

Course Outline for Mathematics 257/316 (3 credits) Term 1, Sept.-Dec., 2013
Partial Differential Equations

<u>Prerequisites:</u>	One of Math 215, 255, 265.
<u>Credit:</u>	3 Credits. Credit only given for one of Math 256, 257, 316.
<u>Instructor:</u>	Anthony Peirce, <u>Office:</u> Mathematics Building 108
<u>Home Page:</u>	http://www.math.ubc.ca/~peirce
<u>Office Hours:</u>	Monday: 10-11 am, Wed: 3-3:55 pm, Fri: 10-11 am.
<u>Assessment:</u>	The final grades will be based on homework (15%) (including EXCEL/MATLAB projects), two in class midterm exams (35%) and one final exam (50%). Assignments are to be submitted in hard-copy from at the designated class – no late assignments can be accepted. There will be no make-up midterms.
<u>Test Dates:</u>	Monday, October 21 st , Friday, November 15 th .
<u>Text:</u> (recommended)	Elementary Differential Equations and Boundary Value Problems (10 th Ed), W.E. Boyce and R.C. DiPrima (John Wiley & Sons) 2006

<u>Other References:</u>	1. Partial Differential Equations with Fourier Series and Boundary Value Problems (2 nd Ed), by N.H. Asmar, (Pearson), 2004. 2. Applied Partial Differential Equations with Fourier Series and Boundary Value Problems (4 th Ed), R. Haberman, (Pearson), 2004. 3. http://www.math.ubc.ca/~rfroese/notes/Lecs316.pdf , Richard Froese, Partial Differential Equations, UBC M257/316 lecture notes free on the web.
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<u>Topics:</u>	<u>Approx Time</u>
1. Review of techniques to solve ODEs	1 hr
2. Series Solutions of variable coefficient ODEs (Chapter 5)	
a. Series solutions at ordinary points (5.1-5.3)	3 hrs
b. Regular singular points (5.4-5.7, 5.8 briefly)	4 hrs
3. Introduction to Partial differential equations (Chapter 10)	
The heat equation (10.5), the wave equation (10.7), Laplace's equation (10.8)	2 hrs
4. Introduction to numerical methods for PDEs using spread sheets	3 hrs
a. First and second derivative approximations using finite differences - errors	
b. Explicit finite difference schemes for the heat equation	
• Stability and derivative boundary conditions	
c. Explicit finite difference schemes for the wave equation	
d. Finite difference approximation of Laplace's Equation – iterative methods	
5. Fourier Series and Separation of Variables (Chapter 10)	
a. The heat equation and Fourier Series (10.1-10.6)	9 hrs
b. The wave equation (10.7)	3 hrs
c. Laplace's equation (10.8)	5 hrs
6. Boundary Value Problems and Sturm-Liouville Theory (Chapter 11)	
a. Eigenfunctions and eigenvalues (11.1)	1 hr
b. Sturm-Liouville boundary value problems (11.2)	1 hr
c. Nonhomogeneous boundary value problems (11.3)	2 hrs
	Tests <u>2 hrs</u>
	36 hrs