Math 261 - Elementary Differential Equations, Fall 2018
Course Syllabus

Instructor: Brian Leary
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Office: Learning Resource Center 323K
Office hours: Tues 9:30-10 & 1-2, Wed 9:30-10 & 2-3, Thurs 12-2
Math Tutoring Lab: Mon 2-3, Fri 9-10

Class Room/Time: INN-B 110, MTWF 12:00-12:50 pm
Course website: community.wvu.edu/∼bal0018/math261F18.html (as a backup website, I will also try to keep the eCampus site updated)

Homework assignments will be posted on the course website. Course announcements may also be posted on the website or sent via email. Please be sure to check the website regularly, and to regularly check the email address you have on record. You are responsible for any information posted on the course website.
Textbook: Zill and Cullen, *Differential Equations with Boundary-Value Problems*, 8th edition

Catalog Data: MATH 261 Elementary Differential Equations (4-0) Credits 4. Ordinary differential equations, Laplace transforms, partial differential equations, Fourier series, applications.
Prerequisite: MATH 251 or grade "B" or better in MATH 315.

Course material: This course is a study of differential equations. The majority of the course will be dedicated to ordinary differential equations, and we will discuss both the classification of such differential equations and various different methods to solve them. We will also see the many types of real-world problems that differential equations help model. Finally, we will discuss Fourier series as well as the classification and solution of certain partial differential equations.
An outline of the topics covered can be found on the next page.

Course Objectives: Upon successful completion of the course, the student will be able to do the following:

1. Solve first order differential equations.
2. Solve ordinary differential equations using the methods of undetermined coefficients (annihilators) and the method of variation of parameters.
3. Use (systems of) linear differential equations to model physical processes.
4. Find the Laplace transform of a function and use it to solve differential and integral equations.
5. Find power series solutions of second order ODEs.
6. Find the Fourier series of functions.
7. Solve PDEs and boundary-value problems using separation of variables.

Topics:

1. Introduction to Differential Equations, First-Order (6 days - Chapters 1-2):
   (a) Basic Definitions and Terminology
   (b) Separation of Variables
   (c) Homogeneous Equations
   (d) Exact Equations
   (e) Linear Equations
   (f) Bernoulli's Equation
2. Applications of First-Order Differential Equations (3 days - Chapter 3):
   (a) Growth and Decay
   (b) Cooling Problems
   (c) Chemical Mixtures
3. Linear Differential Equations of Higher Order (9 days - Sections 4.1-4.6)
   (a) Initial/Boundary-Value Problems
   (b) Linear Independence/Dependence
   (c) Structure of Solutions
   (d) Reduction of Order
   (e) Auxiliary Equation; Distinct Roots
   (f) Auxiliary Equation; Repeated Roots
   (g) Auxiliary Equation; Complex Roots
   (h) Differential Operator
   (i) Undetermined Coefficients
   (j) Variation of Parameters
4. Differential Equations with Variable Coefficients (2 days - Section 4.7):
5. Applications of 2nd Order Differential Equations (3 days - Section 5.1):
   (a) Simple Harmonic Motion
   (b) Damped Motion
   (c) Forced Motion
6. The Laplace Transform (10 days - Sections 7.1-7.4):
   (a) The Basic Definition
   (b) The Inverse Transform
   (c) Translation Theorems
   (d) Derivatives of a Transform
   (e) Transform of Derivatives
   (f) Transform of Integrals and Convolution
   (g) Transform of the Unit Step Function and Multipart Functions
   (h) Transform of a Periodic Function
   (i) Solving Differential and Integral Equations Using Laplace Transforms
7. Systems of Linear Differential Equations (3 days - Chapter 8):
   (a) Systems of Linear First-Order Equations
   (b) Operator Method (OPT)
8. Series Solutions of Linear Equations (6 days - Chapter 6):
   (a) Solutions About Ordinary Points
   (b) Solutions About Singular Points

9. Fourier Series (6 days - Sections 11.1-11.3)
    (a) Orthogonal Functions
    (b) Fourier Series
    (c) Sine and Cosine Series
10. Partial Differential Equations and Boundary Value Problems (6 days - Chapter 12)
    (a) Sturm-Liouville Problem
    (b) Separation of Variables Technique
    (c) Heat Equation
    (d) Wave Equation
    (e) Laplace's Equation
    (f) 3-Dimensional Rectangular Partial Differential Equations (OPT)
    (g) Equations Revisited in Polar Coordinates (OPT)

Grading: Your final grade will be based on homework, quizzes, four exams during the semester, and the final exam. Your final course score will be the maximum of the following two grading schemes:

- 10% Homework + 5% Quizzes + 15% Exam 1 + 15% Exam 2 + 15% Exam 3 + 15% Exam 4 + 25% Final Exam
- 10% Homework + 5% Quizzes + 25% (highest grade of the four exams) + 15% (2nd grade of the four exams) + 15% (3rd grade of the four exams) + 30% Final Exam

Letter Grade Cutoffs: A: 90%, B: 80%, C: 70%, D: 60%, F: below 60%

Homework: Homework assignments will be posted on the course website and will typically be due on Fridays. There will likely be about 12 total assignments, and your lowest 2 homework scores will be dropped from grade computation.
A note about the homework: the only real point of the homework is for you to do it. The time you spend thinking, trying things, getting wrong answers, and (hopefully) getting right answers is the purpose of the homework. The exams are where your course grade will really be decided, and the homework is your training for the exams. Don't skip your training!

Exams: There will be four exams, tentatively scheduled for Wednesday, September 5; Friday, September 28; Friday, October 26; and Wednesday, November 14. These will be 50 minute exams taken during the regular lecture time. The final exam time has been set by the university, and will be Monday, December 10 from 10:00-11:50. Make-up exams will only be given to students with excused absences, and such make-up exams must be scheduled within 24 hours of the missed exam.

Quizzes: There will be a quiz given most weeks in which there is no exam. This will be a very brief quiz given at the beginning of class, intended to test you with more immediacy than the exams and with less consequence. The problems that appear on the quiz will be taken from the homework problems I assign. Only your best 5 quizzes will count toward your grade, and there will be absolutely NO make-up quizzes.

Class policies:

- Graphing calculators will never be allowed during any exams. Scientific calculators will be considered on an exam by exam basis. You may use any calculator to help you do the homework if you wish, but you should keep in mind that you may be required to solve similar problems without a calculator on the quizzes and exams.
- While class attendance does not directly factor into your grade computation, attendance of each lecture is highly recommended. Regular attendance will tend to lead to better understanding of the course material, which tends to lead to better performance on exams.
- If you believe a problem on a homework assignment or midterm exam has been graded incorrectly, you must notify the instructor of your complaint within 7 days of the date the exam is handed back. If you are unable to retrieve your graded material at the time it is handed back, it is your responsibility to make arrangements with the instructor to retrieve the material at another time.

Getting Help: Please feel free to come to office hours or email me if you have questions about the course material. If you are unable to make it to my regularly scheduled office hours, I am willing to make an appointment to meet at another time if possible. Additionally, you can get help in the Math Tutoring Lab in LRC 323 from 8 AM to 4:30 PM. Free tutoring is also available through Student Support Services, located in Benedum 130, and the Student Success Center, located in the library on the second floor of LRC. Finally, I would also encourage the formation of study groups, to learn from each other and help each other learn.

Academic Integrity: The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code at http://studentlife.wvu.edu/office_of_student_conduct/student_conduct_code. Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me before the assignment is due to discuss the matter. [Available at: http://facultysenate.wvu.edu/r/download/15702]