NE 548
Engineering Analysis II
TR 11:00-12:15 in Engineering Hall 1209

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Textbook 1 Required: *Advanced Mathematical Methods for Scientists and Engineers*, Bender and Orszag, Springer.

Textbook 2 Recommended: *Applied Partial Differential Equations*, Haberman, Pearson/Prentice Hall. This text is recommended because some of you may already own it (from Math 322). Almost any intermediate-advanced PDEs text would be suitable alternative as reference.

Grading: Your grade for the course will be based on two take-home midterm exams and selected homework solutions.

Midterm 1: Given out Thursday March 6, 2014 and due Thursday March 13, 2014.

Midterm 2: Given out Thursday May 1, 2014 and due Thursday May 8, 2014.

Course Goals: To learn techniques commonly used to solve of ODEs and PDEs that arise in engineering and science problems. Examples are fluid boundary layers, WKB analysis of Schrodinger's equation, and multiple-scale analysis of dispersive wave equations (*e.g.*, plasma turbulence).

Course Outline

Part I: Intermediate-Advanced Topics in ODEs from Bender and Orszag.

1. Review of local analysis of ODEs near ordinary points, regular singular points and irregular singular points (BO Chapter 3, 1.5 weeks)
2. Global analysis using boundary layer theory (BO Chapter 9, 1.5 weeks).
3. Global analysis using WKB theory (BO Chapter 10, 1.5 weeks).
4. Green's function solutions (1 week)
5. Multiple-scale analysis (BO Chapter 11, 1.5 weeks).

Part II: Intermediate-Advanced Topics in PDEs

1. Review of Sturm-Liouville theory and eigenfunction expansions (1.5 weeks)
2. Non-homogeneous problems and Green's function solutions (1.5 weeks)
3. Infinite domain problems and Fourier transforms (1.5 weeks)
4. Quasilinear PDEs (1.5 weeks)
5. Dispersive wave systems (time remaining)