

ACMS 40395 / 60395 - Numerical Linear Algebra

Textbook: Lloyd N. Trefethen and David Bau, III, Numerical Linear Algebra, SIAM, 1997. ISBN: 0-89871-487-7. **(Note: the book may not be exactly followed)**

Pre-requisite: For ACMS 40395: Numerical Analysis (ACMS/MATH 40390), Linear Algebra (ACMS 20620 / MATH 20610). For ACMS 60395: Numerical Analysis I (ACMS 60690).

Course description: The course will cover numerical linear algebra algorithms which are useful for solving problems in science and engineering. Algorithm design, analysis and computer implementation will be discussed.

Topics to be covered (subject to change due to time limit)

1. Review of fundamental knowledge: orthogonal vectors and matrices, norms, the singular value decomposition.
2. QR factorization, Gram-Schmidt orthogonalization, Householder triangularization, Least Squares.
3. Conditioning and condition numbers, stability of Householder triangularization, stability of back substitution, stability of Least Squares algorithms.
4. The spectral radius, matrix splittings and stationary iterative methods, conjugate gradient iteration, GMRES iteration, Krylov subspace methods.
5. Eigenvalue problems, Rayleigh quotient, QR algorithms, computing the SVD.
6. Topics related to problems in numerical PDEs.