MATH 251 Ordinary and Partial Differential Equations
Spring Semester 2012
Syllabus

Course Description: Ordinary and Partial Differential Equations (4:4:0). First- and second-order equations; series solutions; Laplace transform solutions; higher order equations; Fourier series; second-order partial differential equations.

Prerequisite: Math 141, or equivalent courses.

Textbook: *Elementary Differential Equations and Boundary Value Problems*, 9th edition (7th or 8th ed ok), W. E. Boyce and R.C. Diprima, John Wiley and Sons, Inc.

Examinations: Two 75-minute midterm examinations, given on February 16 and April 3, and a comprehensive final examination given during the final examination period. The final examination period will begin on Monday, April 30 and end on Friday, May 4. **Students should not make plans to leave University Park before Saturday, May 5, 2012.**

Calculators: A calculator may be useful for some homework problems involving graphing. However, **the use of calculators is not permitted on exams**.

Grading Policy: Grades will be assigned on the basis of 450 points distributed as follows

100 points	midterm examination I (6:30 - 7:45 pm, 2-16-2012)
100 points	midterm examination II (6:30 - 7:45 pm, 4-3-2012)
100 points	quizzes/homework
150 points	final examination

Final grades will be assigned as follows:

A 405-450 pts	A− 390-404 pts	B+ 375-389 pts	B 360-374 pts
B− 345-359 pts	C+ 330-344 pts	C 315-329 pts	D 270-314 pts
F 0-269 pts			

Note: The above is the common policy across all sections of Math 251. Please check with your instructor for other section-specific policies. Theses include, but are not limited to: office hours, homework and quiz schedule, late homework policy, and attendance requirement.

Conflict and Makeup Examinations: For each midterm exam, there is a conflict exam session, from 5:05 to 6:20 pm on the same day as the regularly scheduled exam. Students with schedule conflicts may sign up to take the conflict exam, in person, with their respective instructors, at least two class days prior to the exam. A student will not be allowed to take the conflict exam without having so signed up with his/her instructor first.

In addition, a makeup exam will be given about a week after the regularly scheduled exam. Students who have a valid **documented** reason, such as a class conflict or illness, during both the conflict and regular examination times are permitted to schedule a makeup examination with no penalty. To sign up to take a makeup exam, please see your instructor, in person. Students must be prepared to verify the reason for taking the makeup by providing the proper document(s) upon

request. **Personal business such as travel, employment, weddings, graduations, or attendance at public events such as concerts, sporting events, and Greek Rush events are not valid excuses. Nor is forgetting the date, time or room of an examination a valid excuse.** Students who do not have an approved reason for missing the examination are permitted to schedule to take the makeup, but 25 points will be deducted from their score. Students who have taken either the regularly scheduled examination or conflict examination are not permitted to take the makeup examination. The makeup examinations are given from 6:30 to 7:45 pm (check with your instructor for the exact dates).

Questions, Problems, or Comments: If you have questions or concerns about the course, please consult your instructor first. If further guidance is needed, you may contact the course coordinator whose email address is given below.

Course Coordinator: The department coordinator for Math 251 during the spring 2012 semester is Zachary Tseng. You can reach him by sending an email to tseng@math.psu.edu

Tentative Course Outline:

1. INTRODUCTION
1.1 Direction Fields (.5)
1.2 Solution of Some Differential Equations (1)
1.3 Classification of Differential Equations (.5)

2. FIRST ORDER DIFFERENTIAL EQUATIONS
2.1 Linear Equations with Variable Coefficients (2)
2.2 Separable Equations (1)
2.3 Modeling with First Order Equations (cover mixing problems, plus either motion with air resistance, compound interest, or Newton's law of cooling) (3)
2.4 Differences Between Linear and Nonlinear Equations (1)
2.5 Autonomous Equations and Population Dynamics (cover stability of equilibrium solutions) (1.5)
2.6 Exact Equations (omit Integrating Factors) (1.5)

3. SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS
3.1 Homogeneous Equations with Constant Coefficients (1)
3.2 Fundamental Solutions of Linear Homogeneous Equations; Wronskian (2)
3.3 Complex Roots of the Characteristic Equations (1)
3.4 Repeated Roots; Reduction of Order (1.5)
3.5 Nonhomogeneous Equations; Method of Undetermined Coefficients (3)
3.7 Mechanical and Electrical Vibrations (2)
3.8 Forced Vibrations (w/o damping) (1)

4. HIGHER ORDER LINEAR EQUATIONS
4.1 General Theory of n-th Order Linear Equations (.5)
4.2 Homogeneous Equations with Constant Coefficients (1)

6. THE LAPLACE TRANSFORM
6.1 Definition of the Laplace transform (1)
6.2 Solution of Initial Value Problems (2)

6.3 Step Functions (1)
6.4 Differential Equations with Discontinuous Forcing Functions (2)
6.5 Impulse Functions (1)

7. SYSTEMS OF TWO LINEAR DIFFERENTIAL EQUATIONS
7.1 Intoduction to Systems of Differential Equations (1)
7.2-7.3 Introduction to 2 x 2 Matrices (1)
7.5, 7.6, 7.8 2 x 2 Linear Systems of Differential Equations (3)

9. NONLINEAR DIFFERENTIAL EQUATIONS AND STABILITY
9.1 Phase Portraits of 2 x 2 Linear Systems (1)
9.2 Autonomous Systems and Stability (.5)
9.3 Almost Linear Systems (.5)
9.5 Predator-Prey Equations (1)

10. PARTIAL DIFFERENTIAL EQUATIONS AND FOURIER SERIES
10.1 Two-Point Boundary Value Problems (2)
10.2 Fourier Series (2)
10.3 The Fourier Convergence Theorem (1)
10.4 Even and Odd Functions (1.5)
10.5 Separation of Variables; Solutions of Heat Conduction Problems (2)
10.6 Other Heat Conduction Problems (1.5)
10.7 The Wave Equation: Vibrations of an Elastic String (2)
10.8 Laplace's Equation (2)

(This schedule is subject to change.)

ACADEMIC INTEGRITY STATEMENT: All Penn State policies regarding ethics and honorable behavior apply to this course. For more information see:
http://www.science.psu.edu/academic/Integrity/index.html