UNIVERSITY OF BRITISH COLUMBIA

MATH 257/316-SECTION 951   SUMMER II 2015

PARTIAL DIFFERENTIAL EQUATIONS

Textbook: *Elementary Differential Equations and Boundary Value Problems*, 10th edition, by William E. Boyce and Richard C. DiPrima. The textbook is available at the UBC Bookstore. ISBN 10 digit: 0470458313. ISBN 13 digit: 978-0470458310. This book is available at the UBC Bookstore.

This textbook is *optional*, and students may choose to rely solely on provided lecture notes.

Prerequisite: Calculus I, II, III, Linear Algebra, and Ordinary Differential Equations.

Grading:

- Weekly homework (14%) due Tuesdays, the first is due on July 14, 2015;

- Two 50-minute midterm exams (18% each): Midterm Exam 1 is on July 24, 2015 (Friday); Midterm Exam 2 is on August 07, 2015(Friday).

- One 150-minute final exam (50%).

Policies:

1. No calculators or notes are allowed in the midterm and final exams.

2. Homework assignments are to be handed in at the beginning of class on Tuesday. Solutions will be posted on my webpage.

3. Permission to shift the weight of your missed midterms to other exams, or to ignore missed assignments, may be granted only in the following circumstances: (a) prior notice of a valid, documented absence (e.g. out-of-town varsity athletic commitment with a letter from a coach) on the scheduled date; or (b) notification to the instructor of absence due to a medical condition with a doctors note. Otherwise, a score of 0 will be given for the missed midterms/assignments.

Section 951 Instructor: Dr. Mingfeng Zhao, ESB 4122, phone 604-822-2159, mingfeng@math.ubc.ca.

Office Hours Location: *Leonard S. Klinck Building 300C*

Office Hours: *TueWedThuFri: 12:40PM–01:40PM* or By Appointment

Section 951 homepage: `http://www.math.ubc.ca/~mingfeng/pdesummerII2015.html`

Piazza Signup Link: `https://piazza.com/ubc.ca/summer2015/math257951`

Schedule of Topics:

1. **Introduction and Review** (4 hours)

   - Intro to the course: heat (10.5), wave (10.7), and Laplace (10.8) equations
   - Review of ODE methods (especially 2.1-2.2, 3.1-3.4)
   - Review of sequences, series, power series, & Taylor series (5.1)

2. **Series Solutions of Ordinary Differential Equations** (6 hours)

   - Series solutions at ordinary points (5.1-5.3)
   - Regular singular points (5.4-5.7)

3. **Fourier Series and Separation of Variables** (16 hours)

   - The heat equation and Fourier series (10.1-10.6)
   - The wave equation (10.7)
   - The Laplace equation (10.8)

4. **Numerical methods for PDE** (3 hours)

   - Finite difference approximations
   - Spreadsheet computation of solutions

5. **Boundary Value Problems and Sturm-Liouville Theory** (7 hours)

   - Eigenfunctions and eigenvalues (11.1)
   - Sturm-Liouville boundary value problems (11.2)
   - Nonhomogeneous boundary value problems (11.3)