Course outline for Math 257/316 (2019S May-June Term 1)
Partial Differential Equations

Prerequisites: One of Math 215, 255, 265.

Credit: 3 Credits. Credit only given for one of Math 257, 316.

Instructor: Jordan MacKenzie, Office: PPC 219, Office hours: T/Th 14:30-16:00.

Home Page: [Jordan MacKenzie](#)

Assessment: The final grades will be based on 5 in class quizzes (10% each) and one final exam (50%). **There will be no make up quizzes. A student must get at least 35% on the final exam to pass this course.**

Test Dates: May 13, 21, 27 and June 10, 17.

Text: Elementary Differential Equations and Boundary Value Problems (10$^{\text{th}}$ Ed), W.E. Boyce & R.C. DiPrima (John Wiley & Sons) 2012. **This text is recommended but not required.**

Other References:

1. Applied Partial Differential Equations with Fourier Series and Boundary Value Problems (4$^{\text{th}}$ Ed), R. Haberman, (Pearson), 2004.

2. [http://www.math.ubc.ca/ rfroese/notes/Lecs316.pdf](http://www.math.ubc.ca/rfroese/notes/Lecs316.pdf), Richard Froese, Partial Differential Equations, UBC Math 257/316 lecture notes free online.

Topics:	Approx. Time
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).	3 hrs
3. **Introduction to Partial differential equations (Chapter 10)**	
(a) The heat equation (10.5), the wave equation (10.7) and Laplace's equation (10.8)	3 hrs
4. **Introduction to numerical methods for PDEs using Matlab**	3 hrs
(a) First and second derivate approximations using finite differences	
(b) Finite difference approximation of Laplace's equation - iterative methods	
(c) Explicit finite difference schemes for the heat equation	
(d) Explicit finite difference schemes for the wave equation	
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)	4 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) Non-homogeneous boundary value problems (11.3)	2 hrs
	Tests: <u>5 hrs</u>
	Total: 38 hrs