

**Differential Equations**

Time: MW 2:00 – 3:15

Room: ACR 206

Instructor: Eric Funasaki

Office: ACR 109C and BAB 210

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**Office Hours:**

MW 3:30 – 5:00, TR 2:00 – 2:50, or by appointment.

**Textbook:**

*Elementary Differential Equations and Boundary Value Problems*, 12<sup>th</sup> edition, William E. Boyce, Richard C. DiPrima, and Douglas B. Meade.

**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.

**Marketable Skills**

1. Students Demonstrate Logical and Analytical Skills.
2. Students Demonstrate Problem-Solving Using Analytic and Algebraic Methods.
3. Students Use Technology in Problem-Solving and Presentation.
4. Students Use Communication and Pedagogical Skills.

**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.

## Course Assessment:

Your grade will be based on the following components:

- 10% In-class problems and participation
- 20% Homework assignments and quizzes
- 48% Exams
- 22% 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

- 1/15 W 1.1 Some Basic Mathematical Models; Direction Fields  
1.2 Solutions of Some Differential Equations  
1.3 Classification of Differential Equations

### Week 2

- 1/20 M 2.1 Linear Equations; Method of Integrating Factors
- 1/22 W 2.4 Differences Between Linear and Nonlinear Equations

### Week 3

- 1/27 M 2.5 Autonomous Equations and Population Dynamics
- 1/29 W 3.1 Homogeneous Equations with Constant Coefficients  
3.2 Fundamental Solutions of Linear Homogeneous Equations  
3.3 Linear Independence and the Wronskian

### Week 4

- 2/3 M 3.4 Complex Roots of the Characteristic Equation, 3.5 Repeated Roots
- 2/5 W 3.6 Nonhomogeneous Equations; Method of Undetermined Coefficients

### Week 5

- 2/10 M 3.6 Nonhomogeneous Equations; Method of Undetermined Coefficients  
3.8 Mechanical and Electrical Vibrations
- 2/12 W 3.8 Mechanical and Electrical Vibrations, 3.9 Forced Vibrations

### Week 6

- 2/17 M Review for Exam 1
- 2/19 W **Exam 1**

### Week 7

- 2/24 M 6.1 Definition of the Laplace Transform
- 2/26 W 6.2 Solution of Initial Value Problems

### Week 8

- 3/3 M 6.2 Solution of Initial Value Problems
- 3/5 W 6.3 Step Functions

### Week 9

- 3/10 M 6.4 Differential Equations with Discontinuous Forcing Functions
- 3/12 W 6.5 Impulse Functions

### Week 10

- 3/17 M **Spring Break (no class)**
- 3/19 W **Spring Break (no class)**

### Week 11

3/24 M Review for Exam 2

3/26 W **Exam 2**

### Week 12

3/31 M 7.1 Introduction (Systems of First Order Linear Equations), 7.2 Review of Matrices  
7.3 Linear Algebraic Equations; Linear Independence, Eigenvalues, Eigenvectors

4/2 W 7.3 Linear Algebraic Equations; Linear Independence, Eigenvalues, Eigenvectors  
7.5 Homogeneous Linear Systems with Constant Coefficients

### Week 13

4/7 M 7.5 Homogeneous Linear Systems with Constant Coefficients

4/9 W 7.6 Complex Eigenvalues

### Week 14

4/14 M 7.8 Repeated Eigenvalues

4/16 W 9.3 Almost Linear Systems, 9.5 Predator-Prey Equations

### Week 15

4/21 M 9.5 Predator-Prey Equations, 9.4 Competing Species

4/23 W Review for Exam 3

### Week 16

4/28 M **Exam 3**

4/30 W Review for Final Exam

### Week 17

5/6 T **Final Exam (3 pm – 5 pm)**

#### **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 the instructor has 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.

#### **Cheating:**

Cheating will not be tolerated. Anyone caught cheating will receive a grade of zero on that assignment, exam, or quiz.

#### **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:**

SRSU Accessibility Services. Sul Ross State University (SRSU) is committed to equal access in compliance with the Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the student's responsibility to initiate a request each semester for each class. Students seeking accessibility/accommodations services must contact Mrs. Mary Schwartz Grisham, LPC, SRSU's Accessibility Services Director or Mr. Ronnie Harris, LPC, Counselor, at 432-837-8203 or email [mschwartz@sulross.edu](mailto:mschwartz@sulross.edu) or [ronnie.harris@sulross.edu](mailto:ronnie.harris@sulross.edu). Our office is located on the first floor of Ferguson Hall, room 112, and our mailing address is P.O. Box C122, Sul Ross State University, Alpine, Texas, 79832.

**Student Responsibilities Statement:**

All full-time and part-time students are responsible for familiarizing themselves with the Student Handbook and the Undergraduate & Graduate Catalog and for abiding by the University rules and regulations. Additionally, students are responsible for checking their Sul Ross email as an official form of communication from the university. Every student is expected to obey all federal, state, and local laws and is expected to familiarize themselves with the requirements of such laws.

**SRSU Distance Education Statement:**

Students enrolled in distance education courses have equal access to the university's academic support services, such as library resources, online databases, and instructional technology support. For more information about accessing these resources, visit the SRSU website.

Students should correspond using Sul Ross email accounts and submit online assignments through Blackboard, which requires a secure login. Students enrolled in distance education courses at Sul Ross are expected to adhere to all policies pertaining to academic honesty and appropriate student conduct, as described in the student handbook. Students in web-based courses must maintain appropriate equipment and software, according to the needs and requirements of the course, as outlined on the SRSU website. Directions for filing a student complaint are located in the student handbook.

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