



蘇州大學  
Soochow University

## **MAT 330 Differential Equations**

**Summer 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, first and second-order differential equations, 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. Apply mathematical methods to solve problems that are linear in form.
3. Classify and construct differential equations under given conditions.
4. Solve linear differential equations using integrating factors, substitution and reduction of order.
5. Find the Laplace Transform of certain functions and use the Laplace Transform to solve problems.

### **PREREQUISITES**

MAT 110 Calculus I

### **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	30 Points
Final Exam	30 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:

William Boyce, Richard Diprima, Douglas Meade, *Elementary Differential Equations & Boundary Value Problems*, 11th Edition, Wiley, 2017.

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

None

## COURSE TOPICS

MODULE	TASKS
Module 1	<b>Topics:</b> Topic 1: Course Introduction: What is a differential equation Topic 2: Linear differential equations and integrating factors Topic 3: Separable and autonomous differential equations Topic 4: Differences between linear and nonlinear differential equations; Euler's Method <b>Assessments:</b> Assignment # 1
Module 2	<b>Topics:</b> Topic 5: Repeated roots of the characteristic equation Topic 6: Non-homogeneous equations; Variation of parameters Topic 7: Method of undetermined coefficients Topic 8: Higher-order linear differential equations



	<p><b>Assessments:</b> Quiz # 1</p>
Module 3	<p><b>Topics:</b> Topic 9: Power series Topic 10: Series solutions near an ordinary point Topic 11: Euler equations Topic 12: Regular singular points; Series solutions near a regular singular point</p> <p><b>Assessments:</b> Midterm Exam</p>
Module 4	<p><b>Topics:</b> Topic 13: The Laplace Transform; Solution of initial value problems Topic 14: Step functions; Differential equations with discontinuous Topic 15: Impulse functions; The convolution integral Topic 16: Introduction to first-order systems of linear differential equations</p> <p><b>Assessments:</b> Assignment # 2</p>
Module 5	<p><b>Topics:</b> Topic 17: Introduction to second-order systems of linear differential equations Topic 18: Homogeneous linear system with constant coefficients; Complex-valued eigenvalues; Techniques for solving differential equations Topic 19: Fundamental matrices; Repeated eigenvalues; Non-homogeneous linear systems; Numerical methods Topic 20: Linear systems; Autonomous systems and stability; Locally linear systems; Competing species</p> <p><b>Assessments:</b> Quiz # 2 Final Exam</p>

## 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**

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- 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**

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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 (e.g., note taking, reading course documents).

### **ACADEMIC INTEGRITY POLICY**

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



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## **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.