MAE/MSE 502 Partial Differential Equations in Engineering
Spring 2014 Monday/Wednesday 6:00-7:15 PM, PSF 173

Instructor: Huei-Ping Huang (hp.huang@asu.edu), ERC 359
Office hours: Tuesday 3-5 PM, Wednesday 2-3 PM, or by appointment

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. Fourier Series
   Solution of ODE and PDE by Fourier Series expansion
4. Short review of Sturm-Louville Problem and orthogonal functions;
   Representation using orthogonal basis
5. Fourier transform
   Solution of PDE by Fourier transform; Behavior of solution in spectral space
6. PDE in non-Cartesian geometry
7. Forced problem and brief introduction to Green's function

II. Additional topics

8. Comparison of numerical and analytic methods for Laplace's equation and heat equation
9. Very brief introduction to nonlinear PDE
   Examples of nonlinear PDEs for real world phenomena; Behavior of their solutions; Conservation laws
10. Method of characteristics; Solutions of nonlinear/quasilinear equations.
11. Miscellanies (while time allows)

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

Additional lecture notes/slides will be provided by instructor

Grade: Homework 50% Midterm 20% Final 30%

Useful links

ASU policy on academic integrity: https://provost.asu.edu/academicintegrity
Campus safety and security: https://provost.asu.edu/University-Safety-Security
Grade and grading policies: https://students.asu.edu/grades
Counseling and consultation: https://students.asu.edu/counseling
SEMTE advising: http://engineering.asu.edu/semte/Advising.html

ASU common software/applications portal: https://apps.asu.edu (login required)
MATLAB searchable online documentation: http://www.mathworks.com/help/techdoc/?s_iid=ML2013_bb_doc
MATLAB online tutorial: http://www.mathworks.com/products/matlab/examples.html