Computer Sciences 323H
Scientific Computing – Honors

Course: CS 323H: Scientific Computing - Honors Section
Time: Tu-Th 12:30-1

Instructor: A. K. Cline
Office: Taylor 3.104 A
Office Hours: W 1-2, F 11-12, and by appointment

Web Site: http://www.cs.utexas.edu/users/cline/CS323H/
Email: cline@cs.utexas.edu

Assistant: TBA
Office: TBA
Office Hours: TBA
Email: TBA

Prerequisite: Consent of the instructor.

Exams: Two midterms each counting 20% of the final grade and a final exam counting 40% of the final grade.

Homework: Approximately ten assignments counting 20% of the final grade.

Text: Cleve B. Moler: *Numerical Computing with Matlab:*, SIAM. (Optionally students should consider obtaining: *The Student Edition of MATLAB*)

Course Outline:

1. Introduction to scientific computing

2. Basics of MATLAB

3. Floating point number systems
   - Errors in representation and arithmetic
   - Cancellation error

4. Linear systems of equations
   - Gaussian elimination
   - Norms and matrix condition numbers
   - Sparse and banded matrices

5. Interpolation
   - General, linear, and nonlinear
   - Splines

6. Nonlinear equations and Optimization
   - Root finding
   - Minimizing with one variable
   - Minimizing with several variables
   - Systems of non-linear equations
   - Least squares fitting

7. Integration
   - Polynomial based rules
   - Composite rules
   - Automatic and adaptive quadrature
   - Extrapolation

8. Initial Value Problems of ordinary differential equations
   - Runge-Kutta methods
   - Multistep methods