MATH 6304
Theory of Matrices
Fall 2012

Class: T&Th 11:30am-1:00pm, SW 219

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Office: PGH 604; Mo 2-3pm, We 1-2pm

Objectives: This course covers topics in linear algebra and matrix theory that have proven to be important in analysis and applied mathematics. We assume that the student is familiar with standard concepts and results from linear algebra and basic analysis. We will study canonical factorizations of matrices, including the QR, triangular and Cholesky factorizations. We will develop ways to achieve the Jordan canonical form. We will study eigenvalue perturbation and estimation results and we will study special families of matrices such as positive definite, Hermitian, Hankel, and Toeplitz matrices. Matrix analysis relies on concepts from analysis, such as limits, continuity and power series, to get results in linear algebra.

Contents:

Topic	*Approximate Time*
Spectral theory and similarity	1 week
Schur's triangularization, normality and QR decomposition	2 weeks
Jordan normal form	2 weeks
Hermitian and symmetric matrices	1 week
Courant Fischer theorem	1 week
Eigenvalue interlacing	1 week
Perturbation of eigenvalues	1 week
Positive definite matrices and Cholesky factorization	1 week
Singular value and polar decompositions	1 week
Non-negative matrices	1 week

Prerequisites: Math 4377 and 4331 or Math 6377.

Text: Matrix Analysis, by Roger A. Horn and Charles R. Johnson, Cambridge University Press, 1985, ISBN 978-0-521-38632-6.

Assignments: You will be asked to take turns and typeset class notes. The notes will be posted online.

Final Grade: Based on the accuracy and quality of your prepared notes.