Scientific Computing II
Math 225 – Spring 2009

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Course Synopsis

Prerequisites

Programming background in C/C++ or MATLAB or FORTRAN.

Synopsis of course content

This course will develop the theoretical and computational techniques for

- Approximation of functions - interpolation, extrapolation
- Numerical differentiation and integration
- Solution of initial value problems for ordinary differential equations
- Random number generators; simulation of Markov chains, basic techniques for one-dimensional Stochastic Differential Equations

Error analysis and formulation of convergent mathematical schemes will be used to derive stable, reliable, efficient, and accurate numerical methods for large classes of problems.

This course is a prerequisite for Math 226 and 227: Numerical Partial Differential Equations, parts I & II.

Textbooks One of:

- *An Introduction to Numerical Analysis*, 2nd Edition, by K. E. Atkinson
- *Elementary Numerical Analysis*, by K. E. Atkinson
- *Numerical Mathematics*, by A. Quarteroni, R. Sacco, F. Saleri

Other references:

- *Numerical Solution of Stochastic Differential Equations*, by P.E. Kloeden, E. Platen

Assignments

Weekly problem sets will include theory, analysis and computational projects. A written solution and hardcopy of every code, input or output must be submitted for each problem. An electronic copy of our code must also be submitted to me via e-mail, in a unique zip or tar/gzip file. Requests for extensions on homework should be done before the due data; unexcused late assignments will be penalized. You are encouraged to discuss the homework problems with your classmates, but your final submission must be entirely your own independent work (see the Duke Community Standard).

Exams

There will be a midterm and a final. Grade to be based on weekly assignments and exams.