Course Syllabus Spring Semester 2010

MAT 5293.001 Numerical Linear Algebra MW 4:00-5:15 pm MS 2.01.06

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MY SPRING 2010 TEACHING SCHEDULE:
MAT 5293.001 MW 4:00-5:15 pm MS 2.01.06 Numerical Linear Algebra
MAT 5663.001 MW 5:30-6:45 pm HSS 3.04.06 Ordinary Differential Equations II
MAT 6603.001 MW 7:00-8:15 pm MS 2.02.52 Optimization Techniques/Operations Research

Textbook: Numerical Linear Algebra, Lloyd Trefethen and David Bau, SIAM, ISBN 978-0-898713-61-9. Lectures and problem assignments will follow the textbook closely, so it is necessary to have access to a copy.

GRADING: Beginning graduate students should review the pages in the Graduate Catalog relating to grades. Problem sets assigned on a (roughly) weekly basis will determine 45% of your grade, an in-class midterm exam 25%, and a final exam 30%. At my discretion, there may be a final assignment instead of an in-class final exam; it will consist of your reading through a survey article in the field and making a written/oral presentation. Note that class will meet during the final exam period regardless. This is a graduate course and I reserve the right to make minor modifications to the grading scheme to reflect how the class as a whole progresses with the material.

COURSE DESCRIPTION: 5293 Numerical Linear Algebra (3-0) 3 hours credit. Prerequisite: MAT 2233 or an equivalent. Direct and iterative methods for solving general linear systems, the algebraic eigenvalue problem, least squares problems, and solutions of sparse systems arising from partial differential equations. (Same as CS 5293. Credit cannot be earned for both MAT 5293 and CS 5293.)

COURSE OBJECTIVE: The course is designed to enable a student to attain mastery of the elements of modern numerical linear algebra, particularly as they relate to the large scale computational challenge problems in the sciences and engineering. Note that MAT 2233 is a prerequisite and I will assume that all students have familiarity with Gaussian elimination (LU-factorization) and the basic concepts concerning linear spaces, linear transformations, and scalar products. As we discuss the various matrix factorizations, LU, SVD, QR, etc, it is important that you start with a solid understanding of elimination and more generally reduced row echelon form. There are several good reference books for the undergraduate material including those by Strang. Note also that while Calculus III (MAT 2213) is not a formal prerequisite for MAT 5293, we will need to minimize/maximize functions of several variables in our development of least-squares. Our interest will be in understanding the mathematics behind the various algorithms, but it is important that you understand implementation issues and are able to define an algorithm using pseudo-code. Actually programming assignments will be minimal and can be implemented using Matlab or Sage.

DATES TO REMEMBER:
January 11 - First Day of Classes
January 27 - CENSUS DATE
February 10 – In-class midterm exam
February 19 – Midterm Grades due
March 15-19 – Spring break
March 22 – Last Day to drop
May 7, Friday, 1:30-4:00pm - Final Exam