# MATH 466 Numerical Linear Algebra with Applications Spring 2005

## **Course Information:**

- Class Location & Time: PH0304, MW 4:30-5:45pm
- Instructor: Dr. Koung Hee Leem, kleem@siue.edu, 650-2366, SL 1331, Office Hours : MT 9:00-11:00am, or by appointment.

#### Course Website: http://www.siue.edu/~kleem/math466.html

Pay close attention to the course website. Project assignments and other information will be posted.

**Textbook:***Numerical Analysis, 7th edition* by R. Burden and J. Faires. **Prerequisite:** MATH 135, 250, 305, 321, CS 140 or 141.

## **Course Description:**

This course is about matrix computations (linear system solvers, eigenvalue/vector approximations and nonlinear system solvers). The class will cover direct and iterative methods for linear systems, approximation for eigenvalues, solution of nonlinear systems, numerical solution of ODE and PDE boundary value problems, function approximation.

- 1. Chapter 1, Math Preliminaries
  - 1.2 Roundoff Errors and Computer Arithmetic
- 2. Chapter 6, Direct Methods for Solving Linear Systems
  - 6.1 Linear Systems of Equations
  - 6.2 Pivoting Strategies
  - 6.3 Linear Algebra and Matrix Inversion
  - 6.4 The Determinant of a Matrix
  - 6.5 Matrix Factorization
  - 6.6 Special Types of Matrices
- 3. Chapter 7, Iterative Techniques in Matrix Algebra
  - 7.1 Norms of Vectors and Matrices
  - 7.2 Eigenvalues and Eigenvectors
  - 7.3 Iterative Techniques for Solving Linear Systems
  - 7.4 Error Bounds and Iterative Refinement
- 4. Chapter 9, Approximating Eigenvalues
  - 9.1 Linear Algebra and Eigenvalues
  - 9.2 The Power Method
  - 9.3 Householder's Method
  - 9.4 The QR Algorithm
- 5. Chapter 10, Numerical Solutions of Nonlinear Systems of Equations

- 10.1 Fixed Points for Functions of Several Variables
- 10.2 Newton's Method
- 10.4 Steepest Descent Techniques
- 6. Chapter 11, Boundary-Value Problems for Ordinary Differential Equations
  - 11.3 Finite-Difference Methods for Linear Problems
  - 11.4 Finite-Difference Methods for Nonlinear Problems
  - 12.1 Elliptic Partial Differential Equations

# Grading Scheme:

The final grade is based on standard grading scale: 100-90 A, 89-80 B, etc., and it will be based on exams and homework assignments, as follows:

20%	Projects
50%	Two Midterms
30%	<pre>Final("Comprehensive")</pre>

Three midterms are given on the following dates:

### February 23, April 13

Final exam is comprehensive and from 4:30-6:10pm on Monday, May 2.

#### **Important Notes:**

- Attendance at the class is <u>required</u>. Try to arrive ON TIME to each class meeting. When a class is missed, the student is responsible for material covered in class.
- Late Project is not accepted.
- All works on exams and assignments must be your own. The university has a straight forward policy on academic integrity.
- Make-up exam may be given for exams missed due to <u>unavoidable circumstances and compelling</u> situations which are documented.
- Incomplete will <u>not</u> be given as an alternative to a withdrawal.
- The course plan may be modified during the semester. All changes will be announced in class in advance. It is the student's responsibility to be informed of such announced changes.
- Students needing special academic accommodations and who have documented disabilities should make an appointment to discuss these accommodations. Students with disabilities are also encouraged to visit the SIUE Disability Support Services office located in Rendleman Hall, room 1218.

## **Important Dates:**

The last day to withdraw without receiving a grade is January 21. The last day to withdraw from a class without permission of advisor and instructor is March 25. After March 25, but before April 15, students may withdraw from a class but will receive a grade of WP or WE. To receive a WP, you must have a percentage of 60% or above when you drop.