



蘇州大學
Soochow University

MAT 250 Intermediate Numerical Analysis

Winter 2024

Course Credits: 4

Contact Hours: 56 hours

Instructor: TBA

Email: TBA

COURSE OBJECTIVES

Continuing the introduction to numerical analysis begun in MAT 220, this course provides an exploration of numerical methods for solving mathematical problems that arise in various fields of science, engineering, and economics. Focusing on the solutions of equations, topics mainly include approximation of functions, iterative methods, direct methods for solving linear systems, boundary-value problems for ordinary differential equations, finite-difference methods, and numerical solutions to partial differential equations.

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

1. Gain a better understanding of the theoretical principles behind numerical algorithms.
2. Extend the concepts learned in previous courses to a wider class of problems.
3. Analyze the accuracy and stability of numerical solutions.
4. Communicate effectively about numerical analysis concepts and results.
5. Grasp the theory and practice of numerical methods for solving ordinary and partial differential equations.
6. Apply numerical methods to solve mathematical problems encountered in real-world applications.

PREREQUISITES

MAT 220 Introduction to Numerical Analysis

GRADING



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

ITEM	POINTS
2 Quizzes	20 Points
2 Homework	20 Points
Midterm	20 Points
Term Paper	10 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:

Numerical Analysis, Richard L. Burden and J. Douglas Faires, 9th Edition.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
Module 1	Topics: Topic 1: Mathematical Preliminaries and Error Analysis Topic 2: Numerical Software Topic 3: Solutions of Equations in One Variable Topic 4: Error Analysis for Iterative Methods Topic 5: The Bisection Method Assessments: Quiz 1



Module 2	<p>Topics: Topic 6: Interpolation and Polynomial Approximation Topic 7: Parametric Curves Topic 8: Numerical Differentiation and Integration Topic 9: Elements of Numerical Integration Topic 10: Adaptive Quadrature Methods</p> <p>Assessments: Homework 1</p>
Module 3	<p>Topics: Topic 11: Direct Methods for Solving Linear Systems Topic 12: Linear Systems of Equations Topic 13: Linear Algebra and Matrix Inversion Topic 14: Iterative Techniques in Matrix Algebra Topic 15: Relaxation Techniques for Solving Linear Systems</p> <p>Assessments: Homework 2 Midterm</p>
Module 4	<p>Topics: Topic 16: Approximation Theory Topic 17: Discrete Least Squares Approximation; Rational Function Approximation Topic 18: Fast Fourier Transforms Topic 19: Approximating Eigenvalues Topic 20: Linear Algebra and Eigenvalues</p> <p>Assessments: Quiz 2</p>
Module 5	<p>Topics: Topic 21: Boundary-Value Problems for Ordinary Differential Equations Topic 22: The Linear Shooting Method Topic 23: Finite-Difference Methods for Linear and Nonlinear Problems Topic 24: Numerical Solutions to Partial Differential Equations Topic 25: An Introduction to the Finite-Element Method</p> <p>Assessments: Term Paper 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

- 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 and any attempts to cheats and plagiarism will be reported to the university



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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.