Instructor: D.W. Schwendeman (schwed@rpi.edu, 276-2647)

Office Hours: Wednesdays 3:30–5:00pm, Fridays 9:30–11:00am, or by appointment.

Course website: Linked from my homepage: http://www.rpi.edu/~schwed


Outline:

1. Introduction (Text sections 0.1–0.5)
   - Floating-point representations
   - Computer arithmetic
   - Elements of calculus (review)

2. Solving Nonlinear Algebraic Equations (Text sections 1.1–1.4)
   - Bisection method
   - Fixed-point iteration, rates of convergence
   - Limits of accuracy
   - Newton’s method

3. Solving Systems of Equations (Text sections 2.1–2.4, 2.6, 2.7)
   - Gaussian elimination, LU factorization
   - Sensitivity and conditioning, pivoting strategies
   - Special types of linear systems
   - Newton’s method for systems of equations

4. Interpolation and Data Fitting (Text sections 3.1, 3.2, 3.4, 4.1)
   - Polynomial interpolation, error formula
   - Piecewise polynomial interpolation, cubic splines
   - Least squares

5. Numerical Differentiation and Integration (Text sections 5.1–5.5)
   - Numerical differentiation
   - Numerical quadrature

6. Solving Initial-Value Problems for ODEs (Text sections 6.1, 6.2, 6.4–6.7)
   - Euler’s method; analysis of IVP solvers
   - Runge-Kutta methods, error estimation
   - Multi-step methods, explicit vs. implicit methods

Grading Policy:

- Course grades will be based on exams (two in-class exams and a final exam) and problem sets (a combination of pencil & paper problems and computing problems).
- The weights for these items are 70% for exams and 30% for homework.