MATH 251 Ordinary and Partial Differential Equations
Fall Semester 2017
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*, 11th edition, W. E. Boyce, R.C. Diprima, and D.B. Meade, John Wiley and Sons, Inc.

Examinations: Two 75-minute midterm examinations, given on October 5 and November 6, and a comprehensive final examination given during the final examination period. The final examination period will begin on Monday, December 11 and end on Friday, December 15. **Students should not make plans to leave University Park before Saturday, December 16, 2017.** Before each exam session, please note your assigned examination room. **Students who take an exam at a location not assigned to their section will be assessed a 5-point penalty on their exam scores.**

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 (6:00 - 7:15 pm, 10-5-2017)
100 points	midterm examination II (6:00 - 7:15 pm, 11-6-2017)
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 section's instructor for other section-specific policies. These 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, on the same day, but at an earlier time (typically from 4:35 to 5:50 pm), 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 one week prior to the scheduled exam. A student will not be allowed to take the conflict exam without having so signed up with his/her instructor first. A student who forgets to sign up to take conflict exam in time, and whose schedule conflicts with the regular exam, may instead sign up for the makeup exam, but is subject to a 5-point penalty, up to the day before the regularly scheduled exam. (A student who fails to so sign up before the day of the regularly scheduled exam, and who is otherwise not eligible to take the

makeup exam without penalty, would still be subject to the 20-point penalty as described in the next paragraph.)

In addition, a makeup exam will be given about a week after the regularly scheduled exam. Students who have a valid **documented** reason (no exceptions!), 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 20 points will be deducted from their score. **Students who missed a scheduled exam session, and who have not previously signed up to take the makeup exam, should contact their section's instructor within 24 hours of the missed exam to be signed up. Failure to so inform your instructor will result in a score of zero being given for the missed exam.** 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 6:00 to 7:15 pm (check with your instructor for the exact dates).

Late-drop deadline: For fall 2017, the last day to late drop is Friday, November 10.

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 fall 2017 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) (2)
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 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 Introduction to Systems of Differential Equations (1)
7.2-7.3 Introduction to 2 x 2 Matrices (1.5)
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 Locally 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

Penn State Learning: The Penn State Learning is a student service providing free "drop-in" peer tutoring, as well as peer-lead exam review sessions. For 200-level Math courses, this tutoring service is offered semester-long Sundays through Thursdays from 6pm to 10pm, in room 007 Sparks (note the difference in location from their main office in Boucke Bldg).

Disability Services: Penn State welcomes students with disabilities into the University's educational programs. If you have a disability-related need for reasonable academic adjustments in this course, contact the Office for Disability Services (ODS) at 814-863-1807 (V/TTY). For further information regarding ODS, please visit the Office for Disability Services Web site at http://equity.psu.edu/ods/. In order to receive consideration for course accommodations, you must contact ODS and provide documentation (see the documentation guidelines at http://equity.psu.edu/ods/guidelines/documentation-guidelines). If the

documentation supports the need for academic adjustments, ODS will provide a letter identifying appropriate academic adjustments. Please share this letter and discuss the adjustments with your instructor as early in the course as possible. You must contact ODS and request academic adjustment letters at the beginning of each semester.

Counseling & Psychological Services: Students with a need or interest in obtaining counseling services may wish to contact the Penn State Counseling & Psychological Services Office. More information about the Counseling & Psychological Services Office can be found here: http://studentaffairs.psu.edu/counseling/