Health Practice (3)
(See FAMD 502.) Cross-listed as FAMD 502.

MPHP 504. Public Health Capstone Seminar (0)
Year-long, weekly seminar course offered in conjunction with the core requirement MPHP 652 Capstone Experience. The seminar provides a forum for preparing students to select and support development of the capstone experience and a “think tank” for discussion of public health issues that evolve as relevant in current capstone placements. The seminar features speakers from community based Capstone sites, student presentations on public health topics related to Capstone projects, and debriefing and problem-solving sessions for current capstone experiences.

MPHP 506. Ethics, Law, and Epidemiology (3)
This course is intended 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. Prereq: EPBI 490 and EPBI 491. Cross-listed as EPBI 506.

MPHP 510. Health Disparities (3)
(See EPBI 510.) Cross-listed as EPBI 510.

MPHP 532. Health Care Information Systems (3)
(See MIDS 432.) Cross-listed as MIDS 432.

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.

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 assistance 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.

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. The MSTP director is Clifford V. Harding III, M.D., Ph.D., and the associate director is George Dubyak, Ph.D. The program manager is Deidre J. Gruning.

For more information, see the previous MSTP section in the School of Medicine section of this publication, under Programs Leading to the M.D.; write: MSTP, Case Western Reserve University School of Medicine, Room T-401, 10900 Euclid Avenue, Cleveland, Ohio 44106-4936; call (216) 368-3404; visit the Web site at http://mstp.case.edu; and/or e-mail mstp@case.edu.

MEDICAL SCIENTIST TRAINING PROGRAM (MSTP)
Graduate Course

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 stu-
dent in selecting a laboratory for their thesis work. Prereq: Consent of MSTP Associate Director.

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’s 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 bioethics 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 advanced 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 School of Graduate Studies. For more information, visit http://www.case.edu/med/bioethics/masmenu.html, call (216) 368-6196, or e-mail bioethics@case.edu.

PH.D. In Bioethics

Case 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 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 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, offered in conjunction with Case’s 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 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.cwru.edu/hsr.html or contact the departmental coordinator for Graduate Studies, Ms. Alicia Boscarello at (216) 368-5957 or by email 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.cwru.edu/petp/; write PETP Admissions, Case Western Reserve University, 10900 Euclid Avenue, Cleveland, Ohio 44106-7207; phone (216) 368-4094; or e-mail axbl27@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 (djj10)
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 (gx61), Stephen Schulte (ses44), Bishr Aldabagh (bxa33), CCLCM: Kevin Blaine (blaine@ccf.org)
Description: The AMA-MSS chapter at Case 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!

**Asian Pacific American Medical Students Association (APAMSA)**

Contact: Case: Florence Lin (fsl28@case.edu), Ravi Venkatesh (ravi.venkatesh@case.edu), Nolan Walther (nolan.walther@case.edu) Shelley Chang (sxc149@case.edu)
Description: 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, and to improve the health of 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-President (jj342)
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 (lde10)
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 (fsl28)
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 (jnm18), Jane Park-Vice-President (jhp16), Erin Broadus-Secretary (ech16), James Choi-Treasurer (jjc47), Eddie Jones-SCME Chair (elj14), Liz Alos-Social Chair (eja10)
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 (dpe)
Description: The Complementary 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 Rashtegar (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 (kck14)
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 (pwg4), Bishoy Gad (bxg24)
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 (dap6), Carrie Tuten-Administrative Chair (cet11)
Description: The Family Medicine Interest Group aims to develop the interest and knowledge of 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 relationships 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 (shb5)
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 (vch), 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 Jannacec (lmj17)
LGBTM – Dante Roulette (gdr4), Dan Wei (ddw8)

Medical Students for Choice (MSFC)
Contact: Millie Gentry-Student Coordinator (mgc19), Kathryn Feldman-Student Coordinator (krf11), Christine Gosen – Secretary (clg10), Christina Shenko-Treasurer (cas32), Karen Gibbins-Education Chair (kig7), 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 (jkc20), Emily Link-Vice-President (eel4)
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 (jll23)
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 (kig7)
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: Rhashedah 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 (fxl28)
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 (elg10), Hadele Banna (hxb33).
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 (dbb11), Laura Janneck (lmj17)

Psychiatry Interest Group
Contact: Scott Morris (scm11)
Description: Our organization’s goal is to promote interest in the field of psychiatry, and to facilitate the sharing of information and resources to help medical students excel in this field.

Student Physicians for Social Responsibility
Contact: Shelley Chang (sxg149), Aimee Wing (ajw32), Elaine Lu (el4)
Description: Physicians for Social Responsibility (PSR) is a leading public policy organization with 24,000 members representing the medical and public health professions and concerned citizens, working together for nuclear disarmament, a healthful environment, and an end to the epidemic of gun violence. Student physician chapters of PSR are committed to the promotion of global health, and understand that it is our obligation to share and educate others on the most realistic strategies for assuring global survival:

1. Eliminating nuclear weapons
2. Achieving a sustainable environment
3. Reducing violence and its causes
Student Communication Committee (SCC)
Contact: All council members: Devon Collins-Richards (djc32), Matthew Pifer (map31), Blessing Igboeli (boi), Kyauna Miller (ksm17), Brandon Gimbel (bgc7), Bishoy Gad (bxg24), Samer Fadl (sxf62), Kelly Buchanan (kab32), Barry Czeslser (bxc67)
Description: SCC is a newly formed organization aimed at improving communication between students, student groups, and students and administration. With the curricular changes being into place, communication has been and will continue to be especially important during the upcoming year.

Smile Train
Contact: Devon Collins-Richards-Co-Chair (djc32)
Description: Smile Train is a national 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 (bcm16), Christi na 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)
Contact: Ostranda Williams (olw2), 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), Shamil Patel (ssp4), Jeffery Goshe (jmg20), Fahhad Farukhi (ff), Mazen Awais (mxa38)
Description: Unite for Sight serves to develop vision health education programs for the underserved population and raise funds and eyeglasses for underserved kids. 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.

GRADUATE PROGRAMS

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 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.

COURSE DESCRIPTIONS (ANAT)

ANAT 312. Basic Histology (3)
Fundamental histology course covering microscopic structure, nomenclature, and function of normal cells, tissues, and selected organs (human emphasis).

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 on the anatomical structure and functionality of the skeletal and muscular system. Muscle action and involvement in human movement and form will be analyzed and applied.

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. Prereq: ANTH 103 and BIOL 110 or equivalent. Cross-listed as ANTH 375.

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). Cross-listed as ANTH 377.

ANAT 383. Evolutionary Anatomy (4)
This course will introduce graduate and advanced undergraduate students to primate comparative anatomy and will examine methods of reconstructing physiology and behavior from fossil remains. Prereq: ANTH 103 and BIOL 110 or equivalent. Cross-listed as ANTH 383.
ANAT 384. Development and Evolution of the Vertebrate Skull (3)
This course will approach vertebrate cranial diversity from the perspective of our rapidly improving knowledge of craniofacial morphogenesis. The course will thoroughly review craniofacial embryology, including new data regarding the genetics of pattern formation, and will cover all major events in vertebrate craniofacial evolution. Prereq: Permission of instructor.

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. Prereq: Permission of instructor.

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. Prereq: Permission of instructor.

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 (2-6)
This course is an in-depth, cadaver dissection based, introduction to human gross anatomy. The course is modeled after a traditional medical school gross anatomy curriculum and taught by the CWRU School of Medicine, Department of Anatomy faculty. One hour of lecture will precede 3 hours of dissection laboratory Monday, Wednesday, and Friday. Lectures and dissection labs will cover all human anatomy. The course is divided into three sections: thorax and abdomen; pelvis/perineum and limbs/back; and head and neck. Students may take the lecture and lab of any section for 2 credit hours; two sections for 4 credit hours or all three sections for 6 credit hours. The lecture only portion of the entire course may be taken for 3 credit hours. This is an intense course to which students should be prepared to devote more time than the scheduled hours of 1:00 to 5:00pm. Dissection labs are open 24 hours 7 days a week. Prereq: 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). Prereq or Coreq: ANAT 312 or ANAT 412.

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, neurophysiology 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 brain human 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. Prereq or Coreq: ANAT 414.

ANAT 417. Cell and Molecular Biology Techniques (2)
One spring semester long laboratory training in faculties research laboratories designed to introduce the student to techniques commonly used in modern laboratory research including tissue culture, RNA, DNA and protein detection methods, immunohistochemistry and microscopy, principles of gene cloning, DNA-protein interactions. In addition, lectures will cover selected topics in cellular stress response (ischemia-reperfusion injury, hypoxia, hypoxia and ionizing radiation). Prereq: Consent of department advisor or permission of instructor.

ANAT 420. Forensic Pathology (3)
Forensic Pathology is that 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. Prereq: Permission of instructor.

ANAT 421. Electron Microscopy in Medicine (3)
(See PATH 421.) Cross-listed as PATH 421.

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 anatomy and vascularization of the spinal cord and brain will be gained through brain dissection and study of stained and unstained sections. Prereq: 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 curriculum. 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 material 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)
(See EPBI 431.) Cross-listed as EPBI 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. Back-
ground in linear algebra and basic statistics is desirable.

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. Prereq:
Undergraduate degree.

ANAT 462. Advanced Principles of Development-
mental Biology (3)
(See BIOL 462.) Cross-listed as BIOL 462.

ANAT 467. Topics in Evolutionary Biology (3)
(See ANTH 467.) Cross-listed as ANTH 467.

ANAT 475. Human Evolution: The Fossil
Evidence (3)
(See ANAT 375.) Prereq: ANAT 103 and BIOL 110 or equivalent. Cross-listed as ANTH 475.

ANAT 477. Human Osteology (4)
(See ANAT 377.) Cross-listed as ANTH 477.

ANAT 483. Evolutionary Anatomy (4)
(See ANAT 383.) Cross-listed as ANTH 483.

ANAT 484. Development and Evolution of
the Vertebrate Skull (3)
(See ANAT 384.) Prereq: Graduate standing or per-
mission of instructor.

ANAT 491. Embryology (3)
A detailed description of development will be pre-
sented, focusing on the developing human. Discus-
sions and presentations will also include several de-
veloping systems that have served as useful models in
experimental embryology for deciphering mech-
anisms responsible for producing adult metazoan
organisms. Prereq: Permission of instructor.

ANAT 497. Scientific Presentations (1)
These courses provide a foundation and experience
for making scientific presentations. Scheduled si-
multaneously with ANAT 498 and students from
both courses are present, but the requirements for
passing differ. Students in ANAT 497 prepare Pow-
erPoint and poster presentations. Oral presentations
by students taking ANAT 498 will occur during the
class periods for the remainder of the semester. Stu-
dents taking 497 and 498 must participate in these
discussions. Students must take ANAT 497: Scien-
tific Presentations before ANAT 498: Departmental
Seminar.

ANAT 498. Anatomy Departmental Seminar
(1)
These courses provide a foundation and experience
for making scientific presentations. Scheduled si-
multaneously with ANAT 497 and students from
both courses are present, but the requirements for
passing differ. Students in ANAT 497 prepare Pow-
erPoint and poster presentations. Oral presentations
by students taking ANAT 498 will occur during the
class periods for the remainder of the semester. Stu-
dents taking 497 and 498 must participate in these
discussions. Students must take ANAT 497: Scien-
tific Presentations before ANAT 498: Departmental
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. Prereq: Permission of
instructor.

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 de-
partment professor before registration. Prereq: Per-
mission of instructor.

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 consequen-
tes, and basic surgical approaches. Prereq: 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
fourth year medical students. The course will famili-
arize participants with surgical approaches used to
treat musculoskeletal disease. Students will learn to
correlate normal and abnormal anatomical findings
with radiographical studies. Prereq: ANAT 411.

ANAT 516. Surgical Anatomy: Head and Neck
(4)
Students will build on their understanding of basic
gross, histological, pathologic, and embryonic anat-
omy of the head and neck. Human cadaveric dissec-
tion, 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 re-
moval and other therapeutic surgical interventions.
Students conduct weekly surgical interventions on
live dogs, followed by a discussion in a “grand
rounds” atmosphere. Surgical approaches covered
include: cranial cavity, skull base, orbit, maxillofa-
cial, oral, otic, pharyngeal, and airway. Students are
required to attend and participate in lectures, dis-
section (live and cadaveric), and discussions. A pre-
course and final essay examination. Prereq: ANAT
411, ANAT 412, ANAT 413, ANAT 414, ANAT
415, and ANAT 491 and permission of instructor.

ANAT 517. Optical Microscopy and Imaging
for Biologists (2)
This intense lecture and laboratory-based course
will cover basic concepts of light microscopy and
introduce advanced techniques relevant to modern
cell and molecular biology. Students will gain ex-
tensive hands-on experience with state-of-the-art
equipment for optical imaging guided by experi-
enced academic instructors. The latest and most ad-
vanced instrumentation for light microscopy, image
detection, and computerized image analysis will be
available for use in the laboratory part of the course.
Cross-listed as PHOL 517.

ANAT 523. Histopathology of Organ Systems
(3)
Comprehensive course covering the underlying ba-
sic mechanisms of injury and cell death, inflamma-
tion, 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). Prereq: ANAT 412 or permission of in-
structor. Cross-listed as PATH 523.

ANAT 530. Forensic Anatomy: Basic Facial
Reconstruction (2)
This introductory course takes a step-by-step ap-
proach to facial reconstruction for forensic iden-
tification. Students will study the placement and
function of head and neck muscles, average tissue
depths and more in order to recreate facial features.
Students will apply pasteline to a casting of an ac-
tual skull.

ANAT 599. Visually Interpreting the Cadaver
(3)
This course is designed to facilitate prolonged focus
on drawing from the cadaver. The main objectives
are to enhance the student’s knowledge of human
anatomy, to gain better proficiency at rendering the
full range of human tissues, and to enhance the abil-
ity to “breathe life” into dead tissue. Visual com-
munication skills with regard to interpreting the
visual field into a meaningful visual statement are
also emphasized.

ANAT 601. Research (1-18)
Predoctoral laboratory research. Prereq: Permission
of instructor and academic advisor.

ANAT 610. Oxygen and Physiological Func-
tion (2)
Lecture/discussion course which explores the signif-
icance and consequences of oxygen and oxygen me-
tabolism in living organisms. Topics to be covered
include oxygen transport by blood tissues, oxygen
toxicity, and mitochondrial metabolism. Empha-
sis will be placed on mammalian physiology with
special reference to brain oxidative metabolism and
blood flow.
ANAT 611. Practicum in Human Gross Anatomy (1-3)
A course of study designed especially for the prepa-ration of teachers that involves the supervised prac-tical application of previously studied theory. Stud-ents accepted into ANAT 611 must participate in one of three sections of the course (as described be-low). Participation is defined as preparing a prosec-tion 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 411 - 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). Prereq: ANAT 411 and permission of instructor.

ANAT 612. Practicum in Histology and Ultra-structure (2)
A course of study designed especially for the prepa-ration of teachers that involves the supervised prac-tical application of previously studied theory. Stud-ents accepted into ANAT 612 must participate in one of two sections of the course: Section 1: Cell biology and tissues (1 credit); Section 2: Organs and organ systems (2 credits). The prerequisite knowledge required for ANAT 612 must have been obtained previously in ANAT 412: Histology and Ultrastructure and the associated laboratory ANAT 413: Histology Laboratory. Permission of the course instructor is also required. Required participation in ANAT 612 is defined as: 1. meet weekly with course instructor to (pre)review course material; 2. attend all ANAT 412 lectures; 3. participate/assist in all ANAT 413 laboratory sessions. Teaching will be guided, supervised, and evaluated by the course instructor with reference to the help they received in preparing their classroom presentations in the first half of the course. The graduate student will be evaluated by the students in ANAT 491 with reference to the help they received in preparing their classroom presentations in the first half of the course. 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. Prereq: ANAT 491.

ANAT 701. Dissertation Ph.D. (1-18)
(Credit as arranged.)

ANAT 703. Dissertation Fellowship (1-8)

DEPARTMENT OF ANESTHESIOLOGY AND PERIOPERATIVE MEDICINE
Lakeside Hospital Room 2532
Phone (216) 844-8077/Fax (216) 844-7349
www.anesthesiaprogram.com

ANESTHESIOLOGY (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. Prereq: Consent of department.

ANES 440. Patient Monitoring and Instrumentation I (2)
Students are taught the proper balance between circuits and engineering concepts and the clinical applica-tion 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 instru-mentation of the profession. Prereq: Consent of department.

ANES 441. Patient Monitoring and Instrumentation II (3)
Continuation of ANES 440. Prereq: 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. Prereq: Consent of department.

ANES 458. Applied Physiology for Anesthesiologist Assistants II (3)
Continuation of ANES 456. Prereq: 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 calcula-tions. Prereq: Consent of department.

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. Basic life support certification is re-quired for course completion. Prereq: 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 empha-sized. Prereq: 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. Prereq: ANES 461.

ANES 464. Anesthesia Clinical Correlation II (1)
A spectrum of case presentation conferences pre-sented 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 confer-ences are included. Prereq: 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-port) and ACLS (Advanced Cardiac Life Support)
certification is required for course completion. Prereq: ANES 463, BLS Certification, ACLS Certification.

ANES 467. Anesthesia Clinical Experience III (4)
Extended exposure to all of the clinical subspecialties of anesthesiology (obstetrics, pediatrics, neurosurgery, cardiovascular, etc.). Students alternate through rotations at several area hospitals. Prereq: ANES 465, ACLS certification and PALS.

ANES 468. Anesthesia Clinical Correlation III (1)
The second-year equivalent of ANES 462. Prereq: ANES 464.

ANES 469. Anesthesia Clinical Experience IV (8)
A continuation of ANES 467. A comprehensive clinical examination is administered at the end of the semester. Prereq: ANES 467.

ANES 470. Anesthesia Clinical Correlation IV (1)
The second-year equivalent of ANES 464. Prereq: ANES 468.

ANES 471. Anesthesia Clinical Experience V (8)
A continuation of ANES 469. A comprehensive clinical examination is administered at the end of the semester. Prereq: ANES 469.

ANES 475. Pharmacology for Anesthesiologist Assistants (2)
Pharmacodynamics, pharmacokinetics, uptake, distribution and action of the volatile and intravenous anesthetics, muscle relaxants, narcotics, hypnotics and other pharmaceuticals used in the administration of an anesthetic. Prereq: Consent of department.

ANES 477. Electrocardiography for Anesthesiologist Assistants (2)
Diagnosis and practical applications of electrocardiography and echocardiography as monitoring techniques in the operating room. Prereq: Consent of department.

ANES 480. Fundamentals of Anesthetic Sciences I (1)
A continuum of courses over the fall and spring semesters that covers a series of topics in basic medical science with special emphasis on the effect of anesthetics on normal physiology. An examination is administered at the end of each semester. Prereq: Consent of department.

ANES 485. Introduction to Physiological Model-Based Simulation (1)
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 anesthesia machine checkout, drug and equipment setup, safety inspections, and performing anesthesia for uncomplicated surgical cases. Prereq: Consent of the department.

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. Prereq: 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. Prereq: ANES 486.

ANES 489. 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. Prereq: Consent of department.

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. Prereq: Consent of department.

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. Prereq: Consent of department.

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. Prereq: 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.) Prereq: 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. Prereq: Consent of department.

Master of Science in Anesthesia Degree
The Master of Science in Anesthesia (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 Education Credential Evaluation Reports for foreign transcripts.
Biochemistry offers undergraduate programs leading to the bachelor of arts degree and bachelor of science degree in biochemistry and graduate programs leading to the master of science, doctor of philosophy, and dual-degree programs as follows: doctor of medicine/doctor of philosophy degree; doctor of medicine/masters of science in biomedical investigation; juris doctor/masters of science in biochemistry.

The department also participates in several interdisciplinary and interdepartmental programs in the School of Medicine and at Case Western Reserve University that provide additional avenues of study. Research interests within the department include a spectrum of modern biochemical topics in six broad areas: enzymology, protein chemistry, structural biology, gene expression, cell biology, and molecular medicine/gene therapy. These areas are described in detail later in this section. The department has state-of-the-art equipment and facilities for research in modern biochemistry. More complete information about the undergraduate and graduate programs may be obtained by contacting the departmental office.

UNDERGRADUATE PROGRAMS

Please see the College of Arts and Sciences section of this General Bulletin

GRADUATE COURSES (BIOC)

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)
Discussion of current research. Prereq: BIOC 407.

BIOC 612. Biochemistry Seminar II (1)
Discussion of current research. Prereq: BIOC 407.

BIOC 617. Special Topics in Biochemistry (3)
Special topics courses on areas of current interest in biochemistry. Prereq: BIOC 407.

BIOC 618. Special Topics in Biochemistry (3)
Special topics courses on areas of current interest in biochemistry. Prereq: BIOC 407.

BIOC 620. Transcription and Gene Regulation (3)
(See MBIO 620.) Cross-listed as MBIO 620.

BIOC 641. Proposition I (2)
Design of research proposal. Prereq: BIOC 407.

BIOC 643. Proposition II (2)
Design of research proposal. Prereq: BIOC 407.

BIOC 651. Dissertation M.S. (1–6)
(Credit as arranged.)

BIOC 701. Dissertation Ph.D. (1–18)
(Credit as arranged.)

BIOC 703. Dissertation Fellowship (1–8)

GRADUATE PROGRAMS

Masters Degrees

The master of science degree programs provide advanced training for students who wish to continue beyond the B.A. or B.S. degree without committing themselves to the Ph.D. curriculum. Two lines of study are offered: the three-year research program leading to the master’s of science in biochemical research and the two-year course work program leading to the master’s of science in biochemistry.

Master of Science Degree in Biochemical Research

The program leading to the M.S. degree in biochemical research is uniquely designed to provide interested students with sufficient background and laboratory experience to enable them to function as senior research assistants and eventually as laboratory supervisors in university departments, research institutes, or industrial laboratories. Students in this 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 Degree in Biochemistry

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.
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 multidisciplinary, 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.

JD/MS 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 oncogenes.

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 structure, 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.

DEPARTMENT OF BIOETHICS
Room TA-200, School of Medicine
Phone (216) 368-6196
http://www.case.edu/med/bioethics/bioethics.html
Stuart J. Youngner, M.D., Susan E. Watson Professor of Biomedical Ethics and Chair

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 and activities, department events, and master's degree alumni information. The department has a Web site 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 DEGREE IN BIOETHiCS

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 advanced 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 two 10-week rotations. 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's 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 health care 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 course work.
• 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 course work

(see course descriptions for more information)

• Foundations in Bioethics I & II.

Clinical Ethics Rotation.
and human nature, but should we? We have the genetic technology to change nature
...E-mail: bioethics@case.edu
...Phone: (216) 368-8718
...10900 Euclid Ave.
...SCHOOL OF MEDICINE
...Critical Readings in Bioethics
appeals do representatives of these traditions make to rational public argumentation? While the center of gravity will rest with the monotheistic faith traditions (Judaism, Islam and Christianity), the course will be attentive to Buddhism and Hinduism as well. We will meet in seminar format. Students from every background are welcome. Mutual respect, tolerance, and openness to new insights will ensure the highest standards of contemporary scholarship in religion, ethics, and bioethics.

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. Will include intensive reading and case-based discussions. Evaluation based on class participation, a written exercise and a case analysis. Open to graduate students with permission from instructors.

BETH 418. Health Inequalities and Social Justice (3)
This course introduces students to the interdisciplinary study of health inequalities and social justice, drawing on materials from history, anthropology, epidemiology, philosophy, economics, and health services research. Students will learn how humans have identified and responded to health inequalities in the past, and will be introduced to current research on inequalities in the United States and abroad. Topics include: historical and political contexts in which inequalities occur; conceptual and ethical issues involved in defining, identifying, verifying, and measuring health inequalities; explanatory models for health inequalities; local and global perspectives on inequality; and intervention strategies for preventing or responding to health inequalities.

BETH 440. Science and Society Through Literature (3)
(See PHRM 440.) Crosslisted as PHRM 440.

BETH 452. Models of Mind, Mental Disorders, and Bioethics (3)
Discussions of basic theories in the philosophy of mind with analysis and application of these theories to issues raised by real mental disorders and case studies in psychiatry. Emphasis on the interaction between philosophical understandings of the mind and society, with examples from psychiatric writings and general literature on the philosophy of mind. Advance reading is necessary. Classes include a combination of lecture presentation, student presentations from pre-reading, and discussion around key questions.

BETH 453. Hindu and Jain Bioethics (3)
(See RLGN 453.) Cross-listed as RLGN 453.

BETH 496. Public Policy and Aging (3)
(See EBPI 408.) Cross-listed as EBPI 408.

BETH 501. Advanced Seminar in Bioethics (3)
of statistical methods in analysis of variance, catego-
gorical data analysis, survival data analysis, non-

parametric methods, generalized linear model and multivariate techniques. Students will also be intro-
duced 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 hypotheses, correlation and regression; and survey of

statistical methods in analysis of variance, catego-
gorical data analysis, survival data analysis, non-

parametric methods, generalized linear model and multivariate techniques. Students will also be intro-
duced 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 ques-
tion 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 other core course work, the course will also

teach students about how to complete application forms and to create a budget. We will also familiar-

ize 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 in-

stitutional 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 transplant-

ation, and medical futility. Requires minimum of

10 total hours of rotation experience per week dur-
ing two semester 10-week rotations. Locations for

this course include: MetroHealth Medical Center, University Hospitals of Cleveland, and the Hospice of

the Western Reserve. Prereq: 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 rela-

tionship; 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 spe-
cific topics.

THE FIRST YEAR

Course Work

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 Adviser

During the first year, students select an adviser for the dissertation research. Each student also joins the training program with which the adviser 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
- Neurosciences
- Nutritional Sciences
- Pharmacological Sciences
- RNA Biology/Biochemistry

Training faculty, course offerings and individual degree requirements are described in detail in the separate listings for each of these programs.

CELL BIOLOGY PROGRAM

Wolstein Research Building 5-532
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 (CB10 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 (CLBY)

CLBY 466. Cell Signaling (3) (See PHOL 466.) Cross-listed as PHOL 466.

CLBY 468. Membrane Physiology (3) (See PHOL 468.) Cross-listed as PHOL 468.

CLBY 487. Cell Biology of the Nucleus (3) (See PATH 487.) Prereq: CBIO 453 and CBIO 454 or consent of instructor. Cross-listed as PATH 487.

CLBY 488. Yeast Genetics and Cell Biology (3) (See MBIO 488.) Cross-listed as MBIO 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.

CLBY 512. 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.

CLBY 518. Cell Surfaces and Matrices (3) Lecture and discussion course emphasizing current advances in cell-cell and cell-substrate interactions. Cross-listed as MBIO 518 and NEUR 518.

CLBY 519. Molecular Biology of RNA (3) (See MBIO 519.) Cross-listed as MBIO 519.

CLBY 525. Transport and Targeting of Macromolecules in Health and Disease (3) (See PATH 525.) Cross-listed as PATH 525.


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.

CLBY 703. Dissertation Fellowship (1-8)

PARTICIPATING FACULTY
Josephine Adams
Erik Andrulis
Susann Brady-Kalnay
Cathleen Carlin
Martha Cathcart
Piet de Boer
Guy Chisolm
Paul DiCorleto
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 Rietsh
Ofer Reizes
Iain Robinson
Kurt W. Runge
Steven Sanders
Ruth E. Siegel
Roy Silverstein
Neena Singh
Jonathan Smith
The Master of Science and Doctor of Philosophy degree programs are designed to increase the student's knowledge of environmental health science as well as to provide a firm foundation in the life sciences. The programs are multidisciplinary and emphasize cancer biology, environmental toxicology, and nutrition and toxicology. They are based on a core classroom curriculum in the biological sciences, including biochemistry, biostatistics, microbiology, genetics, molecular biology, pharmacology, epidemiology, and toxicology.

CELL BIOLOGY PROGRAM (CLBY)

CLBY 466. Cell Signaling (3)
(See PHOL 466.) Cross-listed as PHOL 466.

CLBY 468. Membrane Physiology (3)
(See PHOL 468.) Cross-listed as PHOL 468.

CLBY 487. Cell Biology of the Nucleus (3)
(See PATH 487.) Prereq: CBIO 453 and CBIO 454 or consent of instructor. Cross-listed as PATH 487.

CLBY 488. Yeast Genetics and Cell Biology (3)
(See MBIO 488.) Cross-listed as MBIO 488.

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CLBY 518. Cell Surfaces and Matrices (3)
Lecture and discussion course emphasizing current advances in cell-cell and cell-substrate interactions. Cross-listed as MBIO 518 and NEUR 518.

CLBY 519. Molecular Biology of RNA (3)
(See MBIO 519.) Cross-listed as MBIO 519.

CLBY 525. Transport and Targeting of Macromolecules in Health and Disease (3)
(See PATH 525.) Cross-listed as PATH 525.

CLBY 555. Emerging Concepts in Cell Regulation (3)
(See PATH 555.) Prereq: CBIO 453. Cross-listed as PATH 555.

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.

CLBY 703. Dissertation Fellowship (1-8)

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.
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 academia, 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.

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

COURSES OF STUDY (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. Cross-listed as ANTH 498, BETH 496, GERO 496, HSTY 480, MPH 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. Cross-listed as MPH 411.

EPBI 412. Pathophysiologic Consequences of Behavior (3)
This course provides non-clinical students interested in health behavior research a background in the physiological mechanisms through which behavior affects bodily systems and the development/maintenance of these disease mechanisms. A primary focus is on cardiovascular disease, diabetes, hypertension, cancer, asthma, and arthritis. Other physiological mechanisms highlighted include metabolic processes, lipid and insulin production, and addiction and withdrawal processes. This course will also discuss the use and limitations of common measures applied to disease conditions and behavior. Class is currently open to Behavioral Epidemiology Students only.

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 several useful software packages (SAS and S-Plus) for database management, spreadsheet construction, statistical analysis, and graphics. Primary emphasis is 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. Students will be required to complete assignments using personal computers and UNIX systems maintained by the department. Knowledge of basic statistics is beneficial, as this course does not teach statistical analysis, but it is not vital to learning the material in this course.

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. Prereq: Two semesters of calculus or consent of instructor. Cross-listed as ANAT 431, BIOL 431, and MPHP 431.

EPBI 432. Statistical Methods II (3)

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. Prereq: EPBI 490, EPBI 431, or MPHP 405. Cross-listed as 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. Prereq: 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. Prereq: EPBI 441. Cross-listed as 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. Prereq: 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. Cross-listed as MPHP 450.

EPBI 451. Principles of Genetic Epidemiology (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. Prereq: EPBI/MPHP 431 or MPHP 405, EPBI/MPHP 490. Cross-listed as GENE 451 and MPHP 451.

EPBI 452. Statistical Methods for Genetic Epidemiology (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 testing 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. Prereq: 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. Prereq: 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. Prereq: EPBI 431.

EPBI 455. Genetic Epidemiology of Complex Diseases (3)
This course gives an integrated view to the process of genetic epidemiology as applied to complex diseases. To provide a basis, we initially study concepts of logic and causality. We then investigate the steps involved with a coherent approach to deciphering complex diseases in genetic epidemiology. In particular, the course covers: migrant studies, familial aggregation, linkage, disequilibrium, association studies, characterizing genes, gene-environment interactions, molecular epidemiology, ecogenetics, and pharmacogenomics. Prereq: EPBI 451.

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 452.

EPBI 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. Prereq: EPBI 432 or MPHP 432. Cross-listed as MPHP 458.

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 models, 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 objec-
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 patient guidelines and patient management and outcomes. Statistical methods especially useful in health services research (e.g., cost-effectiveness and cost/benefit analysis, joint analysis, utility assessment, and meta-analysis) will be introduced as well as examining approaches to the assessment of care quality. Prereq: 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 463. Survey Design and Data Collection in Health Research (3)
This course takes an in-depth look at survey/questionnaire design and issues related to collecting and using survey data. Specifically, the course focuses on four major areas; (a) survey design; (b) developing and writing survey questions; (c) assessing reliability and validity; and (d) scale development and psychometric exploration (factor analyses). Students receive practical experience at writing survey questions, as well as analyzing survey data using existing databases. Basic statistical background is required for this course. Prereq: EPBI 431. Cross-listed as MPH 463.

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 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. Cross-listed as 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. Prereq: Consent of instructor. Cross-listed as MPH 468 and NURS 468.

EPBI 470. Health Behavior Constructs and Theory (1.5)
This course provides an extensive overview of the predominant theories and models currently used in health behavior research and interventions aimed at health behavior change. Students will learn the underlying theoretical constructs of predominant theory/models and to evaluate the use of these constructs health behavior interventions.

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. Prereq: 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 analyses of cancer research data. Data on all levels will be considered, ranging from epidemiological datasets to DNA microarray datasets. Prereq: BIOG 407, EPBI 432.

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 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. Prereq: EPBI 515. Cross-listed as 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 distributions; 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 Statistic I (3)

EPBI 482. Theoretical Statistic II (3)
(See STAT 446.) Prereq: MATH 223 or STAT 445 or consent of instructor. Cross-listed as STAT 446.

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. Prereq: EPBI 490, EPBI 491 and a microbiology course or consent of instructor. Cross-listed as INTH 484 and MPH 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. Cross-listed as MPH 488.

EPBI 489. Perspectives in Women’s Health (3)
This course provides an overview of basic issues in women’s health over the lifespan. The course is organized by substantive themes, dealing with various
aspects of women's health and health care. Issues are
approached from a public health, rather than bio-
medical, perspective and draw from multiple dis-
ciplines. To the extent possible, discussion will ad-
dress women's health in a national and international
context. Cross-listed as MPH 498.

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
epidemiology, and epidemiologic inference. Classi-
cification, morbidity and mortality rates, sampling,
screening, epidemiologic models, field trials, con-
trolled epidemiologic surveys, sources of bias, and
causal models. Prereq: STAT 201 or STAT 207 or
STAT 312 or equivalent. Cross-listed as MPH 490.

EPBI 491. Epidemiology: Case-Control Study
Design and Analysis (3)
This course builds upon EPBI 490 with a compre-
sensive study of the concepts, principles, and methods
of epidemiologic research. The course content specif-
cally focuses on the case-control study design and
provides a framework for the design, analysis, and
interpretation of case-control studies. Rigor-
ous problem-centered training includes exposure
measurement, subject selection, validity, reliabil-
ity, sample size and power, effect modification,
confounding, bias, risk assessment, matching, and
logistic regression. Individual and group data proj-
ects will be analyzed using SAS statistical software.
Prereq: EPBI 431, EPBI 490, MPH 431, MPH 490.
Cross-listed as MPH 491.

EPBI 492. Epidemiology: Cohort Study De-
sign 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 un-
derlying cohort studies, planning and conducting a
cohort study, basic concepts of time, exposure and
outcome, and methods in the analysis of longitudi-
dinally collected data. Analytic methods covered in
the class include, but are not limited to: analysis of
duration and death rates, analysis of repeated mea-
sures, and analysis of time-to-event data. Students will have the oppor-
tunity to conduct analysis of data obtained from an
actual cohort study using a statistical package of
their choice. Prereq: EPBI 431 and EPBI 490.
Cross-listed as MPH 492.

EPBI 493. Chronic Disease Epidemiology (3)
This course is intended for graduate students in epi-
demiology 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 infer-
ence; 2) major chronic diseases in the U.S. popula-
tions and prevention; and 3) cancer screening. For
each specific disease of interest, the lecture is struc-
tured according to 4 major components: 1) basic
epidemiology; 2) risk factors and etiology; 3) pre-
vvention (and screening); and 4) controversies and future research. Prereq: MPH/EPBI 490. Cross-
listed as MPH 493.

EPBI 494. Infectious Disease Epidemiology
(1-3)
The epidemiology, prevention and control of rep-
resentative infectious disease models. Emphasis
on the triad of agent, host, and environment and the
molecular and genetic basis of agent and host interac-
tion in the population. Prereq: EPBI 490,
EPBI 491, and a microbiology course or consent of
instructor. Cross-listed as INTH 494 and MPH 494.

EPBI 495. Psychiatric Epidemiology (3)
This course provides an overview of various topics
in the area of psychiatric epidemiology. These in-
clude a history of psychiatry as it is relevant to psy-
chiatric epidemiology, methodological issues critical
to research in this area, the social, ethical, and legal
context of research in this area, and the epidemiol-
ogy of various psychiatric disorders. Cross-listed as
MPH 495.

EPBI 499. Independent Study (1-18)
Cross-listed as MPH 499.

EPBI 501. Graduate Seminar (0)
Students and faculty have the opportunity to meet
on a weekly basis to discuss papers in the literature.
Each week a paper is reviewed in detail by a gradu-
ate student in a formal presentation. Discussion of
the strengths and weaknesses of the work gives in-
sight into the complexities of investigations in the
Public Health arena. Cross-listed as MPH 501.

EPBI 502. Seminar in Genetic Epidemiology
(0)
Presentation of original research or recent journal
publications by faculty and students.

EPBI 503. Seminar in Biostatistics (0)
Presentation of original research or recent journal
publications by faculty and students in the area of
Biostatistics.

EPBI 507. Environmental Epidemiology (2)

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 re-
search. This is not a public health law class. Issue
papers are assigned on a weekly basis. Each issue
tent may require that the student draft a pro-
posed rule, a portion of legislation, or a document
such as an informed consent form. Other exercises
classified as an informed consent form. Other exercises
may require that the student analyze the situation
depicted and apply the principles learned. Some is-
A short, intensive courses on current research topics,
statistical analyses, methodological issues or inter-
vention approaches related to epidemiology, partic-
ularly infectious disease, chronic disease, behavioral
and social epidemiology. Course hours and require-
ments 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)
Prereq: Departmental prospectus form.

EPBI 701. Dissertation Ph.D. (1-18)

EPBI 703. Dissertation Fellowship (1-8)

DEPARTMENT OF
FAMILY MEDICINE
The Department of Family Medicine offers a
master's degree in family medicine. The pro-
gram includes basic training in biostatistics, epidemiology and research methods, with a
specific emphasis on the family. The depart-
ment is a national leader in primary care re-
FAMILY MEDICINE (FAMD)

Graduate Courses

FAMD 431. Applied Statistics in Medical Education (3)
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. Cross-listed as MPHP 502.

FAMD 601. Independent Study (1-18)
FAMD 651. Thesis M.S. (1-18)

DIVISION FOR ADOLESCENT HEALTH

2027 Cornell Road
Phone (216) 368-3770
http://www.case.edu/med/adolescent-health/blah.html
Barbara A. Cromer, M.D., Director and Frederick C. Robbins, M.D., Professor of Child and Adolescent Health

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 professionals 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 county wide 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.

ADOLESCENT HEALTH (ADHT)

ADHT 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. Cross-listed as MPHP 485.

ADHT 486. Adolescent Health Care Policies (3)
The focus of the course is a critical analysis of health care policies that impact the public health care needs of adolescent populations. Legal and ethical implications will be discussed. Cross-listed as MPHP 486.

ADHT 487. Launch Program: Reaching Goals in Research and Community Projects (3)
This course will provide students opportunities to study in both didactic and applied methods and steps needed to launch a program in adolescent health in a community setting. Such concepts as needs assessment, literature searches, grants (private foundation/federal), internal review boards, budgeting, and evaluations will be considered. Cross-listed as MPHP 487.

ADHT 499. Independent Study in Adolescents (1-12)
This course will provide the student interested in adolescent health with the opportunity to work independently and in depth in an area pertaining to adolescents in a community or other institutional setting. The designation ADHT 499 will be used for field placements, internships, or capstone experiences. Prereq: Consent of instructor.

DIVISION OF GENERAL MEDICAL SCIENCES

The Division of General Medical Sciences at the School of Medicine was established in 1986 to provide an organizational unit with interdisciplinary research and education objectives. Special centers—with individual directors and missions—currently based in the division include the Case Comprehensive Cancer Center, the Center for Adolescent Health, the Center for Bio-architectonics, the Center for Global Health and Diseases, the Center for Psychoanalytic Child Development, the Center for RNA Molecular Biology, and the Center for Science, Health, and Society.

Case Comprehensive Cancer Center
Phone (216) 844-8797
http://cancer.case.edu
Stanton L. Gerson, M.D., Asa and Patricia Shiverick Professor of Hematological Oncology and Director of the Center

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
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 Advancement of Medical Learning**

Director, to be announced

For more information, contact Daniel Anker
dxa2@case.edu

**CENTRE FOR BIO-ARCHITECTONICS**

Room BRB B-17, School of Medicine

Phone (216) 368-2390

Raymond J. Lasek, Ph.D. (Anatomy), Professor and Director of Center

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

Phone (216) 368-6321

James W. Kazura, M.D., Professor of International Health, Medicine, and Pathology, Director of Center

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, and the northern Ohio community, and the northern Ohio community.
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 website. For a list of services and to explore opportunities to collaborate, please visit the website: 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 of the Center

The Center for Psychoanalytic Child Development was created in the Case School of Medicine in 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; consultation 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-113, School of Medicine
Phone (216) 368-1606
http://www.maresearch.org
Timothy W. Nilsen, Ph.D.,
Professor and Director of Center

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.

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 scientist 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 Health Care Research And Policy

Rammelkamp Research and Education Building, second floor, MetroHealth Medical Center
Phone: (216) 778-3902
Fax: (216) 778-3945
Website: 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.

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), HB1 (hemangioblast (AC133) from umbilical cord blood), MSC (mesenchymal stem cells), MAPC (multi-potent 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
Website: 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 properties 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 (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
For more information please visit 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 fledgling 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 noted 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 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
For more information please see: 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 emphasis 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 interdepartmental 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 website) 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 website). 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 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.

DEPARTMENT OF GENETICS (GENE)

GENE 451. Principles of Genetic Epidemiology (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. Prereq: EPBI 431 and EPBI 490 or consent of instructor. Cross-listed as EPBI 451.

GENE 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/cytoplasmic transport, mitochondrial import and biogenesis, chromosome segregation, cytokinesis, mating response and signal transduction. Cross-listed as MBIO 488.

GENE 500. Advanced Eukaryotic Genetics I (3)
Fundamental principles of modern genetics: transmission, recombination, structure and function of the genetic material in eukaryotes, dosage compensation, behavior and consequences of chromosomal abnormalities, mapping and isolation of mutations, gene complementation and genetic interactions. Prereq: BIOL 362.

GENE 503. Readings and Discussions in Genetics (0-3)
(Credit as arranged.) In-depth consideration of special selected topics through critical evaluation of classic and current literature.

GENE 504. Advanced Eukaryotic Genetics II (3)
Fundamental principles of modern genetics: population and quantitative genetics, dissection of genome organization and function, transgenics, developmental genetics, genetic strategies for dissecting complex pathways in organisms ranging from Drosophila and C. elegans to mouse and human. Prereq: GENE 500 or permission of instructor.

GENE 508. Bioinformatics and Computational Genomics (3)
The 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. Prereq: GENE 500 and GENE 504 or permission of instructor.

GENE 509. Complex Genetic Traits (3)
A combination of lecture, readings-based, and discussions that survey the origins of variation and disease and the genetic and phenotypic analysis of complex traits. The course emphasizes the sources of variation, genetic and phenotypic analysis of complex traits, and gene families and physiological pathways. Prereq: GENE 500 and GENE 504 or permission of instructor.

GENE 511. Critical Analysis of the Scientific Literature (3)
Presentation and discussion of any aspect of human genetics but emphasizing recent molecular insights into defects in humans. Both classical and recent papers are analyzed and critiqued.

GENE 512. Structural Analysis of Complex Genomes (3)
Lectures, readings and discussion course surveying the status of mapping and sequencing the human genome and those of model organisms. Prereq: GENE 500 and GENE 504.

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. Prereq: GENE 500 and GENE 504.
GENE 515. Nuclear Organization (3)
An advanced literature-based course examining specific topics relating to the structure and function of eukaryotic nuclei. Topics will vary from year to year. Examples include: chromosome and chromatin organization; centromeres and telomeres; nuclear bodies; RNA transport; ribonucleoprotein biogenesis; heterochromatin and position effect variegation; and connections to diseases will be emphasized, a long with genetic approaches for their study. Prereq: 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. Prereq: Consent of instructor.

GENE 519. The Genetics of Emerging Infectious Diseases (3)
This course will survey the genetics, transmission and life cycle of emerging infectious agents. Lecturers will include local and visiting scientists internationally recognized as experts in infectious disease research. Prereq: Consent of instructor.

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. Cross-listed as BIOL 521.

GENE 523. Embryonic Patterning in Development (3)
This course will focus on current understanding of patterning mechanisms in animal development. The seminal contributions of Turning, Stern, 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. Prereq: Permission of instructor.

GENE 524. Advanced Medical Genetics: Cyogenetics (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. Prereq: Consent of instructor.

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 diagnostis, etiology, genetics, prognosis and management. Prereq: Consent of instructor.

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, Bayes theorem; linkage analysis and disequilibrium; risk assessment ad consanguinity. Prereq: Consent of instructor.

GENE 527. Advanced Medical Genetics: Biochemical Genetics (2-3)
Fundamental principles of metabolic testing: amino acid disorders; organic acid disorders; carbohydrate 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. Prereq: Consent of instructor.

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. Prereq: Consent of instructor.

GENE 529. Psychosocial Issues in Genetic Counseling (3)
Fundamental principles regarding the psychosocial aspects of genetic disease and birth defects, its psychological 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. Prereq: Consent of instructor.

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. Prereq: Consent of instructor.

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. Prereq: Admission to Genetic Counseling Training Program.

GENE 533. Genetics of Aging (3)
This course will focus on our current understanding of the genetic mechanisms underlying cellular and organismal aging as well as age-related diseases. Theories of aging will be covered as well as the most recent experimental analysis in a variety of systems (yeast, worms, flies, mice, and humans). While aging research has long been primarily descriptive in nature, the most recent genetic-based experiments are providing the first insights into the molecular pathways involved with striking similarities across model systems. Prereq: GENE 500, GENE 504, or consent of instructor.

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. Prereq: CBIO 453 and CBIO 455. Cross-listed as NEUR 534.

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.)

GENE 703. Dissertation Fellowship (1-8)

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

INTEGRATED BIOLOGICAL SCIENCES (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). Prereq: First three semesters of medical school. Coreq: Currently a medical student in good standing.

IBIS 425. 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. Prereq: First three semesters of medical school. Coreq: Currently a medical student in good standing.

IBIS 443. 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 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. Prereq: First three semesters of medical school. Coreq: 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)

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 antimicrobial 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 not only 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 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. With the completion of the genome 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 micro-organisms will be the key to our long-term success.

MOLECULAR BIOLOGY
AND MICROBIOLOGY (MBIO)
Undergraduate Course

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/ aspartate phosphorylation and regulation of cellular physiological events will be reviewed. Then eukaryotic 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. Prereq: CBIO 453 and CBIO 455. Cross-listed as MVIR 522.

MBIO 524. Trends in Prokaryotic Cell and Developmental Biology (3)
Did you know that (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 (v) that 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. Aequorea victoria is a tiny jellyfish that likes to turn blue light into green, and in doing so has inspired arguably the greatest renaissance 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: MBIO 453 and MBIO 455.

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 or 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 coactivators 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. Prereq: CBIO 453 and CBIO 455. Cross-listed as BIOC 620.

MBIO 651. Thesis M.S. (1-18)
MBIO 701. Dissertation Ph.D. (1-18)
MBIO 703. Dissertation Fellowship (1-8)

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 complete 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 topic 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.
The First Year
Course work

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 PhD 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 Adviser

After the second semester of the first year students select an adviser for the dissertation research. The emphasis of the Ph.D. work is on research, culminating in the completion of an original, independent research thesis.

MOLECULAR MEDICINE

PHD PROGRAM

Graduate Courses

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. Prereq: Permit required - issued by MMED graduate program coordinator.

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. Prereq: Consent of department.

MMED 410. Introduction to Human Physiology and Disease (4)
The purpose of this course is to give an introduction to the physiology and histology 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 clinicians 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 clinical laboratories and medical terminology. Prereq: MMED graduate program coordinator.

MMED 411. Proteins, Membranes, and Bioenergetics (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 metabolism; hormones; protein metabolism; muscle protein metabolism; and turnover; biological membranes and transport through membranes; and bioenergetics. Prereq: Permit required - issued by MMED graduate program coordinator.

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. Prereq: Permit required - issued by MMED graduate program coordinator.

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. Prereq: Permit required - issued by MMED graduate program coordinator.

MMED 414. Mammalian Genetics (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: human genome and genetic variation; linkage and association studies; complex diseases; pharmacogenetics and whole genome expression studies; and mouse models of disease, treatments for genetic diseases, legal and ethical issues. Prereq: Permit required - issued by MMED graduate program coordinator.

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/endoceytosis/rafts; the nucleus; cell communication; and mechanics of cell division. Prereq: Permit required - issued by MMED graduate program coordinator.

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...
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 etiological 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 Web site at http://www.cwrui.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)

Graduate Courses

MVIR 420. Molecular Genetics of Cancer (3)
Using a combination of lectures and student presentations, this course provides an in-depth analysis of cancer as a genetic disease in the Mendelian sense of inheritance and in the sense of causation by somatic mutation. The objectives of the course are to examine both proto-oncogenes and tumor suppressor genes that are the targets of oncogenic mutations and the mechanisms of mutational change. Discussions emphasize experimental approaches used to identify and study oncogenes and tumor suppressor genes. This course also covers viral mechanisms of oncogenesis which involve interactions between viral proteins and the products of cellular proto-oncogenes or tumor suppressor genes. Prereq: CBIO 453, CBIO 454, CBIO 455, and CBIO 456. Cross-listed as BIOC 420 and MBIO 420.

MVIR 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). Cross-listed as MBIO 434 and PHRM 434.

MVIR 435. Seminar in Molecular Biology and Microbiology (1)
(See MBIO 435.) Cross-listed as MBIO 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. Prereq: CBIO 453, CBIO 454, CBIO 455, and CBIO 456. Cross-listed as MBIO 445.

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 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. Prereq: MVIR 445/MBIO 445 recommended. Cross-listed as MBIO 446.

MVIR 481. Immunology of Infectious Diseases (3)
(See PATH 481.) Prereq: Introductory immunology course or consent of instructor. Cross-listed as PATH 481.

MVIR 521. HIV and AIDS: Research and Care (3)
(See MBIO 521.) Cross-listed as MBIO 521.

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. Medical students are encouraged to pursue research projects with neurosciences 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.
NEUROSCIENCES (NEUR)

Graduate Courses

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. Prereq: CBIO 453. Cross-listed as BIOL 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. Prereq: 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. Prereq: Consent of instructor.

NEUR 411. Neurobiology of Disease (1)
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 presentations, 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 myasthenia gravis, dementia (including Alzheimer's disease), multiple sclerosis, Duchenne's muscular dystrophy, poliomyelitis, seizures and strokes. Prereq: NEUR 405 or NEUR 406.

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)
(See PATH 425.) Cross-listed as 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. Cross-listed as BIOL 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. Cross-listed as 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. Prereq: NEUR 402 or consent of department.

NEUR 440. Synaptic Transmission (3)
This course will explore the basic mechanisms of synaptic transmission that operate at central and peripheral synapses. Students will read and present a mixture of historical and modern papers that established the fundamental principles of synaptic transmission and plasticity. The course will begin with a brief review of cellular neurophysiology and the techniques used to study synaptic potentials. We will then read classic papers by Katz and colleagues that defined the mechanisms controlling transmitter release at the neuromuscular junction. Next we will consider the role of calcium in regulating the release of neurotransmitters and in short-term modulation of synaptic potentials. We will then explore pre- and post-synaptic processes such as receptor saturation and vesicle dynamics that govern the amplitude and time course of post-synaptic potentials. Quantal analysis and silent synapses will be discussed in the context of the present-day controversies regarding long-term potentiation at central synapses. We will also consider the relationship between short- and long-term synaptic plasticity and behavioral functions such as learning and memory. Occasional faculty lectures will complement student presentations on primary research articles. Student grades will be based on two short (5 page) essays and class participation. Prereq: Permission of the course director.

NEUR 473. Introduction to Neurobiology (3)
(See BIOL 473.) Cross-listed as BIOL 473.

NEUR 474. Neurobiology of Behavior (3)
(See BIOL 374.) Cross-listed as BIOL 474.

NEUR 476. Neurobiology Laboratory (3)
(See BIOL 476.) Cross-listed as BIOL 476.

DEPARTMENT OF NUTRITION
School of Medicine, Room WG 48
Phone (216) 368-2440
Fax (216) 368-6644
http://www.case.edu/med/anutrition/home.html
Henri Brunengraber, M.D., Ph.D., chair
Edith Lerner, Ph.D., vice chair

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.

UNDERGRADUATE PROGRAMS
Please see the College of Arts and Sciences section in this publication.

GRADUATE PROGRAMS (NTRN)

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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: Nutrition major and graduate standing 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. Prereq: NTRN 365 or equivalent.

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. Prereq: 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. Prereq: NTRN 435 or consent.

NTRN 451. Food Service Systems Management (3)
Application of organizational theory and skills in the preparation and service of quantity food. Laboratory experiences in professional food service are included. Students will analyze one aspect of food service management in depth. Prereq: Nutrition Major or consent.

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. Prereq: BIOC 307 or equivalent. Cross-listed as BIOC 452.

NTRN 454. Isotope Tracer 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. Prereq: 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. Prereq: 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. Prereq: NTRN 365 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. Prereq: 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. Prereq: 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. Prereq: 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. Prereq: Statistics and Public Health Nutrition students only.

NTRN 530. Public Health Nutrition (3)
Analysis of public health programs in government and voluntary 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. Prereq: Consent of instructor.

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. Prereq: 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. Prereq: 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. Prereq: NTRN 435 or consent.

NTRN 534. Advanced Public Health Nutrition Field Experience (1)
Individually planned advanced public health experience. Prereq: 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 (2-3)
NTRN 561. Investigative Methods in Nutrition (1-4)
Research methods appropriate for nutrition. Methods for conducting research in nutrition and food sciences, food service management and dietetics. Designing research proposals. Prereq: Nutrition major or consent of instructor.

NTRN 560. Special Problems (1-18)
NTRN 651. Thesis M.S. (1-18)
NTRN 701. Dissertation Ph.D. (1-18)
NTRN 703. Dissertation Fellowship (1-8)

Master of Science Degree in Nutrition
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 Degree in Public Health Nutrition/Internship**
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 adviser 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 Degree in Nutrition**
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.

**DEPARTMENT OF PATHOLOGY**
Case Western Reserve University
School of Medicine
Department of Pathology
10900 Euclid Avenue
Cleveland, OH 44106-7288
216-368-3611
http://www.case.edu/med/pathology/

The clinical, research, and educational activities of the Case Department of Pathology are located in several primary locations. Four are situated in University Circle, the cultural center of Northeast Ohio, located minutes from the heart of downtown Cleveland. These four include the Basic Science component of the department at Case School of Medicine, the Clinical Services component of the department at University Hospitals of Cleveland, the Cuyahoga County Coroner’s Office, and the Veteran’s Administration Hospital. Research laboratories of the department are located in the Wolstein Research Building (completed in 2003), and in the Institute of Pathology. Both are situated adjacent to University Hospitals of Cleveland, the primary teaching hospital of the Case School of Medicine and the location of the department’s Pathology Residency Program. Affiliations with educational and research relevance include the Pathology Department at MetroHealth Medical Center in downtown Cleveland. Also close by are several outstanding libraries, including the Health Science Library, the Allen Memorial Medical Library, the Kelvin Smith Library, and the department’s own library. World class research is conducted in the department in biomaterials biocompatibility, cancer biology, immunology, neurobiology, outcomes research, and tissue injury and healing. The department’s research activities are characterized by highly cooperative and collaborative interactions within the department, and the Case community. In 2005, the department’s annual NIH research support totaled $10,783,617, placing the Department of Pathology twentieth nationally, amongst ninety-five medical school pathology departments. For information about graduate programs, please see http://www.case.edu/med/pathology/grad_prog/gradprogmenu.htm.

**GRADUATE COURSES (PATH)**

**PATH 390. Undergraduate Research in Cancer Biology, Immunology, or Pathology (1-3)**
Students undertake a research project directly related to ongoing research in the investigator’s instructor’s laboratory. Written proposal outlining research topic, a schedule of meetings and format and length of final written report to be prepared prior to registration for credit. Prereq: Consent of instructor.

**PATH 395. Selected Readings in Immunology, Cancer Biology, or Pathology (1-3)**
Relevant readings and literature search on particular immunology, cancer biology or pathology topics chosen by the student and directed by the instructor. Written proposal outlining chosen topic, type of work to be done, a schedule of meetings and format and length of final written report to be prepared prior to registration for credit. Prereq: Consent of instructor.

**PATH 410. Aging and the Nervous System (1)**
Lectures and discussion on aspects of neurobiology of aging in model systems; current research on Alzheimer’s, Parkinson’s, and Huntington’s diseases. Prereq: Consent of instructor.

**PATH 412. Theories of Aging and Longevity (1)**
Insight into current theories of aging of molecules, cells, extracellular elements and their relationship to lifespan in human beings and other vertebrates. Lecture/journal club format. Prereq: Consent of instructor.

**PATH 415. Cytoskeleton and Disease (1)**
Discussion of recent papers that have added to knowledge of normal cytoskeletal functions and their alterations in disease. Prereq: Consent of instructor.

**PATH 416. Fundamental Immunology (3)**
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 and basic molecular biology of B and T lymphocytes. Lectures emphasize experimental findings leading to the concepts of modern immunology. Prereq: BIOL 210 or BIOL...
215, graduate standing and consent of instructor. Cross-listed as BIOL 416 and CLBY 416.

PATH 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 includes regulatory and inflammatory cytokines, colony stimulating factors, chemokines, cytokine and cytokine receptor gene families, intracellular signaling through STAT proteins and tyrosine phosphorylation, clinical potential, and genetic defects. Lecture format using texts, scientific reviews and research articles. Prereq: PATH 416 or equivalent. Cross-listed as BIOL 417 and CLBY 417.

PATH 418. Tumor Immunology (2)
Interactions between the immune system and tumor cells. Topics include the historical definition of tumor specific transplantation antigens, immune responses against tumor cells, the effects of tumor cell products on host immune responses, molecular identification of tumor specific transplantation antigens and recent advances in the immunotherapy of human cancers. Prereq: PATH 416.

PATH 419. Reproductive Immunology (3)
This will be a lecture and literature-based course that will include classic and recent publications. The course will cover subjects related to the cellular and molecular biology of fertilization and development of the placenta and fetus in humans and how this process is affected by the maternal immune system. Specific areas of discussion will include mechanisms by which the antigenically foreign placenta and fetus create an apparent state of maternal immune tolerance, the physiologic role of endogenous retroviruses in trophoblast differentiation, the participation of maternal and placental cytokines in pregnancy, the effects of maternal alloimmunization and autoimmunity on differentiation of the trophoblast and development of the placenta/fetus, the development and effects of fetal lymphocyte microchimerism in maternal tissues, and a variety of current controversies in Reproductive Immunology. Prereq: PATH 416 or equivalent, or permission of the instructor.

PATH 420. The Rhetoric of Science (3)
In this course, we shall analyze both written and oral communication of scientific results in order to understand the principles of effective exposition. The students will be expected to attend selected seminars and to participate in writing and speaking exercises. The goal of the course is to improve the written and oral communication skills of the students. Instructor approval is required for registration. Prereq: Completion of the first year of the Biomedical Scientist Training Program. Coreq: Instructor approval.

PATH 421. Electron Microscopy in Medicine (3)
The goal of this course is to implement of modern electron microscopic techniques for biology and medicine. This course will include the tissue processing, immunocytocytochemistry, theoretical aspects and instrumentation, tissue preparation, sectioning and staining of grids, specialized techniques such as electron microscopic in situ hybridization by using colloidal gold decoration, application of EM for diagnostic purposes, pre- and post-embedding EM immunocytochemistry, image analysis and EM qualitative and quantitative autoradiography. Cross-listed as ANAT 421.

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. Cross-listed as NEUR 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 these in class. Prereq: Consent of instructor.

PATH 432. Biomedical 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. Cross-listed as NEUR 432 and PFRM 432.

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. Students read assigned primary literature and present and discuss these in class. Prereq: Consent of instructors.

PATH 465. Advanced Immunobiology (3)
Advanced immunology topics course covering the most important and recent advancements in specific areas of immunobiology. Course organization includes lectures by the faculty to give an overview of each topic emphasizing the recent advancements in that area, followed by student presentations of important papers and discussion on related topics. Course also includes participation in an immunology journal club (literature review/discussion session). Prereq: PATH 416.

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. Prereq: PATH 416 or consent of instructor.

PATH 480. Immunology, Evolution, and Logic (3)
Review and discussion of current research papers and selected sections of scientific books to explore connections between immunological recognition, evolution and logic. Emphasis placed on student analysis of scientific concepts, interpretation of data and synthesis of ideas. Prereq: PATH 416 or PATH 510 or consent of instructor.

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. Prereq: PATH 416 or consent of instructor. Cross-listed as MVIR 481.

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. Prereq: CBIO 453 and CBIO 454 and CBIO 455 and CBIO 456 or consent of instructor. Cross-listed as CLBY 487.

PATH 488. Yeast Genetics and Cell Biology (3)
(See MBIO 488) Prereq: CBIO 453 and CBIO 454 and CBIO 455 and CBIO 456. Cross-listed as MBIO 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. Prereq: Consent of instructor.
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)  
(See PHRM 520.) Cross-listed as PHRM 520.

PATH 521. Special Topics in Cancer Biology and  
Clinical Oncology (1)  
(See PHRM 521.) Cross-listed as 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). Prereq: ANAT 412 or permission of instructor. Cross-listed as ANAT 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. Prereq: CBIO 453, CBIO 454, CBIO 455, and CBIO 456. Cross-listed as CLBY 525.

PATH 527. Mechanisms of Cell Growth  
Control (3)  
In-depth study of examples of cellular growth control involving hormonal, metabolic, transcriptional and post-translational mechanisms in higher eukaryotes using current scientific reviews and research articles. During each class period, students summarize research articles orally and lead discussions of the scientific points raised in the papers, with facilitation by the instructor. Emphasis placed not only on the scientific content of the papers, but also on developing skills of interpretation of published work and oral presentation. Attendance at research seminars relevant to the topic also required. Prereq: CBIO 453 and CBIO 454 and CBIO 455 and CBIO 456 and consent of instructor.

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 roles novel mechanisms such as regulated proteolysis, ubiquitin proterosomal 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. Prereq: CBIO 453. Cross-listed as BIOC 555 and CLBY 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. Prereq: Consent of Chair of Graduate Committee.

PATH 651. Thesis M.S. (1-18)

PATH 701. Dissertation Ph.D. (1-18)

PATH 703. Dissertation Fellowship (1-8)

DEPARTMENT OF  
PHARMACOLOGY

Room W-357, School of Medicine  
Phone (216) 368-4617  
http://pharmacology.case.edu/

GRADUATE PROGRAMS (PHRM)

PHRM 301. Undergraduate Research (1-18)

PHRM 340. 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 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.

PHRM 400. Research Experience in Pharmacology (0)  
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 Fall Semester (September through mid-October).

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-October to December.

PHRM 430. Advanced Methods in Structural  
Biology I (3)  
(See BIOC 430.) Cross-listed as BIOC 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 the 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. Cross-listed as NEUR 432 and PATH 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: resistance. This course will focus on and compare the 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). Cross-listed as MBIO 434 and MVIR 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, as 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. Cross-listed as BETH 440 and HSTY 440.

PHRM 475. Protein Biophysics (3)
(See PHOL 475). Cross-listed as PHOL 475.

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 (0-1)
Current topics of interest in the pharmacologist sciences.

PHRM 515. Endocrine Pharmacology (3)
Seminar lecture course on regulation at the molecular level of selected interrelated endocrine systems. Prereq: Consent of instructor. Cross-listed as BIOC 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 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. Prereq: CBIO 453, CBIO 455. Cross-listed as PATH 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. Prereq: CBIO 453, CBIO 455. Coreq: PHRM 520 or PATH 520. Cross-listed as PATH 521.

PHRM 523. Advanced NMR Spectroscopy in Structural Biology (3)
(See PHOL 523.) Cross-listed as PHOL 523.

PHRM 525. Topics in Cell and Molecular Pharmacology (3)
Individual library 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. Prereq: Consent of instructor.

PHRM 526. Special Topics in Drug Discovery (3)
This semester long course will survey the discovery and clinical application of both established and new drugs entering the pipeline. A series of lecturers (both basic scientist and clinicians) will address scientific and marketplace trends with implications for research planning in drug discovery. In this course, students will develop their own project for a discovery opportunity and present their plan to participants in the class. Topics will include 1) the use of genomic and proteomic methods to rationally identify targets, 2) screening methodologies and high-throughput assays, 3) mechanism-based drug design, 4) structure-based drug design, 5) in vitro and in vivo testing, and 6) issues commonly encountered during the early stage of drug development and target validation. The course will take the form of lectures, student presentations and discussions. In addition, students will write a proposal based on a drug-discovery project and orally defend this proposal to class participants.

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. Prereq: 1st year Pharm Graduate required courses.

PHRM 601. Independent Study and Research (1-18)

PHRM 651. Thesis M.S. (1-18)

PHRM 701. Dissertation Ph.D. (1-18)

PHRM 703. Dissertation Fellowship (1-8)

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/neuropsycharmacology, 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 entry in this publication), each of which provides an introduction to many re-
lated 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 adviser 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 adjacent Wood Research Tower. Facilities include extensive chromatographic and tissue culture facilities, a transgenic mouse laboratory, imaging and confocal microscopy equipment, and ready access to specialized research techniques, including various aspects of recombinant DNA and hybridoma technology, in situ hybridization histochemistry, fluorescence cell sorting, NMR and mass spectroscopy, and X-ray crystallography.

**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.

**DEPARTMENT OF PHYSIOLOGY AND BIOPHYSICS**

Room E-541, School of Medicine
Phone (216) 368-5529
http://physiology.case.edu/

**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 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 GPA and a maximum 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 adviser 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 thesis dissertation, and completion and acceptance of two first authored manuscripts in an excellent 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 final 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 levels 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 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 (3)
- PHOL 498-01 Physiology and Biophysics Departmental Seminar (1)
- PHOL 505-01 Laboratory Research Rotation (3)
- Elective (3)

First Year Spring
- PHOL 475 Cell Biophysics (3)
- PHOL 476 Protein Biophysics (3)
- PHOL 498-02 Physiology and Biophysics Departmental Seminar (1)
- PHOL 500 Translational Cell Physiology (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)
- IBMS 500 Translational Cell Physiology (0)
- IBMS 500 Ethics and Biomedical Research (0)
- 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 499. Biophysics/Biomedical Engineering Seminar (1)
Weekly one-hour reviews by faculty or invited speakers of their research. Students present literature reviews or summaries of their research.

PHOL 500. Translational Cell Physiology (1)
Weekly one-hour journal article/discussion course designed to provide students with knowledge regarding the links between basic and clinical sciences, translation of laboratory-based studies to clinical application, and the disease-relevancy of basic investigation. (once weekly; 1 hr/class) Prereq: Permission of instructor required.

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. Prereq: Consent of instructor and scheduled laboratory.

PHOL 514 Advanced Cardiovascular Physiology (3)
- PHOL 519 Advanced Respiratory Physiology (3)
- PHOL 498-02 Physiology and Biophysics Departmental 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 Departmental 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 (3)
- PHOL 498-02 Physiology and Biophysics Departmental Seminar (1)
- IBMS 500 Ethics and Biomedical Research (0)
- PHOL 505 Laboratory Research Rotation (3)

Elective (3)

PHYSIOLOGY (PHOL)

PHOL 499. Biophysics/Biomedical Engineering Seminar (1)
Weekly one-hour reviews by faculty or invited speakers of their research. Students present literature reviews or summaries of their research.

PHOL 500. Translational Cell Physiology (1)
Weekly one-hour journal article/discussion course designed to provide students with knowledge regarding the links between basic and clinical sciences, translation of laboratory-based studies to clinical application, and the disease-relevancy of basic investigation. (once weekly; 1 hr/class) Prereq: Permission of instructor required.

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. Prereq: Consent of instructor and scheduled laboratory.
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 517. Optical Microscopy and Imaging for Biologists (2)
(See ANAT 517.) Cross-listed as ANAT 517.

PHOL 519. Cardiorespiratory 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. Prereq: Permission of instructor.

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 523. Advanced NMR Spectroscopy in Structural Biology (3)
An advanced course on NMR spectroscopy designed for advanced students interested in structural biology. Prereq: PHOL 430 or BIOC 312/412 or consent of instructor. Cross-listed as BIOC 523, CHEM 523, and PHRM 523.

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. Prereq: CBIO 453 and CBIO 454.

PHOL 531. Transcription Factor Regulation of Gene Expression (2)
A reading and presentation course designed to expand knowledge of the mechanisms that regulate transcription factor activity and the mechanisms whereby transcription factors regulate gene expression. The major transcription factor classes are covered (i.e., AP1, Spl, NFkappaB, POU domain, etc). Students are required to summarize a group of manuscripts that focus on a particular transcription factor-associated signaling process and coherently present this information in class.

PHOL 532. Microscopy - Principles and Application (1)
This course provides the student with both didactic lectures and hands-on experience in the design, construction, and application of numerous types of optical microscopy. Starting with basic optical theory, the course advances through transmitted, fluorescence, confocal, and finally, multiphoton microscopy, and provides the foundation for advanced optical microscopy applications and training. Subjects addressed will include: sample selection and preparation; microscope specifications, selection, and set-up; design and layout of microscopy spaces; function and use; imaging and photomicrography; techniques and limitations; documentation and analysis; and introduction to specialized applications. Prereq: Consent of instructor.

PHOL 601. Research (1-18)
Cellular physiology laboratory research activities that are based on faculty and student interests.

PHOL 651. Thesis M.S. (1-18)

PHOL 701. Dissertation Ph.D. (1-18)

PHOL 703. Dissertation Fellowship (1-8)
FRANCES PAYNE BOLTON SCHOOL OF NURSING

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 woman congressman 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 top ten schools in US News and World Report and in funding from the National Institutes of Health. Graduate level specialty majors also are in the top five. The Bolton school is noted for its innovation, leadership and excellence in education, research and practice. To support this mission, the school has eleven 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 and is the only 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 Frances Payne Bolton School of Nursing is 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. The purpose of the school 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.

Philosophy
To accomplish the stated mission, the School of Nursing has set forth the following philosophy:
Nursing practice includes assisting 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, historical 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. Their 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.

Health
• Health is a dynamic, ever-changing state.
• Health is influenced by an individual’s heredity, environment, and lifestyle.
• Individuals may manifest simultaneously states of health and illness.
• Individuals differ in the ways they value and define health.
• Individuals have the potential to grow as a result of an experience with illness.
• Health Care
• Health care encompasses all activities necessary to promote optimal physiologic, 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.

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.

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.

• The goals of the Hirsh Institute are to en-
hance nursing practice and health care delivery by:
• Building a repository of best nursing practices based on research findings.
• Disseminating current scientific evidence on best nursing practices to practicing nurses, educators, administrators, health care facilities, insurers, and policy makers.
• Guiding nursing research by identifying areas where scientific evidence is lacking.
• Conducting a certificate program in implementing best nursing practices based on evidence.
• Focusing attention on nursing excellence through its State of the Evidence Reviews with recommendations for practice.

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 twelve 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
Bachelor of Science in Nursing and Master of Science in Nursing programs are accredited by the National League for Nursing Accreditation Council.

National League for Nursing Accreditation Council
61 Broadway-33rd Floor
New York, NY 10006
212-363-5555 Ext. 153
www.accrediting-comm-nlnac.org

The Council on Accreditation of Nurse Anesthesia Programs accredits the nurse anesthesia program.

American Association of Nurse Anesthetists
222 South Prospect Avenue
Park Ridge, Illinois 60068-4001
(847) 692-7050
info@aana.com

The nurse midwifery program is accredited by the American College of Nurse Midwives.

American College of Nurse-Midwives
Division of Accreditation
8403 Colesville Road, Ste 1550
Silver Spring, MD 20910-6374
240-485-1800
info@acnm.org

The School of Nursing is approved by the State of Ohio Board of Nursing and is a member of the Council of Baccalaureate and Higher Degree Programs of the National League of Nursing.

Ohio Board of Nursing
17 High Street
Suite 400
Columbus, OH 43215-3413
614-466-3947
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 Commission on Institutions of Higher Education
30 N. LaSalle Street, Suite 2400
Chicago, IL 60602-2504
(800) 621-7440
info@ncacihe.org

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 groups 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 a aggregate of specialized hospitals that includes Alfred and Normal 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, Marymount 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 the 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 accommodate 900 people and provide electrical ports for connecting personal laptop computers. Case'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. 30 miles of compact movable shelving allows the library to keep much of its collection on-site 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 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 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.

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 email, 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 Email and group calendaring
- Delivery of telephone services, 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.

ITS Services

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 email, 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. 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 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
• On-line 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 to be gradually phased in, voice over IP.

Services include:
• On-campus, local and long-distance service
• Highly competitive and student oriented long distance rates and discounts
• Electronic access to account information, billing, and payment services
• Voicemail notification via email and audio access to voicemail via computer
• Caller ID and other optional features
• Sprint cellular service at preferential and discounted university 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 architected and deployed by ITS Television Services.

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 strive 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 to intravenous trainer, which uses virtual reality-based patients to teach intravenous (IV) catheterization. They give student 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 colleagueship 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. PhD 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 colleagueship 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 BSN, MSN, PhD or ND 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 magazine published by the nursing school.

ADMINISTRATION
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Assistant Director, University Center on Aging & Health
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(Case Western Reserve University)
BACHELOR DEGREE 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 renown health care facilities including the University Hospitals of Cleveland, the Cleveland Clinic and the MetroHealth 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 University
- Recommendation from secondary school report/counselor
- Secondary school transcript
- Writing sample
- SAT/ACT scores

Transfer

- Application for undergraduate admission to the 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 BSN 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 that 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 of the University Undergraduate Faculty 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 BSN degree. Upon successful completion of the program, graduates will be eligible to sit for the examination for licensure as a registered nurse (RN). 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 RN in the state for which the examination was written.

The BSN 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 BSN 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 BSN program is located on the next page.

Program Plan for
**Generic Baccalaureate Students**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman Year – Fall Semester Hours</td>
<td></td>
</tr>
<tr>
<td>General Education Requirement</td>
<td>3</td>
</tr>
<tr>
<td>NURS 110 Foundations of the Discipline</td>
<td>1</td>
</tr>
<tr>
<td>NURS 111 Foundations of the Practice</td>
<td>3</td>
</tr>
<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 Seminar</td>
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<td>Total</td>
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<tr>
<td>Sophomore Year - Fall Semester</td>
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<tr>
<td>NURS 230 Nursing Care of the Adult</td>
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<tr>
<td>NURS 211 Pharmacology</td>
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<tr>
<td>NURS 250 Aging in Health and Illness</td>
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</tr>
<tr>
<td>NURS 210 Community Seminar II</td>
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<tr>
<td>BIOL 121 Chemical Biology</td>
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</tr>
<tr>
<td>SAGES University Seminar</td>
<td>3</td>
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<td>Total</td>
<td>15</td>
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<tr>
<td>Junior Year - Fall Semester</td>
<td></td>
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<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>
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<tr>
<td>NURS 316 Children &amp; Adolescents in Health &amp; Illness</td>
<td>4</td>
</tr>
<tr>
<td>STAT 201 Basic Statistics</td>
<td>3</td>
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<tr>
<td>Departmental Seminar</td>
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<td>NURS 310 Community Seminar IV</td>
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<tr>
<td>Senior Year - Fall Semester</td>
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<tr>
<td>NURS 370 Informatics</td>
<td>1</td>
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<tr>
<td>NURS 371 Public Health Nursing</td>
<td>3</td>
</tr>
<tr>
<td>NURS 372* Health in the Global Community</td>
<td>3</td>
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<tr>
<td>NURS 373 Community Practice/Capstone</td>
<td>5</td>
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<tr>
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*GER requirements

and nursing courses in process of revision to incorporate SAGES

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Freshman Year - Spring Semester Hours</td>
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</tr>
<tr>
<td>NURS 120 Nursing Informatics: Introduction</td>
<td>2</td>
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<tr>
<td>NURS 122 Nursing Assessment</td>
<td>3</td>
</tr>
<tr>
<td>NURS 201 Nutrition</td>
<td>2</td>
</tr>
<tr>
<td>NURS 160 Community Seminar I</td>
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</tr>
<tr>
<td>BIOL 119 Molecular View of Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 117 Anatomy &amp; Physiology II</td>
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<td>SAGES University Seminar</td>
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<tr>
<td>Sophomore Year - Spring Semester</td>
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<td>General Education Requirement</td>
<td>3</td>
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<tr>
<td>NURS 342 Medical Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>NURS 317 Psych/Mental Health</td>
<td>4</td>
</tr>
<tr>
<td>NURS 240 Nursing Care of the Adult II</td>
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<tr>
<td>NURS 260 Community Seminar III</td>
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<tr>
<td>Junior Year - Spring Semester</td>
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</tr>
<tr>
<td>NURS 351 Acute Care II</td>
<td>4</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>
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</tr>
<tr>
<td>General Education Requirement</td>
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</table>

**RN/BSN Entry Option**

Registered nurse graduates of an associate or diploma program in nursing can obtain their BSN 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 RN licensure in the State of Ohio
- Transcripts of all academic work
- There is 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 nursing 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 com-
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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</thead>
<tbody>
<tr>
<td>NURS 318 Nursing in the Community</td>
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<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>4</td>
</tr>
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</table>

New Applications of Nursing

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Practice Management</td>
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</tr>
<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>
</tr>
</tbody>
</table>

Total 30

MBA), and public health (MSN/MPH).

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 MSN in nursing informatics is offered. Dual degree programs are offered in bioethics (MSN/MA), anthropology (MSN/MAA), business administration (MSN/MBA), and public health (MSN/MPH).

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 policy development through active participation in legislative processes

Undergraduate Prerequisites to MSN Courses

<table>
<thead>
<tr>
<th>Fall Semester Weekend Classes</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>NURS 392 Dynamics of Nursing Practice Management</td>
<td>4</td>
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<tr>
<td>NURS 393 New Applications of Nursing Practice Management</td>
<td>4</td>
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</table>

<table>
<thead>
<tr>
<th>January Intensive Classes</th>
<th>Hours</th>
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<tbody>
<tr>
<td>NURS 345 Nursing Informatics III</td>
<td>2</td>
</tr>
<tr>
<td>NURS 318 Nursing in the Community</td>
<td>4</td>
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</table>

<table>
<thead>
<tr>
<th>May Intensive Classes</th>
<th>Hours</th>
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</thead>
<tbody>
<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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</table>

RN with a BS or BA Degree

Applicants with a BA or BS 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.

RN with BSN Degree

Applicants with a BSN 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 RN 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 re-
requirements may be referred to the MSN 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 BSN 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 12 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 classroom hours is 8 to 1 and for lab experiences it is 2 to 1.

The general curriculum includes the following core requirements:

Clinical Nursing Core
Semester Hours
(See specific program majors) 12-22

Professional Development Core
NURS 443 Professionalism in Advanced Practice
A: Collaboration, Consultation, and Credentialing 1
B: Role Development 1
C: Teaching and Learning 1

NURS 444 Health Care Delivery, Legal and Ethical Issues in Advanced Practice
A: Ethical Issues 1
B: Health Care Delivery and Finance 1
C: Health Policy, Legislation, and Legal Issues 1

Scientific Inquiry Core
NURS 405 Inquiry I 3
NURS 425 Inquiry II 3
NURS 502 Inquiry III 2
NURS 503 Inquiry Practicum 1-2

Advanced Practice Core
NURS 430 Pharmacology and Therapeutics 3
NURS 453 Advanced Physiology 4
NURS 459 Advanced Assessment 3

Community Engagement focus
Selected courses for MSN students at the Frances Payne Bolton School of Nursing incorporate projects with community agencies. Selected projects are designed to improve health care among under-served residents of Cleveland's inner-city neighborhoods. Developed in collaboration with the community 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 MSN 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. The I will remain a permanent part of the transcript if the student fails to complete course requirements within the next semester, unless alternative arrangements are approved in writing. 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 MSN program. If the grade of U or F is in a course that is not required for the MSN program, the student may register for the same course or a substitute course and achieve a passing grade to continue in the MSN 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 BSN degree. Other degree requirements must be fulfilled for those entering with the Portfolio or RN/MSN entry options. A maximum of 12 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 MSN degree, the student must have a cumulative GPA of 3.0 and received satisfactory grades in all nursing courses taken for credit as a MSN 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 Practitioners
There are practice requirements for these specialties. One year of experience in acute care is required for the Acute Care Nurse Practitio-
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

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>NURS 405 Inquiry I</td>
<td>3</td>
</tr>
<tr>
<td>NURS 438 Theoretical Foundations of Acute Care Nursing</td>
<td>4</td>
</tr>
<tr>
<td>NURS 453 Physiological Foundations of Advanced Practice</td>
<td>4</td>
</tr>
<tr>
<td>NURS 459 Assessment for Advanced Practice</td>
<td>4</td>
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<tr>
<td><strong>Total</strong></td>
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<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>NURS 406 Flight Nursing Clinical Seminar I</td>
<td>1</td>
</tr>
<tr>
<td>NURS 404 Emergent Care of Children</td>
<td>2</td>
</tr>
<tr>
<td>NURS 407 Flight Nursing Clinical Seminar II</td>
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<tr>
<td>NURS 523 Advanced Internship in Flight Nursing</td>
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### Cardiovascular Subspecialty Sample Plan

<table>
<thead>
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</thead>
<tbody>
<tr>
<td>NURS 405 Inquiry I</td>
<td>3</td>
</tr>
<tr>
<td>NURS 438 Theoretical Foundations of Acute Nursing Care</td>
<td>4</td>
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<tr>
<td>NURS 453 Physiological Foundations of Advanced Practice</td>
<td>4</td>
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<tr>
<td>NURS 459 Assessment for Advanced Practice</td>
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<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>NURS 409 Specialty Assessment in Cardiovascular Nursing</td>
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<tr>
<td>NURS 410 Cardiovascular Nursing Seminar I</td>
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<tr>
<td>NURS 430 Pharmacology and Therapeutics for the Advanced Practice Nurse</td>
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<tr>
<td>NUNP 443 Advanced Management of Acutely Ill Adults</td>
<td>6</td>
</tr>
<tr>
<td>NURS 444A Ethics in Advanced Practice</td>
<td>1</td>
</tr>
<tr>
<td>NURS 444B Finance in Advanced Practice</td>
<td>1</td>
</tr>
<tr>
<td>NURS 444C Health Policy and Legal Issues in Advanced Practice</td>
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<table>
<thead>
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<th>Course</th>
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<tbody>
<tr>
<td>NURS 425 Inquiry II</td>
<td>3</td>
</tr>
<tr>
<td>NURS 430 Pharmacology &amp; Therapeutics</td>
<td>3</td>
</tr>
<tr>
<td>NUNP 412 Neonatal Nurse Practitioner II</td>
<td>4</td>
</tr>
<tr>
<td>NURS 43A Collaboration and Consultation</td>
<td>1</td>
</tr>
<tr>
<td>NURS 43B Role Development</td>
<td>1</td>
</tr>
<tr>
<td>NURS 443A Collaboration and Consultation</td>
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<td>NURS 443B Role Development</td>
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<td>NURS 443C Teaching and Learning</td>
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### Neonatal Nurse Practitioner

<table>
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<tr>
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<tbody>
<tr>
<td>NURS 405 Inquiry I</td>
<td>3</td>
</tr>
<tr>
<td>NURS 416 Integrated Assessment of the Neonate</td>
<td>3</td>
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<tr>
<td>NURS 453 Physiologic Foundations for Advanced Practice Nursing</td>
<td>4</td>
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<td>NUNP 405 Neonatal Nurse Practitioner I</td>
<td>3</td>
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<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>NURS 425 Inquiry II</td>
<td>3</td>
</tr>
<tr>
<td>NURS 430 Pharmacology &amp; Therapeutics</td>
<td>3</td>
</tr>
<tr>
<td>NUNP 412 Neonatal Nurse Practitioner II</td>
<td>4</td>
</tr>
<tr>
<td>NURS 43A Collaboration and Consultation</td>
<td>1</td>
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<tr>
<td>NURS 43B Role Development</td>
<td>1</td>
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<tr>
<td>NURS 443A Collaboration and Consultation</td>
<td>1</td>
</tr>
<tr>
<td>NURS 443B Role Development</td>
<td>1</td>
</tr>
<tr>
<td>NURS 443C Teaching and Learning</td>
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<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>NURS 502 Inquiry III</td>
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<tr>
<td>NUNP 413 Neonatal Nurse Practitioner III</td>
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**Total** | 5
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**Fall II**

<table>
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<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>NUNP 414</td>
<td>Neonatal Nurse Practitioner I</td>
</tr>
<tr>
<td>NURS 503</td>
<td>OR Inquiry Practicum</td>
</tr>
<tr>
<td>NURS 444A</td>
<td>Ethics in Advanced Practice</td>
</tr>
<tr>
<td>NURS 444B</td>
<td>Finance in Advanced Practice</td>
</tr>
<tr>
<td>NURS 444C</td>
<td>Health Policy and Legal Issues in Advanced Practice</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>9-12</td>
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<tr>
<td><strong>Accumulated Total</strong></td>
<td>40-44</td>
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</tbody>
</table>

* 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.

**Primary Care Nurse Practitioners**

**Adult Nurse Practitioner**

This major is now offered in distance format with only 8 trips to Cleveland if you are a full-time student.

**Family Nurse Practitioner**

This major is now offered in distance format with only 8 trips to Cleveland if you are a full-time student.

---

**Sample Plan for Adding Infection Control to an NP track:**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>NURS 405</td>
<td>Inquiry I</td>
</tr>
<tr>
<td>NURS 453</td>
<td>Physiologic Foundations for Advanced Practice Nursing</td>
</tr>
<tr>
<td>NURS 459</td>
<td>Integrated Assessment for Advanced Nursing Practice</td>
</tr>
<tr>
<td>NUNP 410</td>
<td>Health Promotion Across the Lifespan</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>12</td>
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</table>

**Spring**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>NURS 425</td>
<td>Inquiry II</td>
</tr>
<tr>
<td>NURS 430</td>
<td>Pharmacology &amp; Therapeutics</td>
</tr>
<tr>
<td>NUNP 432</td>
<td>Common &amp; Acute Problems of the Adult I</td>
</tr>
<tr>
<td>NURS 443A</td>
<td>Collaboration and Consultation</td>
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**Summer**

<table>
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<th>Course</th>
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</thead>
<tbody>
<tr>
<td>NURS 502</td>
<td>Inquiry III</td>
</tr>
<tr>
<td>NUNP 433</td>
<td>Common &amp; Acute Problems of the Adult II</td>
</tr>
<tr>
<td>NURS 443B</td>
<td>Role Development</td>
</tr>
<tr>
<td>NURS 443C</td>
<td>Teaching and Learning</td>
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**Fall II**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>NUNP 434</td>
<td>Advanced Management in Adult Primary Care</td>
</tr>
<tr>
<td>NURS 503</td>
<td>Inquiry Practicum</td>
</tr>
<tr>
<td>NURS 444A</td>
<td>Ethics in Advanced Practice</td>
</tr>
<tr>
<td>NURS 444B</td>
<td>Finance in Advanced Practice</td>
</tr>
<tr>
<td>NURS 444C</td>
<td>Health Policy and Legal Issues in Advanced Practice</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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</tr>
<tr>
<td><strong>Accumulated Total</strong></td>
<td>40</td>
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</tbody>
</table>

* 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.
<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tbody>
<tr>
<td>NURS 430 Pharmacology &amp; Therapeutics</td>
<td>3</td>
</tr>
<tr>
<td>NUNP 432 Common &amp; Acute Problems of the Adult I</td>
<td>5</td>
</tr>
<tr>
<td>* EPBI 494 Infectious Disease Epidemiology</td>
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</tr>
<tr>
<td>* NURS 445 Infection Control</td>
<td>3</td>
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### Spring

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>NURS 430 Pharmacology &amp; Therapeutics</td>
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</tr>
<tr>
<td>NURS 405 Inquiry I</td>
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<tr>
<td>NUNP 410 Health Promotion Across the Life Span</td>
<td>2</td>
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<tr>
<td>NURS 441</td>
<td>1</td>
</tr>
<tr>
<td>NURS 442</td>
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### Summer

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
<td>NURS 425 Inquiry II</td>
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<tr>
<td>NURS 502 Inquiry III</td>
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<td>NUNP 433 Common &amp; Acute Problems of the Adult II</td>
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<td>NURS 443B Collaboration &amp; Consultation</td>
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<td>NURS 443B Role Development</td>
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### Fall II

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<tr>
<td>NUNP 434 Advanced Management in Adult Primary Care</td>
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<td>NURS 450 Infection Control II</td>
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<tr>
<td>NURS 503 Inquiry Practicum</td>
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<tr>
<td>NURS 443C Teaching and Learning</td>
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</tr>
<tr>
<td>NURS 444A Ethics in Advanced Practice</td>
<td>1</td>
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<td>NURS 444B Finance in Advanced Practice</td>
<td>1</td>
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<tr>
<td>NURS 444C Health Policy and Legal Issues in Advanced Practice</td>
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<td>* NURS 524 Infection Control Practicum</td>
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<td><strong>Total</strong></td>
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### Accumulated Total

- **53**

* * indicates Infection Control subspecialty

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**For those wishing dual certification as GNP and Gerontological GNS:**

### Fall

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>NURS 453 Physiological Foundations for Advanced Practice Nursing</td>
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<td>NURS 459 Integrated Assessment for Advanced Nursing Practice</td>
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<tr>
<td>NURS 405 Inquiry I</td>
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<td>NUNP 410 Health Promotion Across the Life Span</td>
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<td>NUNP 419 Family Health Nursing: Health of Adults and Older Adults</td>
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<tr>
<td>NURS 430 Pharmacology &amp; Therapeutics</td>
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<tr>
<td>NURS 425 Inquiry II</td>
<td>3</td>
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<tr>
<td>NURS 479 Public Policy &amp; Aging</td>
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### Summer

<table>
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### Accumulated Total

- **41**

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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.
### Pediatric Nurse Practitioner

<table>
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<tbody>
<tr>
<td><strong>Fall</strong></td>
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<tr>
<td>NURS 453 Physiological Foundations for Advanced Practice Nursing</td>
<td>4</td>
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<tr>
<td>NURS 459 Integrated Assessment for Advanced Nursing Practice</td>
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<tr>
<td>NURS 405 Inquiry I</td>
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<td>NUNP 410 Health Promotion Across the Lifespan</td>
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<td>NUNP 401 Health Promotion in Children and Adolescents</td>
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<tr>
<td><strong>Spring</strong></td>
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<tr>
<td>NURS 425 Inquiry II</td>
<td>3</td>
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<tr>
<td>NURS 402 Common and Acute Health Problems of Children</td>
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<td>NURS 430 Pharmacology &amp; Therapeutics</td>
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<td><strong>Summer</strong></td>
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<td>NURS 443A Collaboration &amp; Consultation</td>
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<td>NUNP 403 Advanced Management in Pediatric Primary Care</td>
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<tr>
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### Psychiatric Mental Health Nurse Practitioner

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<tr>
<td>NURS 405 Inquiry I</td>
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</tr>
<tr>
<td>NURS 453 Physiological Foundations for Advanced Practice Nursing</td>
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<tr>
<td>SSBT 548 Adult Psychopathology OR PSCL 524 Advanced Psychopathology</td>
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<tr>
<td>NURS 460 Theoretical Base of Nursing Interventions with Individuals</td>
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<td>NURS 461 Practicum &amp; Supervision of Individual Therapy</td>
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<td><strong>Spring</strong></td>
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<tr>
<td>NURS 425 Inquiry II</td>
<td>3</td>
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<tr>
<td>NURS 459 Integrated Assessment for Advanced Nursing Practice</td>
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<tr>
<td>NURS 430 Pharmacology &amp; Therapeutics</td>
<td>3</td>
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<tr>
<td>NURS 462 Practicum &amp; Supervision of Group &amp; Family Therapy</td>
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<td>NURS 467 Theory of Family &amp; Group Modalities</td>
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<td>NURS 443B Role &amp; Development</td>
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<td>NURS 443C Teaching &amp; Learning</td>
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<tr>
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<tr>
<td>NURS 503 Inquiry Practicum</td>
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<td>NURS 444B Finance in Advanced Practice</td>
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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

<table>
<thead>
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<th>Course</th>
<th>Hours</th>
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<tr>
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<tr>
<td>NURS 425 Inquiry I</td>
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<tr>
<td>NURS 453 Physiological Foundations for Advanced Practice Nursing</td>
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<td>NURS 459 Integrated Assessment for Advanced Nursing Practice</td>
<td>3</td>
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<td>NURS 430 Pharmacology &amp; Therapeutics</td>
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<td>NURS 443A Collaboration &amp; Consultation</td>
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<td><strong>Spring</strong></td>
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<tr>
<td>NURS 425 Inquiry II</td>
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<td>NURS 459 Integrated Assessment for Advanced Nursing Practice</td>
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<tr>
<td>NURS 455 The Childbearing Family</td>
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</table>
NURSE MIDWIFERY

Nurse-midwifery practice is the independent management of women’s health care, focusing particularly on pregnancy, childbirth, the post-partum 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 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 College of Nurse-Midwives (ACNM). 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.
## Medical-Surgical Nursing

<table>
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<tr>
<td>NURS 438</td>
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<td>NURS 453</td>
<td>4</td>
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<tr>
<td>NURS 459</td>
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### Community Health Nursing

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<tr>
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### Spring

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<td>NURS 424</td>
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<td>NURS 430</td>
<td>3</td>
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<tr>
<td>NURS 425</td>
<td>3</td>
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<tr>
<td>NURS 443A</td>
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### Summer

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<tr>
<td>NURS 446</td>
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<tr>
<td>NURS 502</td>
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<td>NURS 443B</td>
<td>1</td>
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<td>NURS 444A</td>
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<td>NURS 444B</td>
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### Fall II

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<td>NURS 443B</td>
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<td>NURS 444B</td>
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## CLINICAL NURSE SPECIALIST

There are two specialty tracks in the Clinical Nurse Specialist program, Medical-Surgical Clinical Nurse Specialist, and Community 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 community 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 community 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.

## Community Health Nursing

### August

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### Fall

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<td>NURS 405</td>
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Infection Control Option

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<td>NURS 495 Community Health Nursing Program Planning</td>
<td>3</td>
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<tr>
<td>NURS 446 Collaboration &amp; Administration in The Health Care Delivery System</td>
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</tr>
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<td>NURS 445 Infection Control I</td>
<td>3</td>
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<td>NURS 425 Infection Control II</td>
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<table>
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<tr>
<td>NURS 524 Infection Control Practicum</td>
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Accumulated Total: 54-58

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.
MSN/MA (ANTHROPOLOGY) JOINT DEGREE
The Master of Science in Nursing/Master of Arts in Anthropology joint degree provides students with the unique combination of cross-cultural 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.

NURS 443A Collaboration & Consultation 1
NURS443B Role Development 1
NURS 443C Teaching & Learning 1
Total 12

Fall II
NUNI 499 Internship in Nursing Informatics 5
MIDS 432 Health Care Information Systems 3
NURS 503 Inquiry Practicum 1
NURS 444A Ethics in Advanced Practice 1
NURS 444B Finance in Advanced Practice 1
NURS 444C Health Policy and Legal Issues in Advanced Practice 1
Total 12
Accumulated Total 37

Required Nursing Courses Hours
NURS 443 A, B, C Professionalism in Nursing 3
NURS 444 A, B, C Health Care Delivery, Legal and Ethical Issues 3
NURS 453 Physiological Foundations 4
NURS 459 Integrated Assessment 3
NURS 430 Pharmacology and Therapeutics 3
NURS 405 Inquiry I 3
Total 31-41

Required Anthropology Courses
ANTH 480 Anthropology of Health & Illness Part I 3
ANTH 481 Anthropology of Health and Illness Part II 3
ANTH 462 Contemporary Theory in Anthropology 3
Anthropology Electives (health-related) 6-9
Total 15-18

Required Research Courses
NURS 425 Inquiry II 3
NURS 502 Inquiry III 2
NURS 503 Inquiry Practicum 1-2
Total 6-7
Required Elective
Approved elective course in Anthropology OR Nursing 3
Total Semester Hours 55-67

Required Bioethics Courses Hours
BETH 401 Foundations in Bioethics I 6
BETH 402 Foundations in Bioethics II 6
BETH 403 Clinical Bioethics 3
Approved electives 6
NURS 502 Inquiry III 2
Total 22
Combined Total Credits 52-62
Total 31-41

MSN/MA (BIOETHICS) JOINT DEGREE
The Master of Science in Nursing/Master of Art 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 MSN/MA degree requirements are 53-63 credits.

NURS 443A Collaboration & Consultation 1
NURS443B Role Development 1
NURS 443C Teaching & Learning 1
Total 12

Fall II
NUNI 499 Internship in Nursing Informatics 5
MIDS 432 Health Care Information Systems 3
NURS 503 Inquiry Practicum 1
NURS 444A Ethics in Advanced Practice 1
NURS 444B Finance in Advanced Practice 1
NURS 444C Health Policy and Legal Issues in Advanced Practice 1
Total 12
Accumulated Total 37

Required Nursing Courses Hours
Clinical Major and Pre-requisites 12-22
NURS 453 Physiological Foundations 4
NURS 459 Integrated Assessment 3
NURS 430 Pharmacology and Therapeutics 3
NURS 405 Inquiry I 3
NURS 425 Inquiry II 3
NURS 443 A, B, C Professionalism in Nursing 3
Total 31-41

Required Bioethics Courses Hours
BETH 401 Foundations in Bioethics I 6
BETH 402 Foundations in Bioethics II 6
BETH 403 Clinical Bioethics 3
Approved electives 6
NURS 502 Inquiry III 2
Total 22
Combined Total Credits 52-62
Total 31-41

MSN/MBA JOINT DEGREE
The Masters 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 nine-hour practicum must be taken in one semester.

Orientation and Statistics Preparation Workshops begin week before Fall courses

Semester I (Fall)
MBAC 410 Management Assessment and Development I 2
MBAC 410 (Lab) Team Development Seminars 1
MBAC 411 Strategic Issues and Applications I 1
MBAC 412 Career Management Seminars 1

585
MBAC 414 Statistics and Decision Modeling 3
MBAC 415 Financial Reporting and Control 3
MBAC 416 Managerial Finance 3
NURS 405 Inquiry I 3
Total 17

Semester II (Spring)
MBAC 413 Human Values in Organizations 3
MBAC 413 (Lab) Negotiations and Collaboration 1
MBAC 421 Strategic Issues and Applications II 2
MBAC 424 Marketing 3
NURS 425 Inquiry II 3
NUND 483 Health Care Policy and Planning and Information Management Systems 3
Total 15

Semester III (Fall)
MIDS 409 Information Design & Management 3
OPMT 405 Operations Management 3
NURS 468 Continuous Improvement in Health Care (recommended) 3
ECON 403 Economics 3
NURS 502 Inquiry III 2
NURS 503 Inquiry Practicum 1-2
NURS 503 Continuous Improvement in Health Care (recommended) 3
ECON 403 Economics 3
NURS 502 Inquiry III 2
NURS 503 Inquiry Practicum 1-2
Total 15-17

Semester IV (Spring)
Open elective (WSOM) 3
NURS 456 Issues in Health Care Management 3
OR HSMC 456 (Thematic elective) 3
NURS 577 Nursing Practicum 9
Total 15

Semester V (Fall)
Open elective (WSOM) 3
Open elective (WSOM) 3
Open elective (WSOM) 3

Note: This program may be done part time. See advisor for details.

MSN/MPH DEGREE
The focus of the MSN 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 Community Health Nursing, but also will prepare nurses to assume leadership roles in the overall planning, organizing, and delivery of care to populations and communities. Students pursuing the combined MSN/MPH degree will take 30 credits of MPH coursework and 29 MSN credits.

JOINT PROGRAMS WITH FRONTIER NURSING SERVICE
MSN/CNEP
The Community-Based Nurse-Midwifery Education Program (CNEP) is a distance education program leading to a certificate in nursing. 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 MSN/CNEP Curriculum

Scientific Inquiry
- NURS 405 3
- NURS 425 3
- NURS 502 2
- NURS 503 1-2
- Total 10-11

MSN/CFNP

The Community-Based Family Nurse Education Program 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
10900 Euclid Avenue
Cleveland, Ohio 44106

OR

Frontier School of Midwifery and Family Nursing
www.frontierfnp.org

Course of Study for MSN/CFNP Curriculum

Scientific Inquiry
- NURS 405 3
- NURS 425 3
- NURS 502 2
- NURS 503 1-2
- Total 10-11

DOCTOR OF NURSING PRACTICE

The Doctor of Nursing Practice Program (DNP) is an innovative academic program designed to prepare leaders in nursing. The DNP program is designed with several entry points to accommodate students with diverse educational backgrounds.

- Graduate Entry DNP Program: The Graduate entry DNP program is designed for individuals with baccalaureate (or above) degrees from an accredited college or university in a discipline other than nursing. The pre-licensure phase (Levels I and II) prepares the student for licensure as a registered nurse. The post-licensure component (Levels III and IV) prepares the student for advanced practice nursing and roles in clinical or educational leadership and leads to the MSN and DNP degrees. Students currently enrolled in an accredited baccalaureate program may apply for and enter the DNP program after three years of study (see section on Senior Year in Professional Studies).
- Post Licensure DNP Program: The post licensure entry program (Levels III and IV) is designed for registered nurses who have completed levels I and II, who hold a diploma in nursing or ADN or BSN degrees, or for RNs who hold a BS or BA in a discipline other than nursing. It leads to the MSN (Level III) and DNP (Level IV) degrees and prepares students for roles in a variety of advanced practice nursing specialties and as clinical or educational leaders.
- Post Master's DNP Program: The post-MSN portion of the DNP program prepares nurses with MSN degrees to be educational or clinical leaders. Students acquire in-depth knowledge in nursing theory, research, policy, and education or management.
- DNP IV Tracks: DNP students in Level IV of the program may choose to follow the Clinical Leadership Track or the Educational Leadership Track. Those who chose Clinical Leadership should be certified, or eligible for certification, in an Advanced Practice Nursing specialty.
- Scholarly Project: All students completing the DNP program prepare a scholarly project involving either a thesis or applied research 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 project
- 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 DNP 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 prelicensure component of the DNP degree must attain a grade point average of 2.5 or above. C, the lowest passing grade is regarded as borderline performance. If a student's semester grade point average is less than 2.5, the student will be placed on probation for the following semester and will be given guidance. If the student on probation receives a grade point average of 2.5 or higher for that semester, the student will be removed from probation. If the student achieves a grade point average of less than 2.5 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 excluded from the program.

DNP 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 NUND 500) 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 DNP student at the Frances Payne Bolton School of Nursing to be awarded the DNP 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 DNP student at the Frances Payne Bolton School of Nursing to be awarded the DNP degree. All DNP students must successfully defend the thesis or research 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 DNP 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 RN Licensure Applications

In order to have the “Program Completion” section of their application RN Licensure approved by the Program Director, students of the Graduate Entry DNP Program must:

A) Qualify for the “Certificate of Professional Nursing” by:
   a. Earning grades of C or higher in all courses in the pre-licensure curriculum (see FPB Bulletin).
   b. Earning an overall GPA of 2.5 or higher in the pre-licensure curriculum.
B) Demonstrate readiness to take the NCLEX-RN Examination by:
   a. Achieving at least a minimum score (pre-determined and announced in advance) on a nationally faculty-selected, normed NCLEX-RN predictor exam.

b. All Grad Entry DNP II students will take the exam at least once prior to the end of the pre-licensure program.
   c. Refer to separate Procedure for Demonstrating Readiness to take the NCLEX Exam for details on this process.

Scholarly Project

The DNP 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 DNP Program and the Associate Dean for Doctoral Education. The thesis or applied research 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 thesis or an applied research project, please see the website http://fpb.case.edu/DNP/curriculum.shtml.

The applied research 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, or other scholarly project as approved. The research project will be developed will be developed in consultation with the student’s research project committee. 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. However, if the student completes NURS504 and NURS520, they do not need to complete NURS503 to be awarded the MSN.

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 DNP program within 5 years.
- Post-master’s entry students must complete the DNP program within 4 years.
- DNP students who do not complete the DNP 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 of 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 DNP 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. At the successful completion of this portion of the DNP program, students receive a Certificate of Professional Nursing. After passing the NCLEX, the student may practice as a registered nurse (RN) while completing the postlicensure portion of the DNP program.

Entry Options

- Graduates from an accredited college or university with a baccalaureate degree in a non-nursing field.
- Students currently enrolled in a 4-year baccalaureate program at an accredited liberal arts college after 3 years of study. (Senior Year in Professional Studies)
Admission Requirements

- BA or BS with acceptable GPA (3.0 cumulative; 2.5 natural science; 2.5 behavioral sciences)
- At least one 3-credit course in English Composition or integrated equivalent
- At least 10 credits of natural science courses, including: Biology (with lab), Organic or Biochemistry (lab preferred), and another 3-credit Biology or Chemistry course. The organic or biochemistry course must be equivalent to BIOL 121.
- At least one 3-credit course in Sociology or Anthropology
- At least one 3-credit course in Psychology
- At least one 3-credit course in Human Growth and Development Across the Lifespan
- Statistics course equivalent to NUND 201 or STAT 201 required within 5 years of enrollment in the program.
- Acceptable graduate admission exam scores:
  - GRE General Test: Verbal-500, Quantitative-500, and either Analytical-500 OR Analytic Writing 4.0
  - Miller Analogies Test (MAT): 45 (before 10/04) or 400 (after 10/04)

Senior Year in Professional Studies

A student in a college with a formal arrangement with the Bolton School may enroll in the Senior Year in Professional Studies leading to RN licensure and then graduate study in nursing. Students 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 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 BS or BA degree at the end of the successful completion of the first year of the DNP program, the following must be met:

- 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.

DNP Prelicensure Plan of Study

<table>
<thead>
<tr>
<th>Semester I (Fall)</th>
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<tr>
<td>NUND 213</td>
<td>Nursing Strategies and Interventions</td>
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<td>NUND 230</td>
<td>Foundations of Nursing Practice</td>
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<tr>
<td>NUND 342</td>
<td>Microbiology</td>
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<td>Medical Microbiology Lab</td>
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<td>NUND 410</td>
<td>Health Assessment</td>
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<td>NUND 412</td>
<td>Anatomy and Physiology</td>
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<td>NUND 211</td>
<td>Pharmacology</td>
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<td>NUND 220</td>
<td>Altered Human Functioning</td>
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<tr>
<td>NUND 223</td>
<td>Health and Aging</td>
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<tr>
<td>NUND 234</td>
<td>Genetics</td>
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<td>NUND 225</td>
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<tr>
<td>*See Below Specialty Clinical Course</td>
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<tr>
<td>NURS 405</td>
<td>Inquiry I</td>
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<td>NUND 222</td>
<td>Nursing Informatics II</td>
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<tr>
<td>NUND 341</td>
<td>Concepts of Management</td>
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<td>NUND 343</td>
<td>Issues and Ethics in Healthcare</td>
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<td>NURS 425</td>
<td>Inquiry II</td>
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</table>

*NUND 315 Parents & Neonates In Health & Illness
*NUND 316 Children & Adolescents in Health & Illness
*NUND 317 Psychiatric-Mental Health Nursing
*NUND 319 Public Health Nursing

Progression from one semester to the next in the Prelicensure Component of the DNP Program is contingent upon passing grades in all courses taken in the preceding semester. Successful completion of all prelicensure courses is necessary to sit for the Professional Nursing Licensing Examination (NCLEX-RN). 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. (see page 37)

DNP Post Licensure Program

After completing the prelicensure portion of the DNP program, students select an advanced practice specialty. RNs with a diploma, ADN, BSN, or non-nursing BA or BS may enter in this portion of the DNP program. For those entering with a BSN, course work consists of master level courses in the chosen specialty, DNP core courses and a DNP 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 DNP 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

- RN with a diploma or associate degree in nursing from an accredited school (See RN/MSN program described under the masters program)
- RN with a BS or BA degree in a discipline
other than nursing (See portfolio option described under the masters program)
- Nurse with a BSN degree
- Nurse with a MSN degree

Admission Requirements
RN with Diploma and Associate Degree
- See the description of the RN-MSN 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.

RN with BS or BA Other than Nursing
- See the description of the portfolio option described under 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.

RN with a BSN
- 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 DNP program. Additional coursework may be required.
- Written statement of academic and career objectives and research interest.
- Students must complete the MSN level inquiry courses before beginning the upper level DNP theory and research courses.

RN with a MSN
- 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/DNP 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 DNP Program.

DOCTOR OF NURSING PRACTICE PROGRAM
DNP III (post-licensure):
- Students who complete Level I and II of the DNP program (pre-licensure) move into DNP III as an RN, having already completed core courses for the MSN.
- Students who enter in Level III of the DNP program will complete the MSN prior to, or concurrently with, the DNP IV curriculum. NURS 503 will not be needed.
- Students entering at the DNP III level follow the curriculum stated for the selected MSN specialty (see curriculum in the MSN section of this Bulletin) while also completing the DNP IV Clinical Leadership or Educational Leadership DNP tracks AND a Scholarly Project. The MSN course NURS 503 is not needed for the DNP.

DNP IV (concurrent with or post-MSN):
- Students who enter in Level IV of the DNP program select one of two tracks for the upper level DNP courses: 1) Clinical Leadership or 2) Educational Leadership AND a scholarly project option: 1) thesis or 2) research project.
- Some courses have a required sequence (see course listings). NURS 504 must precede NURS 520.
- STAT 401, NURS 401 or an equivalent is a pre-requisite for NURS 521. Equivalent courses at other Universities must be approved by the Director of the DNP Program and a transcript provided.
- STAT 401, NURS 401 or an equivalent should be completed within 5 years of admission to the DNP program and prior to taking NURS 521.

DNP IV Core Courses

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>NURS 401</td>
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<tr>
<td>NURS 504</td>
<td>3</td>
</tr>
<tr>
<td>NURS 520</td>
<td>3</td>
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<tr>
<td>NURS 521</td>
<td>3</td>
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<tr>
<td>NUND 483</td>
<td>3</td>
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</tbody>
</table>

Clinical Leadership Track
- NUND 471 Organizational Theories 3
- NUND 441 Management in Advanced Practice 3

Educational Leadership Track
- NUND 478 Curriculum and Instruction 3
- NUND 479 Theoretical Foundations: Educational Testing and Evaluation 2
- NUND 480 Action Research and Program Evaluation 1
- NUND 481 Teaching Practicum 2

Scholarly Project (thesis OR research project)
- NUND 505 Research Project 6
- NUND 500 DNP Thesis Min. 6

Total Min. 26

*Prelicensure students take these during the prelicensure portion of the DNP program.

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...
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 Bachelors of Science in Nursing degree.
• Registered nurses with a Masters of Science in Nursing degree.

Admission Requirements

Applicants to the PhD 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 (BSN or MSN) from an accredited nursing program.
2. Three recommendations describing professional nursing competence, potential for success in the PhD program and for making a significant contribution to nursing science. Two of these recommendations should be from PhD 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.

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 MSN degree with a clinical nursing major with supervised practice can build on their prior masters’ education. Students entering with a BSN 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.

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<thead>
<tr>
<th>Ph.D. Research Methods/Statistics</th>
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<tbody>
<tr>
<td>NURS 530 Advanced Nursing Research I</td>
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<tr>
<td>NURS 531 Advanced Nursing Research II</td>
<td>3</td>
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<tr>
<td>NURS 518 Qualitative Nursing Research</td>
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</tr>
<tr>
<td>NURS 630 Advanced Statistics for Nursing Research: Linear Models</td>
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<tr>
<td>Methods/Statistics elective</td>
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<tr>
<th>Ph.D. related Courses</th>
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<tr>
<td>NURS 609 Health Policy</td>
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<tr>
<td>Substantive elective</td>
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</table>

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 the School 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 PhD candidate must register for a minimum of one credit hour of NURS 701 each semester. Students may petition to transfer credit from another institution towards their degree at Case Western Reserve University by completing the Petition for Transfer Credit Form. An official transcript from the institution must accompany the form. Transfer credit of course-
work must be requested in the student's first academic year, and appropriate for the student's Planned Program of Study. The coursework must be graduate level with a grade of B or better, and it must be in excess of previous degree requirements. No transfer credit will be awarded toward the Ph.D. degree except by approved petition and no dissertation research credit may be transferred from another university. All coursework must have been completed within five years of matriculation at Case Western Reserve University. The academic advisor, faculty currently teaching the course to be substituted, and the Associate Dean for Doctoral Education are responsible for reviewing the course(s) and approving the transfer prior to final review and approval from the School of Graduate Studies.

Research Practicum

A research practicum is required before taking the candidacy examination (described below). The research process is complex and coursework 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 for 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 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 PhD Program

Academic Performance and Progression

Students who enter the PhD in nursing program with an MSN are expected to complete all coursework (36 credits) within four years of matriculation. Students entering with a BSN 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 Doctoral Education 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, he/she will be separated from the PhD 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 the School of Graduate studies before the final date when grades are due in the semester during which the course was taken. All work for theIncomplete 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, PhD 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 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 ad-
ditional course work. A student who fails the examination a second time will be separated from the PhD in Nursing program. A student who is not advanced to candidacy may not undertake further study for credit towards a PhD 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 University faculty and students, but the dissertation chair determines whether the defense is open to others outside of the 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 PhD 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 PhD student at the University is required for awarding the PhD 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 PhD 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 the School 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 PhD program to continue to study using an abbreviated application process. After a review of the application and the student’s academic record, the PhD Admissions Committee makes recommendations about re-admission and additional course work 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 MSN and DNP programs and the Office of Graduate Studies Admissions for the PhD program. The applicant must obtain written permission from the faculty teaching the course, and the Associate Dean for Academic Programs in the Bolton School for those taking PhD 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 MSN 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 PhD 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.

1. 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).
Students applying to clinical programs must demonstrate English language proficiency. Students who demonstrate English language proficiency may request to be exempt from these courses.

2. 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.

3. Students applying to clinical programs must be eligible for licensure as a registered nurse (RN) before any clinical courses are taken. To obtain RN 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, go to the National Council of State Boards of Nursing website at www.ncsbn.org and then go to “Click here to access the Boards of Nursing contact information and Web sites.” You may also write to:

National Council of State Boards of Nursing
676 N. St. Clair Street
Suite 550
Chicago, Illinois, 60611-2921
Telephone: (312) 787-6555.

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 in the pamphlet, Financial Aid at CASE, obtained 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 BSN and RN-BSN 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 BSN are awarded the Bolton Scholarship. Individual awards may be as much as $15,000 per year for a maximum of four (4) years for the BSN program, and three (3) years for transfer BSN and RN-BSN program. This scholarship is not need based. Additional scholarships are awarded to students demonstrating extraordinary merit and/or exceptional need.

Merit-Based Aid
CASE 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 CASE scholarships, students apply by February 1st and submit SAT I 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) and register with the Financial Aid Profile Service (FAP) by February 15th (or as soon after as possible). From this information, and the CASE 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’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 MSN, DNP, PhD, RN-MSN, and the joint degree programs (MSN/MBA, MSN/MPh, and MSN/MA).

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 semesters. Half-time enrollment is 5-8 credit hours Fall and Spring semesters, and 3-5 credit hours Summer semester. To be eligible for financial aid for summer semesters, 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 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.

**Private Loans**
For those students who do not receive federal loans or wish to borrow more money than is provided by federal 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 Semesters 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 full-time MSN students and post-licensure DNP students seeking the MSN. In most cases, students must be enrolled full-time, i.e. 9 credit hours for two or more semesters. No application is required.

**National Health Service Corps Scholarship Program**
This 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 DNP Student Grant**
Pre-licensure DNP 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 pre-licensure component of the DNP 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.

**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.

**Liability Insurance**
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 Maginiin and Associates and the National Student Nurses’ Association. All arrangements are between the student and the company offering the liability program.

**Uniforms**
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.
General Cost 2006-2007

Tuition (2006-2007)

Full-time (per year)* $30,240
Part-time (per credit hour)* $1,266

University Housing

Room $5,240–8,100
Board plan $1,779–1,947
Health Insurance $1,100
Hepatitis B Immunization $200

Additional Costs

B.S.N.

University Activity Fee $263
Clinical Practice Fee $200
Nursing Activity Fee $15
Bus Fee $50

Reservation deposit
(no refund) $200
(Reservation deposits are applied toward the tuition and room rent 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
Graduating students may incur additional expenses for the FPB school pin, State Board Examination fee, certification examination fees, and thesis/dissertation binding fees.

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”. 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 though 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 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/finadmin/controller/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 delinquent, 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 withholds 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 withholds 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.

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.

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. Prereq: Admitted to program.

NUAN 450. Pharmacological Strategies in Anesthesia Practice (2)
Application of phar-mako-kinetic and phar-maco-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. Prereq: 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. Prereq: 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. Prereq: 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 pathophysiology of the renal and neurologic systems. Focus will be on the integration of this knowledge into the planning, implementation, and evaluation of patients requiring nurse aneste-

NUAN 455. Anesthesia Nursing I (2)
An introduction to the art and science of nurse anesthesia including basic anesthetic principles and beginning clinical practice 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. Prereq: 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 Schlorrerfeld 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. Prereq: 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 pharmacologic agents and handling higher stress situations. Students develop and utilize practical clinical applications of nurse anesthesia theory. Prereq: NUAN 457.

NUAN 551B. Nurse Anesthesia: Advanced Practice I (1)
(See NUAN 551A.) Prereq: NUAN 551A.

NUAN 551C. Nurse Anesthesia: Advanced Practice I (1)
(See NUAN 551A.) Prereq: 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. Prereq: NUAN 551A and NUAN 551B and NUAN 551C.
COURSE DESCRIPTIONS (NUND)

NUND 201. Introductory Statistics for Health Sciences (3)
This course is designed to introduce the application of statistical methods to health sciences. Contents include descriptive statistics, distribution, central limit theorem, hypothesis testing, power, and probability. Techniques of t-test, chi-square test, ANOVA, and correlation analysis will be taught along with in-class exercises using statistical software. This course is not for credit toward any undergraduate or graduate degree in Statistics.

NUND 211. Pharmacology (2)
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. Prereq: NUND 342.

NUND 213. Nursing Strategies and Interventions for Alterations in Human Function (4)
An introduction to specific nursing strategies and interventions designed to support the maximum health potential of the adult patient. The fundamentals of nursing care are incorporated into a laboratory setting and practiced in an acute care medical-surgical facility. Particular emphasis is placed on the nursing strategies and interventions. Evaluation of the effectiveness of interventions is integrated throughout the course. Prereq: Admission to DNP program.

NUND 220. 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. Prereq: NUND 412 and completion of first semester of N.D. program.

NUND 222. Introduction to Nursing Informatics (1)
The focus of this course is the integration of information management concepts into health care delivery. Conceptual and functional components of Informatics will be introduced as well as the use of the components in managing information in clinical practice, education, research and administration. The course is designed to build an understanding of basic information technologies and the ways nurses can manage the information to support the delivery of patient care. Prereq or Coreq: NUND 213.

NUND 223. 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. Content will include theories of aging, physiology of aging, geriatric syndromes and interventions, implication for policy and health care services. Prereq: NUND 213, NUND 233, NUND 410, and NUND 412.

NUND 225. Acute Care Nursing of the Adult (9)
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. Prereq: NUND 213.

NUND 230. Foundations of Nursing Practice (2)
This course introduces the discipline of nursing and its attributes for clinical practice. Critical historical, societal, and philosophical influences that have affected nursing as a profession will be critiqued. Nursing theories are introduced. The individual, the group, the family, and the community as clients of the nurse are introduced. Nursing strategies to promote therapeutic communication are emphasized.

NUND 233. Human Growth and Development (1)
Introduction to the theories, concepts and nursing applications relevant to the physical, psychological and social growth and development across the lifespan.

NUND 234. Introduction to Human Genetics (1)
Introduction to the theories and concepts relevant to genetics and embryological development of humans.

NUND 315. 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 225.

NUND 316. 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. Prereq: NUND 225 and 3-credit hour Growth and Development course.

NUND 317. 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 223, NUND 225.

NUND 319. Public Health Nursing (4)
This course focuses on factors influencing the health of groups, communities, and populations. The student will examine relevant concepts, theories, research, and emerging public health issues. Principles of epidemiology will be addressed. Strategies for public health nursing interventions will be designed and implemented. Prereq: NUND 223, NUND 225.

NUND 341. 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. Prereq: Enrolled in 4th semester of N.D. pre-licensure program, or permission of course faculty.

NUND 342. Medical Microbiology, Immunity, and Infectious Diseases (3)
Microbial structure, growth, genetics, and metabolic control function and dysfunction of the human immune response. Manifestations of infectious disease and review of selected infectious diseases.

NUND 342L. Medical Microbiology Lab Methods (1)
This course provides laboratory experience in basic medical microbiologic techniques used for infection control, antibiotic sensitivity testing and infectious disease differential diagnosis. Prereq or Coreq: NUND 342.

NUND 343. 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. Prereq: Enrolled in 4th semester of N.D. pre-licensure program, or permission of course faculty.

NUND 400. Guided Study (1-6)
Selected topics in basic nursing. May include clinical experiences.

NUND 410. Health Assessment (2)
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.
NUND 412. Human Anatomy and Physiology (5)
This course provides a review of the normal embryologic development, anatomy and physiology of the major body systems. Basic biochemical and cellular control mechanisms will be reviewed, with emphasis placed on their impact on normal and compensatory physiologic function. Coreq: NUND 412L or permission of instructor.

NUND 412L. Human Anatomy and Physiology Cadaver Lab (1)
This course provides the student with an observational laboratory of human cadaver dissection. Pre-req: NUND 412 or BIOL 348/448 or permission of instructor.

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 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 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. Cross-listed as 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. Pre-req: NUND 478. Cross-listed as NURS 619.

NUND 480. 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. Pre-req: NUND 479 or consent of instructor. Cross-listed as NURS 620.

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). Pre-req: NUND 480. Cross-listed as NURS 621.

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. Pre-req: Graduate standing in Nursing or consent of instructor.

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 or permission of instructor.

NUND 495. Population-Based Maternal-Child Nursing: Issues, Research, Policy & Inter (3)
Prereq: NUND 493.

NUND 496. Population-Based Maternal-Child Nursing: Issues, Research, Policy & Inter (3)
Prereq: NUND 495.

NUND 499. Internship in Nursing Informatics (5)
This capstone experience consists of four components: the preceptored 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. Pre-req: Completion of first year of M.S.N.

COURSE DESCRIPTIONS (NUNI)

NUND 421. Theoretical Foundations of Nursing Informatics (4)
This course focuses on the practice of Nursing Informatics through the examination of concepts, theories, models, and phenomena relevant to the discipline. Conceptual and functional components of information management will be discussed along with their application within the health care setting. Nursing language concepts will be discussed including the Nursing Minimum Data Set, NIC, NOC, NANDA, as well as various specialized data sets used in health care. Pre-req: Admission to the M.S.N. program.

NUND 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 health care. Pre-req: NUND 421, MIDS 409, NURS 471.

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. Pre-req: NURS 521.

NUND 505. D.N.P. Project (1-6)
Systematic completion of a project based on existing educational or clinical research. The project could include: (1) program needs assessment, (2) development and testing of an assessment instrument/protocol for clients, (3) implementation and evaluation of a new program; or evaluation of a major existing program. The evaluation may include financial, clinical, or educational components as appropriate to the project. The project will be developed under the supervision of the student's N.D. project committee. Pre-req: NURS 521.

COURSE DESCRIPTIONS (NUNP)

NUNP 401. Health Promotion in Children and Adolescents (2)
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 the health of children and their families are emphasized in the professional role development of students. Coreq: NUNP 410.

NUNP 402. Common and Acute Health Problems of Children (6)
This course introduces the common and acute health problems occurring in infancy through adolescence using a bio/psycho/social/cultural approach. Pathophysiology, assessment and diagnostic strategies specific to acute and common problems in children will be emphasized. Nursing strategies used to enhance, maintain and restore health will be discussed. Pre-req: NURS 453, NURS 459, NUNP 410, and NUNP 430. Coreq: NURS 430.
NUNP 403. Advanced Management in Pediatric Primary Care (5)
This course focuses on the primary rehabilitative health care concepts specific to the management of complex, multidimensional health problems experienced by infants, children and adolescents within the context of their family and community environments. Pathophysiology, assessment and diagnostic strategies specific to complex health problems in children are emphasized. The selection of clinical interventions, clinical decision making and evaluation of strategies used to enhance the health outcomes of children and their families will be stressed. Emphasis will be placed on the consultation and referral processes within interdisciplinary and multidisciplinary teams. Prereq: NUNP 402.

NUNP 404. Neonatal Nurse Practitioner I (3)
This course introduces the role of the Neonatal Nurse Practitioner and concepts relevant to the management of the well or ill neonate. Analysis of nursing strategies to optimize health-seeking behaviors in families with well or ill neonates is highlighted. 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 on-going rehabilitative care 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 risks. The course provides the basis for problem identification, decision making, advanced therapeutics, and case management. Prereq: Admission to program. Coreq: NUNP 405.

NUNP 419. Family Health Nursing: Health of Adults and Older Adults (5)
This course introduces the student to the practice of primary health care of adults and older adults. The course includes the principles of growth and development, health promotion, disease prevention, and management of common acute and chronic health problems. Emphasis is placed on the biological, psychological, social and cultural aspects of care. Pathophysiology, assessment and diagnostic techniques specific to the acute and common problems are stressed. Nursing strategies related to health problems used to enhance, maintain, and restore health are emphasized; health-seeking behaviors and the impact on family are stressed. Prereq: NURS 430, NURS 453, NURS 459, and NUNP 410. Coreq: NURS 430.

NUNP 429. Family Health Nursing: Health of the Family During Childbearing Years (4)
This course introduces the influence of family dynamics on the care of women and their families before pregnancy, during pregnancy and within the interconceptional period. Assessment of physical and psychosocial health and deviations is central to the course. Content also includes principles of education for childbearing, parenting and conception control. Nursing strategies to optimize health-seeking behaviors of the family during the childbearing years are emphasized. Prereq: NUNP 410 or NUNP 419.

NUNP 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 430, NURS 453, NURS 459, and NUNP 410. Coreq: NURS 430.

NUNP 433. Common and Acute Health Problems of the Adult II (3)
This course is a continuation of NUNP 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.

NUNP 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: NUNP 433.

NUNP 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: NUNP 429.

NUNP 443. Acute Health Problems of the Adult (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.

NUNP 444. Advanced Management of Acutely Ill Adults (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: NUNP 443.

NUNP 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: NUNP 419.

NUNP 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: NUNP 449. Coreq: NURS 442.

**COURSE DESCRIPTIONS (NURS)**

**NURS 110. Foundations of the Discipline (1)**
The 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. Critical historical influences that affected the development of contemporary nursing will be discussed. Selected trends and issues that will guide future nursing practice will conclude this course.

**NURS 111. Foundations of Practice (3)**
This course is designed as a foundation for clinical nursing practice in relation to the concepts of communication, safety and comfort. The three concepts will be applied to the application of fundamental nursing care. The basic components of the nursing process are presented as a framework for beginning clinical practice.

**NURS 120. Nursing Informatics I: Introduction (2)**
This course focuses on the application of mathematics for nursing, including algebra and biostatistics. Microcomputer, word processing and information concepts for nursing practice will be introduced.

**NURS 122. Nursing Assessment (3)**
The focus of the course is on psychosocial and physical assessment of patients in a variety of settings. Data collection essential to the nursing process will focus on the adult and geriatric populations. Prereq: C or higher in BIOL 115.

**NURS 160. 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 the 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 Schlofield Public Lectures related to issues contributing to disparities in health care. Prereq: NURS 160 or permission of instructor.

**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 Schlofield Public Lectures related to issues contributing to disparities in health care. Prereq: NURS 110.

**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 115.

**NURS 222. Nursing Informatics II: Biostatistics (1)**
This course focuses on advanced concepts in quantitative methods for nursing, including application to nursing problems, and solution strategies using computer software. Prereq: NURS 120.

**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; BIOL 115. 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: Completion of 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 115, 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 Schlofield Public Lectures related to issues contributing to disparities in health care. Prereq: NURS 110.

**NURS 301. Community Engagement Seminar IV (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 Schlofield 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 child bearing 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 317, NURS 342, and C or higher in SOCI 203.

**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, and C or higher in SOCI 203.
The focus of this course is directed toward the NIS (2) NURS 345. Nursing Informatics III: Clinical ethical dilemmas common to modern health care. case analysis, to apply the theories in addressing of rational decision making. Fundamental theories the principles underlying ethical issues and methods This course is designed to introduce the student to NURS 343. Issues and Ethics in Health Care. Prereq: Completion of three semesters of B.S.N. program.

NURS 320. Nursing Research (3) Introduction to scientific inquiry and research process in nursing. Discussion of issues and problems in systematically evaluating reports of empirical re- search on nursing phenomena. Appropriate use of the nursing research literature and research findings in clinical practice is discussed. Prereq: RN license.

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 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 technolo- gies 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. 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 seven semesters in B.S.N. program.

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 depres- sion. The course will also include content on assessment 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, 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. Clini- cal practice is directed toward the care of acutely ill adults. Prereq: NURS 320, NURS 345, NURS 351, and NURS 353.

NURS 353. Principles of Critical Care I (4) This course provides the knowledge and technical skills foundational to the care of critically ill pa- tients. Clinical practice is directed toward the care of the critically ill patient with a focus on patient assessment, use of biomedical technology, development of psychomotor skills, and planning basic care. Prereq: NURS 315, NURS 316.

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 directed towards the care of the critically ill patient with a focus on use of biomedical tech- nology, planning and managing patient care, and beginning care of patients with complex care needs. Prereq: Grade of B or higher in NURS 353. Con- sent of instructor.

NURS 356. Nursing Care of Critically Ill Neo- nates, 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. Em- phasis is on nursing strategies directed toward the application of basic principles of critical care nurs- ing with attention to special needs of critically ill neonates, infants and children and their families. Prereq: Grade of B or higher in NURS 316. Con- sent of instructor.

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 reflec- tion and evaluation of the field experience. In addition, each semester will include required attendance at the Rotella Schiorfeld Public Lectures related to issues contributing to disparities in health care. Pre- req: NURS 310. Coreq: NURS 351, NURS 353.

NURS 370. Information Technologies in Health (1) The focus of this course is the application of ad- vanced information and communication technolo- gies in the health care of communities and popula- tions. Building on a base of consumer informatics, the course will explore Geographic Information Systems (GIS), data mining techniques, telemed- cine technology, and advanced communication technologies in the context of global health. Pre- req: NURS 345. Coreq: NURS 343, NURS 371, NURS 372, 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, stu- dents will discover strategies to assess, plan, imple- ment and evaluate population-focused programs for health promotion and disease prevention. Prereq: NURS 351 and NURS 353. Coreq: NURS 343, NURS 370, NURS 372, 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 351 and NURS 353. Coreq: NURS 343, NURS 370, NURS 371, NURS 372.

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 preceptored, 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 351, NURS 353. Coreq: NURS 343, NURS 370, NURS 371, NURS 372.

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.

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 management. Topics such as strategic planning, resource management, organizational structure, legal issues, and delegation will be explored. Prereq: 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. Prereq: RN license.

NURS 399. Independent Study (1-12)
Independent guided study for undergraduate students with special needs or interests. Prereq: Permission of the program director.

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 degree in Statistics. Prereq: STAT 201 or equivalent.

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. Prereq: Certification in PALS and neonatal resuscitation. 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. Prereq: ACLS, PALS, and neonatal resuscitation certification. Prereq or Coreq: 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. Prereq: Grad student status and permission of the instructor.

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. Prereq: Consent of instructor.

NURS 410. Cardiovascular Nursing Seminar I (1)
This seminar course focuses on cardiac rhythm abnormalities and their management. Prereq: NURS 430 or concurrent enrollment, concurrent enrollment in 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 Neoneate 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.

This course is designed for graduate students in the health, social, and behavioral sciences. The focus is on exploring issues of human rights and social justice within the context of the current HIV/AIDS epidemic in Uganda. Offered in collaboration with Makerere University, this course includes site visits to community organizations and academic institutions in Uganda. Prereq: Graduate status or permission of instructor. Cross-listed as MPH 418.

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. It will provide experience in proposal development. Prereq: NUND 201 or STAT 201, and 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. Prereq: RN license or consent of instructor, NURS 453 recommended.
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: NURS 441.

NURS 443A. Collaboration, Consultation, & Credentialing in Advanced Practice Nurses (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 Practicum 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 elders” as well as those with identified mental disorders. Prereq: NURS 441, 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 and 496 or their equivalents, EPBI 494, NU RS 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. Prereq: 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. Prereq: RN license or consent of instructor.
NURS 460. Theoretical Basis of Nursing Interventions with Individuals (2)
Study of the theoretical basis of individual work with persons experiencing emotional crises and disturbances. The nurse therapist enhances the health-seeking behaviors of individuals as they strive to attain, maintain or regain optimal health. Emphasis on theories, psychotherapy, and crisis intervention. Prereq: Graduate standing in Nursing.

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 460.

NURS 462. Practicum and Supervision of Group and Family Therapy (2–3)
Direct care experience. 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 of clinical experience. Focus of supervision is on judgment, family and group intervention skills, and application of theory from analysis and interpretation of data. Prereq: NURS 467.

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 460 and NURS 462 and graduate standing or consent of instructor.

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. 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 goal of this course is to equip health professions students (medicine, nursing, and health administration) with the ability and confidence to contribute to continual improvement in health care. Through seminar and field experiences students will be given the opportunity to learn the philosophy, knowledge and skills of continuous quality improvement, teamwork and interdisciplinary work. The focus is on collaborative work for the benefit of patients and communities. Prereq: Consent of instructor. Cross-listed as EPBI 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)
(See EPBI 408.) Cross-listed as EPBI 408.

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. Prereq or Coreq: 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. Prereq: 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.

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 conduct 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-Professional & 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 504. Nursing Theory (3)
Theory development in nursing, issues in theory development, and uses of theory. Seminar discussions. Prereq: One year of graduate study in Nursing or consent of instructor.

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.
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 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 537. 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 (2-5)
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 Practicum (9)
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.
NURS 578. Curriculum and Instruction (3)
(See NUND 478.) Cross-listed as NUND 478.

NURS 579. Public Policy and Aging (3)
(See EPBI 408.) Cross-listed as EPBI 408.

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. Prereq: Ph.D. standing, written consent of instructor.

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)
(See NUND 479.) Prereq: NURS 578. Cross-listed as NUND 479.

NURS 620. Action Research and Program Evaluation (1)
(See NUND 480.) Prereq: NURS 619. Cross-listed as NUND 480.

NURS 621. Teaching Practicum (2)
(See NUND 481.) Prereq: NURS 620. Cross-listed as NUND 481.

NURS 630. Advanced Statistics: Linear Models (3)
This course is focused 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, log-linear, mixed models). Prereq: NURS 531, NURS 630, NURS 532, NURS 530.

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. Prereq: Permission of Candidacy Chair.

NURS 701. Dissertation Ph.D. (1-18)

NURS 703. Dissertation Fellowship (1-8)
THE FOLLOWING FOUR-LETTER COURSE IDENTIFICATION CODES ARE USED AT CASE WESTERN RESERVE UNIVERSITY. THEY MUST BE USED WHEN ENTERING COURSES ON THE SCHEDULE FORM DURING REGISTRATION (E.G., ENGLISH 150 WOULD BE LISTED AS ENGL 150).

ACCT, Accounting
ADHT, Adolescent Health
AMST, American Studies
ANAT, Anatomy
ANES, Anesthesiology
ANTH, Anthropology
APMU, Applied Music
ARSC, College Scholars Program
ARTH, Art History
ARTS, Art Studio and Art Education
ASIA, Asian Studies
ASTR, Astronomy
BAFI, Banking and Finance
BETH, Bioethics
BIOC, Biochemistry
BIOL, Biology
BLAW, Business Law
BSTP, Biomedical Sciences Training Program
CBIO, Cellular and Molecular Biology
CHEM, Chemistry
CHIN, Chinese
CHST, Childhood Studies
CIAR, Art Courses at CIA
CLBY, Cell Biology
CLSC, Classics
CMPL, Comparative Literature
COOP, Cooperative Education
COSI, Communication Sciences
CRSP, Clinical Research Scholars Prog
DENC, Dentistry (Clinical)
DEND, Dentistry (Didactic)
DENT, Dentistry
EBME, Biomedical Engineering
ECES, Computer Engineering and Science
ECHE, Chemical Engineering
ECIV, Civil Engineering
ECON, Economics
EDJC, Education at John Carroll
EDMP, Executive Doctor of Management
EDUC, Education
EEAP, Electrical Engineering and Applied Physics
EECS, Electrical Engineering and Computer Science
EMAC, Macromolecular/Polymere Science
EMAE, Mechanical and Aerospace Engineering
EMSE, Materials Science and Engineering
ENGL, English
ENGR, Engineering Science
ENTP, Entrepreneurship
EPBI, Epidemiology and Biostatistics
EPOM, Practice Oriented Masters Program
ERAS, Courses from Erasmus University
ESCI, Systems, Control and Industrial Engineering
ESTD, Environmental Studies
EVHS, Environmental Health Sciences
EXAM, ExaminationsMaster's and Ph.D.
EXCH, Int'l Exchange Program
FAMD, Family Medicine
FRCH, French
GEOL, Geological Sciences
GENE, Genetics
GERO, Gerontological Studies
GREK, Greek
GRMN, German
HDEV, Human Development
HUMN, Humanities
IBIS, Integrated Biological Sciences
IBMS, Integrated Biological Studies
IIME, Inst for Integr of Mgmt & Engr
INTH, International Health
INTL, International Studies
ITAL, Italian
JAPN, Japanese
JRAP, Junior Year Abroad
LAPP, Law and Public Policy
LATN, Latin
LAW, Law
LCAN, Canadian Law Courses
LHRP, Labor & Human Resource Policy
LITR, Literature
LLM, LLM Tax Program
MAN, Mandel Center for Nonprofit Organizations
MAPH, Mathematical Physics
MATH, Mathematics
MBAC, MBA Core
MBIO, Molecular Biology and Microbiology
MEDT, Medical Technology
MGMT, Management
MIDS, Information Systems
MKMR, Marketing
MPHP, Public Health
MUSC, Music and Music Education
MVIR, Molecular Virology Training Prg
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
RBIO, Reproductive Biology
RLGN, Religion
RSCH, Graduate Summer Research
RUSN, Russian
SASS, School of Applied Social Science
SMAB, Semester in Absentia
SOCI, Sociology
SPAN, Spanish
SPPP, Problem, Policy, Program (MSASS)
SRAB, Senior in Absentia
SRCH, Research (MSASS)
SSBT, Socio-Behavioral Theory (MSASS)
SSWM, Social Work Practice Methods (MSASS)
STAT, Statistics
THTR, Theater Arts
UGSP, Undergraduate Scholars Program
UNIV, University Studies
WASH, Washington Semester
WSTD, Women's Studies

PROGRAM CODES

This is a list of all coding used for academic programs 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, minors and for majors no longer offered. It is necessary to maintain this list in its entirety for purposes of maintaining historical records.

ACCT, Accounting
AFR, Auditing & Financial Reporting
AIN, Artificial Intelligence
AMN, Amer Stud & Museum Stud
AMS, American Studies
ANA, Anatomy
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<th>Abbreviation</th>
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<td>ANE</td>
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UNIVERSITY ABBRévIATIONS
The following abbreviations are used at Case Western Reserve University and appear in this publication.

AACSB, American Assembly of Collegiate Schools of Business
AADSAS, American Association of Dental Schools Application Service
AAMC, Association of American Medical Colleges
ACT, American College Testing Program
ALA, American Library Association
ALAS, Auxiliary Loan to Assist Students
AMCAS, American Medical Colleges Application Service
ANA, American Nurses’ Association, Inc.
ARRCC, Andrew R. Jennings Computer Center
CIA, Cleveland Institute of Art
Special Program for Students in the Health Sciences
TOEFL, Test of English as a Foreign Language
UPB, University Program Board
USG, University Student Government
WSOM, Weatherhead School of Management