# UBC MATH 257/316 *Partial Differential Equations* 2014WT2 Outline

**Main Reference**:

- W.W. Boyce & R.C. DiPrima, *Elementary Differential Equations and Boundary Value Problems* (10th. ed.), Wiley.

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

**Rough Schedule of Topics** (with approximate class time, and corresponding Boyce & DiPrima sections)

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

   (a) Intro to the course: heat (10.5), wave (10.7), and Laplace (10.8) equations

   (b) Review of ODE methods (especially 2.1-2.2, 3.1-3.4)

   (c) Review of sequences, series, power series, & Taylor series (5.1)

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

   (a) Series solutions at ordinary points (5.1-5.3)

   (b) Regular singular points (5.4-5.7)

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

   (a) The heat equation and Fourier series (10.1-10.6)

   (b) The wave equation (10.7)

   (c) The Laplace equation (10.8)

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

   (a) Finite difference approximations

   (b) Spreadsheet computation of solutions

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

   (a) Eigenfunctions and eigenvalues (11.1)

   (b) Sturm-Liouville boundary value problems (11.2)

   (c) Nonhomogeneous boundary value problems (11.3)

**Grading scheme:**

- homework assignments: 15%

- 2 mid-term tests (dates TBA): 35%

- final exam: 50%