



MAT 336 Foundations of Mathematical Models

Summer 2024

Course Credits: 4

Contact Hours: 56 hours

Instructor: TBA

Email: TBA

COURSE OBJECTIVES

This course provides students with a comprehensive understanding of mathematical modeling and its applications across various fields. The course covers microscale models and ordinary differential equations, macroscale models and partial differential equations, numerical methods, linear algebra, and vector geometry and others. Students will learn how to use graphical, numerical, symbolic, and linguistic techniques to describe and explore real-world data and phenomena.

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

1. Understand the fundamental principles of mathematical modeling and its applications across different domains;
2. Develop proficiency in constructing and analyzing linear, exponential, logarithmic, and polynomial function models;
3. Gain expertise in formulating discrete optimization and discrete probability models;
4. Explore network models and their applications in various contexts;
5. Develop an understanding of microscale models and their representation using ordinary differential equations;
6. Gain insight into macroscale models and their representation using partial differential equations.

PREREQUISITES

MAT 237 Applied Linear Algebra; MAT 222 Multivariable Calculus; MAT 332 Ordinary Differential Equations and Numerical Methods



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:

Edward A. Bender, *An Introduction to Mathematical Modeling*, 2012, Dover Publications.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
Module 1	Topics: Topic 1: Linear Function Models Topic 2: Exponential Function Models Topic 3: Logarithmic Function Models Topic 4: Polynomial Function Models Assessments: Assignment #1



Module 2	Topics: Topic 5: Discrete Optimization Models Topic 6: Discrete Probability Models Topic 7: Network Models Topic 8: Microscale Models and Ordinary Differential Equations Assessments: Quiz #1
Module 3	Topics: Topic 9: Macroscale Models and Partial Differential Equations Topic 10: Numerical Methods for Mathematical Models Topic 11: Linear Algebra for Mathematical Models Topic 12: Vector Geometry in Mathematical Modeling Assessments: Assignment #2 Midterm Exam
Module 4	Topics: Topic 13: Graphical Techniques for Data Visualization Topic 14: Numerical Techniques for Data Analysis Topic 15: Symbolic Methods for Model Formulation Topic 16: Linguistic Techniques for Model Interpretation Assessments: Quiz #2
Module 5	Topics: Topic 17: Modeling Population Dynamics Topic 18: Modeling Chemical Reactions Topic 19: Applications of Mathematical Models Topic 20: Final Review 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).

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 administration office. A written warning and the relevant penalties will be imposed. The record might be shown on the official university transcript.

DISABILITY ACCOMMODATION



蘇州大學
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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.