MATH 6610
ANALYSIS OF NUMERICAL METHODS
Autumn Semester, 2012

Time and Place:	MWF 11:50-12:40, JWB 208
Instructor:	Professor Aaron Fogelson
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Office Hours:	To be arranged
Texts:	Trefethen and Bau, Numerical Linear Algebra, SIAM, 1997
	Demmel, Applied Numerical Linear Algebra, SIAM 1997
Another reference:	Golub and Van Loan, Matrix Computations, 3rd Ed, 1996 (encyclopedic reference)

The Course. Math 6610 is the first semester of a two semester graduate-level sequence in numerical analysis. The first semester focuses primarily on numerical linear algebra. The second semester focuses primary on numerical methods for solving differential equations.

Homework. Homework will be assigned and collected, and will consist mostly of theoretical analyses and computational experimentation. The latter should be done using MATLAB.

6610 Topics:

i) Some familiar fundamentals, ii) SVD, iii) Projections, iv) QR factorization, v) Application of QR to Least Squares problem, vi) Issue of finite-precision arithmetic, stability of algorithms, and sensitivity of problems (conditioning), vii) Gaussian elimination and its variants for solving a linear system, viii) Eigenvalue problems and algorithms, ix) Iterative methods for linear systems: classical methods (Jacobi, Gauss-Seidel, SOR); Krylov subspace methods (conjugate gradient)

6620 Topics: i) A brief introduction to polynomial interpolation and numerical integration, ii) Theory of Linear Multistep Methods for ODEs, iii) Derivation and analysis of finite-difference methods for hyperbolic, parabolic, and elliptic PDEs, iv) Possible additional topics: Derivation and analysis of finite-element methods for ODEs and PDEs; Spectral methods for PDES; Multigrid methods; Newton-type methods for multidimensional nonlinear systems and optimization.

ADA Statement The Americans with Disabilities Act requires that reasonable accommodations be provided for students with physical, sensory, cognitive, systemic, learning and psychiatric disabilities. Please contact me at the beginning of the quarter to discuss any such accommodations for the course.