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

Office Hours: Wednesdays 1:30–3:00pm, Fridays 9:30–11:00am, or by appointment.

Required Text:


Reference Texts:


Outline

1. Preliminaries (Chap. 1)
   Classification of PDEs, canonical forms and well-posed problems, behavior of solutions, characteristics. An introduction to finite difference methods.

2. Basics of Finite Difference Approximations (Chaps. 2 & 3)

3. Parabolic Equations (Chap. 4)
   Explicit and implicit methods for the heat equation, direction splitting and ADI schemes, convection-diffusion equations.

4. Hyperbolic Equations (Chaps. 5 & 6 + Refs.)
   Finite difference methods for the wave equation and high-order methods. First-order nonlinear equations, quasi-linear and conservation forms. Characteristics, shock waves and contact discontinuities. Finite volume methods. Godunov methods and Riemann solvers, high resolution schemes.

5. Elliptic Equations (Ref. Texts)
   Dirichlet and Neumann problems, solvability. Direct vs. iterative methods of solution. Relaxation and multigrid methods.

Grading Policy:

- Course grades will be based on Exams (midterm and final) and problem sets/computing assignments. The weights for these are 65% and 35% approximately.