MATH 589 – Numerical Methods for Partial Differential Equations

Course Description from Bulletin: The course introduces numerical methods, especially the finite difference method for solving different types of partial differential equations. The main numerical issues such as convergence and stability will be discussed. It also includes an introduction to the finite volume method, finite element method and spectral method. (3-0-3).

Enrollment: Elective for graduate student

Textbook(s): K. W. Morton and D. F. Mayers, *Numerical Solution of Partial Differential Equations,* Cambridge, 2nd Edition

Other required material:

Prerequisites: Undergraduate courses in numerical methods (such as Math 350) and in partial differential equations (such as Math 489), or consent of the instructor

Objectives:

1. Students should learn the principles for designing numerical schemes for PDEs, in particular, finite difference schemes.
2. Students should learn to make a connection between the mathematical equations or properties and the corresponding physical meanings.
3. Students should be able to analyze the consistency, stability and convergence of a particular, 30m(l)-a

b. CFL condition and Fourier analysis
c. Upwind scheme and Lax-Wendroff scheme
d. Finite volume schemes
e. Conservation properties