

NORTH CAROLINA STATE UNIVERSITY  
DEPARTMENT OF MATHEMATICS

**MA401: Applied Differential Equations II**

**Semester:** Spring, 2019

**Course:** MA401

**Section:** 001 (L.K. Norris)

**Office hours:** TBA

**TEXTBOOK:**

“Introduction to Applied Partial Differential Equations” by John M. Davis

**GRADING:**

(plus-minus grading)

- (0) Test #0: 10% - Review Material in section 1.4
- (1) Test #1: 20% - Wednesday, February 21
- (2) Test #2: 20% - Friday, April 13
- (3) Homework: 20% - Composed of take-home problems given throughout the semester. A good portion of the work will require you to use Maple.
- (4) Final Exam: 30% - Friday, May 4 from 8 - 11 a.m.

**COURSE SCHEDULE**

(Topics covered in each chapter are listed on page 2)

- 1. January 7 – February 18: Chapters 1 and 2
- 2. Wednesday, January 23: Test #0
- 3. Wednesday, February 20: Test #1
- 4. Friday February 22 – Wednesday April 10: Chapters 3 and 4
- 5. Friday, April 12: Test #2
- 6. April 15 – April 26: Parts of chapters 5 and 6
- 7. Final Exam: Monday, May 6, 8-11 a.m.

# Semester Schedule

Chapter	Topics
1.....	<b>Introduction to PDEs</b> 1.1 ODEs vs PDEs 1.2 How PDEs Are Born: Conservation Laws, Fluids and Waves 1.3 Boundary Conditions in One Space Dimension 1.4 ODE Solution Methods <b>Test #0</b>
2.....	<b>Fourier's Method: Separation of Variables</b> 2.1 Linear Algebra Concepts 2.2 The General Solution via Eigenfunctions (the heat & wave equations) 2.3 The Coefficients via Orthogonality 2.4 Consequences of Orthogonality 2.5 Robin Boundary Conditions <b>Test #1</b>
3.....	<b>Fourier Series Theory</b> 3.1 Fourier Sine, Fourier Cosine, and Full Fourier Series 3.3 Error Analysis and Modes of Convergence 3.4 Convergence Theorems 3.5 Basic $L^2$ Theory
4.....	<b>General Orthogonal Series Expansions</b> 4.1 Regular and Periodic Sturm-Liouville Theory 4.2 Singular Sturm-Liouville Theory 4.3 Orthogonal Expansions: Special Features <b>Test #2</b>
5.....	<b>PDEs in Higher Dimensions</b> 5.5 Laplace's Equation in 2D 5.6 The 2D Wave and Heat Equations
6.....	<b>PDEs in Other Coordinate Systems</b> 6.1 Laplace's Equation in Polar Coordinates 6.3 The Wave and Heat Equations in Polar Coordinates 6.4 Laplace's Equation in Cylindrical Coordinates 6.5 Laplace's Equation in Spherical Coordinates
Final Exam	