MAE 502 Partial Differential Equations in Engineering
Spring 2010 Mon/Wed 6:30-7:45 PM

Instructor: Huei-Ping Huang (hp.huang@asu.edu), ISTB2 Room 219A
Office hours: Monday 3:30-5:00, Tuesday 1:30-3:00

Course website http://www.public.asu.edu/~hhuang38/MAE502.html

Course Outline

I. Analytic treatment for linear PDE

1. Overview of PDE
   Commonly encountered PDEs in engineering and science
   Types of PDEs, the physical phenomena they represent, and relevant boundary conditions
2. Method of separation of variables; eigenfunction expansion
3. Short review of Sturm-Louville Problem and orthogonal functions;
   Representation using orthogonal basis
4. Fourier Series
   Solution of ODE and PDE by Fourier Series expansion
5. Fourier transform (and Laplace transform)
   Solution of PDE by Fourier transform; Behavior of solution in spectral space
6. PDE in non-Cartesian geometry

II. Numerical methods for PDE

7. Numerical methods for Laplace's equation and heat equation (short introduction)

III. Additional topics

8. Very brief introduction to nonlinear PDE
   Examples of nonlinear PDEs for real world phenomena; Behavior of their solutions
   Conservation laws
9. Method of characteristics; Solutions of nonlinear/quasilinear equations.
10. Miscellanies (while time allows)
    Green's function; Application of Green's function to ODE and PDE
    Similarity solution

Textbook: *Applied Partial Differential Equation*, by R. Haberman, **Required**

Additional lecture notes/slides will be provided by instructor

Grade: Homework 50%
Midterm (one exam) 20%
Final 30%