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

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Assistant: TBA
Office: TBA
Office Hours: TBA
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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