

Differential Equations

Time: TR 9:30 – 10:45
Room: ACR 108

Instructor: Eric Funasaki
Office: ACR 109C
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Office hours:

MWF 10 – 10:50, TR 8:30 – 9:20, TR 11 – 12:15, or by appointment.

Textbook:

Elementary Differential Equations and Boundary Value Problems, 10th edition, by William E. Boyce and Richard C. DiPrima.

Course Description:

First order differential equations, linear differential equations of higher order, power series solutions, systems of linear differential equations, and applications. Use of a programmable graphing calculator may be required. Students are also introduced to a symbolic algebra system running on a personal computer.

Prerequisite:

Math 2414 Calculus II

Mathematics Program Learning Objectives:

The student should be able to:

1. Apply knowledge of basic mathematics principles;
2. Identify and provide valid proofs or solutions for theorems or problems; and
3. Recognize and dispute invalid mathematical statements using counterexamples.

Course Objectives:

The student will be able to:

1. Solve first and second order linear differential equations quantitatively and qualitatively.
2. Solve systems of first order linear differential equations quantitatively and qualitatively.
3. Construct phase portraits for systems of first order nonlinear differential equations.
4. Solve first order linear differential equations using Laplace Transform.

EC-6 Core Teacher Competencies:

1. Competency 013 (Mathematics Instruction): The teacher understands how students learn mathematical skills and uses that knowledge to plan, organize, and implement instruction and assess learning.
2. Competency 014 (Number Concepts and Operation): The teacher understands concepts related to numbers, operations and algorithms, and the properties of numbers.

3. Competency 015 (Patterns and Algebra): The teacher understands concepts related to patterns, relations, functions, and algebraic reasoning.
4. Competency 016 (Geometry and Measurement): The teacher understands concepts related to principles of geometry and measurement.
5. Competency 017 (Probability and Statistics): The teacher understands concepts related to probability and statistics and their applications.
6. Competency 018 (Mathematical Processes): The teacher understands mathematical processes and knows how to reason mathematically, solve mathematical problems, and make mathematical connections within and outside of mathematics.

Course Assessment:

Your grade will be based on the following components:

- 6% In-class problems and participation
- 20% Homework assignments and quizzes
- 48% Exams
- 26% Comprehensive Final Exam

The grading scale will be:

90 – 100 A 80 – 89 B 70 – 79 C 60 – 69 D 0 – 59 F

Course Schedule (tentative):

Week 1

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|------|---|--|
| 1/19 | T | 1.1 Some Basic Mathematical Models; Direction Fields
1.2 Solutions of Some Differential Equations
1.3 Classification of Differential Equations |
| 1/21 | R | 2.1 Linear Equations; Method of Integrating Factors |

Week 2

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|------|---|--|
| 1/26 | T | 2.5 Autonomous Equations and Population Dynamics |
| 1/28 | R | 2.6 Exact Equations and Integrating Factors |

Week 3

- | | | |
|-----|---|--|
| 2/2 | T | 3.1 Homogeneous Equations with Constant Coefficients
3.2 Solutions of Linear Homogeneous Equations; the Wronskian |
| 2/4 | R | 3.3 Complex Roots of the Characteristic Equation
3.4 Repeated Roots; Reduction of Order |

Week 4

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|------|---|---|
| 2/9 | T | 3.5 Nonhomogeneous Equations; Method of Undetermined Coefficients |
| 2/11 | R | 3.7 Mechanical and Electrical Vibrations |

Week 5

- | | | |
|------|---|-----------------------|
| 2/16 | T | 3.8 Forced Vibrations |
| 2/18 | R | Review for Exam 1 |

Week 6

- | | | |
|-------------|----------|---|
| 2/23 | T | Exam 1 |
| 2/25 | R | 6.1 Definition of the Laplace Transform |

Week 7

- | | | |
|-----|---|--|
| 3/1 | T | 6.2 Solution of Initial Value Problems |
| 3/3 | R | 6.2 Solution of Initial Value Problems |

Week 8

3/8	T	6.3 Step Functions
3/10	R	6.4 Differential Equations with Discontinuous Forcing Functions

Week 9

3/15	T	Spring Break (no class)
3/17	R	Spring Break (no class)

Week 10

3/22	T	6.5 Impulse Functions
3/24	R	Review for Exam 2

Week 11

3/29	T	Exam 2
3/31	R	7.1 Introduction (System of First Order Linear Equations) 7.3 Systems of Linear Algebraic Equations; Linear Independence; Eigenvalues; Eigenvectors

Week 12

4/5	T	7.4 Basic Theory of Systems of First Order Linear Equations
4/7	R	7.5 Homogeneous Linear Systems with Constant Coefficients

Week 13

4/12	T	7.6 Complex Eigenvalues 7.8 Repeated Eigenvalues
4/14	R	9.1 The Phase Plane: Linear Systems

Week 14

4/19	T	9.2 Autonomous Systems and Stability 9.3 Locally Linear Systems
4/21	R	9.4 Competing Species 9.5 Predator-Prey Equations

Week 15

4/26	T	Review for Exam 3
4/28	R	Exam 3

Week 16

5/3	T	Review for Final Exam
5/5	R	Dead Day (no class)

Week 16

5/10	T	Final Exam (8 am – 10 am)
5/12	R	(no class)

Attendance Policy:

Role will be taken. You are responsible for all material covered in class as well as any assignments and announcements that are made. If you miss an assignment, exam, or quiz you will receive a grade of zero unless I have been notified in advance.

Sul Ross State University policy is to assign a grade of F when 9 hours of class are missed by a student. For this course that is when you miss **6** classes.

Cell Phones and Other Electronic Devices:

Your cell phone must be **off** while you are in class. You may not read or send text messages while class is in session. If there is an unusual situation where you simply must be able to read and send a message without delay, place your phone in vibrate mode and leave the room before reading and responding. No other electronic devices may be used during class without the permission on the instructor.

ADA Statement:

Sul Ross State University is committed to equal access in compliance with the Americans With Disabilities Act of 1973. It is the student's responsibility to initiate a request for accessibility services. Students seeking accessibility services must contact Mary Schwartz, M.Ed., L.P.C., in Counseling and Accessibility Services, Ferguson Hall, Room 112. The mailing address is P.O. Box C-122, Sul Ross State University, Alpine, TX 79832. Telephone: 432-837-8203. E-mail: mschwartz@sulross.edu.

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