

**April 8, 2009**

## **Numerical Analysis Syllabus**

### **Numerical Linear Algebra**

QR factorization and least squares: orthogonality of vectors and matrices, norms, SVD, projectors, Gram-Schmidt orthogonalization, Householder triangularization, least squares solution methods

Conditioning and stability: Floating point arithmetic, stability and backward stability of algorithms for matrix orthogonalization and back substitution. Conditioning and stability of least squares problems

Gaussian elimination, pivoting, stability. Cholesky factorization.

Eigenvalues: overview and power method. Rayleigh-quotient iteration, inverse iteration. QR algorithms without and with shifts.

### **Interpolation and approximation**

Polynomial interpolation: monomial, Lagrange and Newton representation.

Trigonometric approximation: Discrete Fourier transform and Fast Fourier transform

L. N. Trefethen: Numerical Linear Algebra, SIAM 1996