MAP 4xxx, Numerical Methods for Computational Sciences
Spring, 2009
Dr. Constance Schober

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Course Description

Covering the traditional topics and error analysis, this course puts emphasis on the modern research tools and methods in numerical computation. The following topics will be covered: iterative method for solving linear systems, eigenvalue problem, singular-value decomposition, nonlinear optimization methods, Runge-Kutta methods, finite-difference scheme, finite element methods for solving differential equations, and interpolation and approximation of functions. In addition to the topics mentioned above, some key ideas of parallel computation in a shared memory environment and in a distributed memory paradigm will be introduced through the introduction of adaptive quadrature and matrix multiplication.

Course Requirements:

Students should have completed the Calculus sequence, either ordinary differential equations or linear and matrix algebra. Matlab will be the computing environment for all instruction. Students may use either C programming language or Matlab for homework assignments and projects.

Course Objectives:

To introduce the students to modern methods, techniques, and pitfalls in scientific computing; to present the basic mathematical foundations of numerical analysis; to enhance students' hands-on computing skills for solving problems numerically.

Required Texts

- K. Atkinson, *An Introduction to Numerical Analysis*, 2nd ed., John Wiley & Sons, 1989
- C.B. Moler, *Numerical Computing with Matlab*, 2nd ed., SIAM, 2008

Evaluation Procedures

Grade Categories	Description of the requirements	Weight toward final grade
Classroom participation	Pose questions, present homework problems	20%
Homework and Projects	Weekly homework, two projects	30%
Mid-term Exam	50 min in class test	20%
Final Exam	120 min in class test	30%

- Grading scale: A: 90-100, B: 80-89, C: 70-79, D: 60-69, F: <60

Additional Policies

Homework and projects	Students are encouraged to discuss homework and projects problems but the final write-up must be done individually.
Graded assignments	Selected homework and projects will be collected and graded.
Late, make-up and extra credit work	No late homework will be graded. Make-up tests are given if necessary. No extra credit work will be given.