MAT 332 Ordinary Differential Equations and Numerical Methods

Winter 2024

Course Credits: 4
Contact Hours: 56 hours
Instructor: TBA
Email:TBA

COURSE OBJECTIVES

The course aims to introduce the fundamental theories and concepts of differential equations and boundary value, emphasizing on numerical methods. Topics covered include first order equations, second-order linear differential equations, linear differential equations of higher order, differential operators, Laplace transforms, systems of differential equations, series solutions about ordinary points, numerical methods including error analysis, numerical differentiation, integration and solutions of differential equations and so on. In addition to promoting a conceptual appreciation of these foundations, the course will develop students' calculational facility, both of which are essential for further mathematical study.

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

1.Determine appropriate numerical methods to solve a range of ODEs;

2.Implement such numerical methods in a suitable programming language;

3.Derive and analyse such methods and their errors;

4.Understand the principles of consistency, stability and convergence;

5.Apply the above to examples from modern applied mathematics.

PREREQUISITES

MAT 110 Calculus I; MAT 120 Calculus II; MAT 130 Linear Algebra

GRADING

Grades will be determined by accumulating points, with 100 points being the

maximum, as follows:

ITEM	POINTS
Assignments	40 Points
Midterm Test	20 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 E. Boyce, Richard C. DiPrima, Douglas B. Meade, ***Elementary Differential Equations and Boundary Value Problems***, 11th Edition, Wiley, 2017.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
Module 1	**Topics:** Topic 1: First-order differential equations Topic 2: Linear differential equations Topic 3: Method of integrating factors Topic 4: Second-order linear differential equations **Assessments:** Assignment#1
Module 2	**Topics:** Topic 5: Variation of parameters Topic 6: Mechanical and electrical vibrations Topic 7: Higher-order linear differential equations Topic 8: The method of undetermined coefficients **Assessments:**

	Assignment#2
Module 3	**Topics:** Topic 9: The method of variation of parameters Topic 10: Series solutions of second-order linear equations Topic 11: Review of power series Topic 12: Series solutions near an ordinary point **Assessments:** Midterm Test Assignment#3
Module 4	**Topics:** Topic 13: Differential operators Topic 14: The Laplace transform Topic 15: Differential equations with discontinuous forcing functions Topic 16: Impulse functions **Assessments:** Assignment#4
Module 5	**Topics:** Topic 17: The convolution integral Topic 18: Numerical methods; Error analysis Topic 19: Numerical differentiation Topic 20: Integration; Solutions of differential equations **Assessments:** 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).

ACEDEMIC INTEGRITY POLICY

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.

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.