Math 498: Numerical Analysis II (Winter 2008)

Lectures: MWF 8:30–9:20, PDL 036

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                     Course materials: Click on "Math 498".

Text: We will use course notes which can be downloaded from the course web page.

Another good reference (available in the Math Library) is: *A First Course in the Numerical Analysis of Differential Equations* by A. Iserles.

Course Description: The emphasis this quarter will be on numerical solution of initial value problems in ordinary differential equations. We also will discuss mathematical modeling and Monte Carlo methods. If time permits, we will cover some additional interesting topics in numerical linear algebra, such as Markov chains and how they are used in Google's PageRank algorithm. The topics to be covered are:

1. Mathematical modeling.

2. Monte Carlo methods.

3. Numerical differentiation.

4. Initial value problems in ODE's:

    (a) Examples of initial value problems; existence and uniqueness of solutions; difference methods – consistency, stability, convergence.

    (b) One-step methods. Euler's method, Richardson extrapolation, midpoint method, Runge-Kutta methods; analysis of one-step methods; practical implementation.

    (c) Multistep methods. Adams-Bashforth, Adams-Moulton, predictor-corrector methods.

    (d) Stability, instability, and stiff equations.

5. Markov chains and Google's PageRank, image compression and the SVD, linear programming for solving Sudoku puzzles, or other topics of interest.

There will be homework assignments (with MATLAB programming), a midterm, and a project due Tues., Mar. 18, at 8:30 am. This is the time that would normally be scheduled for our final, but we will use it instead for project presentations. You will need to use the MSCC or other computers. You can find information about the Mathematical Sciences Computing Center by typing: http://www.ms.washington.edu.

Grading: Homework will count 40%, the midterm will count 25–35%, and the project will count 25–35%. Late homework will be marked down by 10% of the total possible points for each day (or portion of a day) late; solutions to homework problems that have already been gone over in class will not be accepted.