

Differential Equations

Time: TR 12:30 – 1:45
Room: ACR 206

Instructor: Eric Funasaki
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Office hours:

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

Textbook:

Differential Equations, 4th edition, by Paul Blanchard, Robert L. Devaney, and Glen R. Hall.

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

- 1/20 T 1.1 Modeling via Differential Equations
- 1/22 R 1.2 Analytic Technique: Separation of Variables

Week 2

- 1/27 T 1.6 Equilibria and the Phase Line
- 1/29 R 1.7 Bifurcations

Week 3

- 2/3 T 1.8 Linear Equations
- 2/5 R 1.9 Integrating Factors for Linear Equations

Week 4

- 2/10 T 2.1 Modeling via Systems
- 2/12 R 2.3 The Damped Harmonic Oscillator

Week 5

- 2/17 T 2.7 The SIR Model of an Epidemic
- 2/19 R 2.8 The Lorenz Equations

Week 6

- 2/24 T Exam 1**
- 2/26 R 3.1 Properties of Linear Systems and the Linearity Principle

Week 7

- 3/3 T 3.2 Straight-Line Solutions
- 3/5 R 3.3 Phase Portraits for Linear Systems with Real Eigenvalues

Week 8

- 3/10 T 3.4 Complex Eigenvalues
- 3/12 R 3.6 Second-Order Linear Equations

Week 9

- 3/17 T Spring Break (no class)**
- 3/19 R Spring Break (no class)**

Week 10

- 3/24 T 4.1 Forced Harmonic Oscillators
- 3/26 R 4.2 Sinusoidal Forcing

Week 11

- 3/31 T 4.3 Undamped Forcing and Resonance
- 4/2 R 4.3 Undamped Forcing and Resonance

Week 12

- 4/7 T Exam 2**

4/9	R	5.1 Equilibrium Point Analysis
<u>Week 13</u>		
4/14	T	5.2 Qualitative Analysis
4/16	R	6.1 Laplace Transforms
<u>Week 14</u>		
4/21	T	6.1 Laplace Transforms
4/23	R	6.2 Discontinuous Functions
<u>Week 15</u>		
4/28	T	6.4 Delta Functions and Impulse Forcing
4/30	R	Exam 3
<u>Week 16</u>		
5/5	T	Review
5/7	R	Dead Day (no class)
<u>Week 16</u>		
5/12	T	(no class)
5/14	R	Final Exam (10:15 am – 12:15 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 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 Schwartze, 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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