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Soochow University

# **MAT 330 Differential Equations**

**Winter 2024**

**Course Credits:** 4

**Contact Hours:** 56 hours

**Instructor:** TBA

**Email:**TBA

## **COURSE OBJECTIVES**

This course makes an introduction for students to learn the theories and practices in differential equations. The main topics include linear differential equations, nonlinear differential equations, repeated roots, non-homogeneous equations, the Laplace transform, differential equations with discontinuous forcing functions, impulse functions, fundamental matrices, the Lorenz equations and more. The course ends with a discussion of the series expansion solutions.

Upon Completion of this Course, students will be able to:

1. Understand the concepts of first-order differential equations, second-order linear differential equations, higher-order linear differential equations, systems of first-order linear equations, nonlinear differential equations, and the Laplace Transform;
2. Understand fundamental concepts of differential equations, and the interrelationship between differential equations and linear algebra;
3. Solve linear differential equations using integrating factors, substitution and reduction of order;
4. Find the Laplace Transform of certain functions and use the Laplace Transform to solve problems.

## **PREREQUISITES**

MAT 130 Linear Algebra

## **GRADING**



Grades will be determined by accumulating points, with 100 points being the maximum, as follows:

ITEM	POINTS
2 Assignments	20 Points
2 Quizzes	20 Points
Midterm Exam	25 Points
Final Exam	35 Points
Total	100 Points

Late submissions will be graded at the end of the course. Grades will be assigned according to the following rule:

$$A \geq 90 > B \geq 80 > C \geq 70 > D \geq 60 > F.$$

We reserve the right to make adjustments to the overall grading policy.

## COURSE MATERIALS

### **Required Texts:**

*Elementary Differential Equations and Boundary Value Problems* (10th Edition), by William E. Boyce and Richard C. DiPrima.

### **Recommended (Optional) Texts or Other Materials:**

None

## COURSE TOPICS

MODULE	TASKS
Module 1	<b>Topics:</b> Topic 1: Some Basic Mathematical Models Topic 2: Classification of Differential Equations Topic 3: Linear Equations/Separable Equations Topic 4: Differences Between Linear and Nonlinear Equations <b>Assessments:</b> Assignment #1



Module 2	<b>Topics:</b> Topic 5: Autonomous Equations and Population Dynamics Topic 6: Exact Equations and Integrating Factors Topic 7: Numerical Approximations: Euler's Method Topic 8: The Existence and Uniqueness Theorem <b>Assessments:</b> Quiz #1
Module 3	<b>Topics:</b> Topic 9: Second Order Linear Equations Topic 10: Complex Roots of the Characteristic Equation Topic 11: Nonhomogeneous Equations Topic 12: Variation of Parameters <b>Assessments:</b> Midterm Exam
Module 4	<b>Topics:</b> Topic 13: Higher Order Linear Equations Topic 14: The Method of Undetermined Coefficients Topic 15: Series Solutions of Second Order Linear Equations Topic 16: Series Solutions Near a Regular Singular Point <b>Assessments:</b> Assignment #2
Module 5	<b>Topics:</b> Topic 17: The Laplace Transform Topic 18: Differential Equations with Discontinuous Forcing Functions Topic 19: Impulse Functions Topic 20: The Convolution Integral <b>Assessments:</b> Quiz #2
Module 6	<b>Topics:</b> Topic 21: Basic Theory of Systems of First Order Linear Equations Topic 22: Complex Eigenvalues/Repeated Eigenvalues Topic 23: Fundamental Matrices Topic 24: Nonhomogeneous Linear Systems <b>Assessments:</b> Final Exam

## ATTENDANCE

1) Class attendance is required. Missing classes without permission will lead to decrease in overall grade.



Missing less than two classes: no penalty.

Missing more than two classes: 7% will be taken off from the overall grade.

If the instructor reports a student's frequent missing of class to the Soochow University Academic Administration Office, the student might get a written warning and might be prohibited from attending final exam.

2) Participants in this course are expected to arrive in class promptly and adequately prepared. The primary objective of this course is to critically engage with the readings and the subject matter. Therefore, course participants are expected to have completed the reading prior to class and prepare thoughtful reflections/commentaries to share with fellow colleagues.

## **LEARNING REQUIREMENTS**

- 1) Late assignments are not acceptable and are subjected to grade deductions.
- 2) Assignments submitted in the wrong format will be counted as not submitted.
- 3) Failure to submit or fulfill any required course component results in failure of the class.
- 4) Make-up for midterm and final exams only with valid excuses, as defined by the University.
- 5) In order to earn a Certificate of Completion, participants must thoughtfully complete all assignments by stated deadlines and earn an average quiz score of 50% or greater.

## **TECHNOLOGY POLICY**

The use of electronic devices in class is distracting, both for the user and for the rest of the class. Only non-programmable calculators can be used in the tests and exam. Any attempts to use cell phones and other electronic communication devices will be seemed as cheating. Laptops are discouraged, unless you use them for activities DIRECTLY related to the course (eg., note taking, reading course documents).

## **ACADEMIC INTEGRITY POLICY**

Soochow University highly values the academic integrity and aims to promote the academic fairness, honesty and responsibility. Any academic dishonesty behaviors



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and any attempts to cheats and plagiarism will be reported to the university administration office. A written warning and the relevant penalties will be imposed. The record might be shown on the official university transcript.

## **DISABILITY ACCOMMODATION**

Soochow University is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at Soochow University. Students with disabilities who require accommodations for access to and/or participation in this course are welcome.

Note:

Please contact the University Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material.