



蘇州大學
Soochow University

MAT 233 Vector Calculus

Summer 2024

Course Credits: 4

Contact Hours: 56 hours

Instructor: TBA

Email: TBA

COURSE OBJECTIVES

This course provides an in-depth introduction to vector calculus, a fundamental mathematical tool used extensively in physics, engineering, and various fields of applied mathematics. Students will explore the concept of vector fields and their operations, delve into the theories of differentiation and integration in the context of vector fields, and learn how these concepts are applied to solve real-world problems. The course will emphasize both theoretical understanding and practical applications through problem-solving exercises.

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

1. Demonstrate proficiency in calculating the instantaneous rate of change using limits and its application to real-world problems;
2. Proficiently differentiate polynomials, sums, products, and apply the chain rule to determine their derivatives;
3. Apply derivatives to identify maxima and minima, sketch graphs, and analyze concavity and points of inflection using the second derivative;
4. Solve optimization problems involving polynomial, rational, and exponential functions within mathematical models;
5. Manipulate vectors in two and three dimensions, perform algebraic operations, calculate dot and cross products, and apply these concepts to solve problems related to projections, areas, and volumes.

PREREQUISITES

MAT 110 Calculus I; MAT 134 Functions



GRADING

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

ITEM	POINTS
2 Homework	20 Points
2 Group Projects	30 Points
Midterm Exam	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:

1. James Stewart, *Calculus: Early Transcendentals*, 8th edition, 2015, Cengage Learning;
2. Susan Colley, *Vector Calculus*, 4th edition, 2011, Pearson.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
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Module 1	<p>Topics: Topic 1: Introduction Topic 2: Functions and Models Topic 3: Derivatives(Exponential, Logarithmic, Special Functions, Trigonometric Functions, Trigonometric Functions) Topic 4: Derivatives(cont.) Assessments: Homework #1</p>
Module 2	<p>Topics: Topic 5: Differentiation Rules(Polynomials and Exponential, Product and Quotient Rules, The Chain Rule, Derivatives of Logarithmic Functions, Linear Approximations and Differentials, Hyperbolic Functions) Topic 6: Application of Differentiation(Maximum and Minimum Values, The Mean Value Theorem, Summary of Curve Sketching, Graphing with Calculus and Calculators) Topic 7: Integrals(Areas and Distances, the Definite Integral, Fundamental Theorem of Calculus, Indefinite Integrals and the Net Change Theorem) Topic 8: Application of Integration Assessments: Group Project#1</p>
Module 3	<p>Topics: Topic 9: Techniques of Integration(Integration by Parts, Trigonometric Integrals, Trigonometric Substitution, Integration of Rational Functions by Partial Fractions, Integration Using Tables and Computer Algebra Systems) Topic 10: Differential Equations (Direction Fields and Euler's Method, Separable Equations) Topic 11: Parametric Equations and Polar Coordinates(Calculus with Parametric Curves, Polar Coordinates) Topic 12: Infinite Sequence and Series Assessments: Homework #2 Midterm Exam</p>
Module 4	<p>Topics: Topic 13: Vectors and the Geometry of Space(Three-Dimensional Coordinate Systems, Dot Product, Cross Product, Equations of Lines and Planes, Cylinders and Quadric Surfaces) Topic 14: Vector Functions(Vector Functions and Space Curves, Derivatives and Integrals of Vector Functions) Topic 15: Partial Derivatives(Limits and Continuity) Topic 16: Multiple Integrals(Rectangles, Polar Coordinates) Assessments: Group Projects #2</p>



Module 5	<p>Topics: Topic 17: Vector Calculus(Vector Fields, Line Integrals, Fundamental Theorem for Line Integrals, Green’s Theorem, Curl and Divergence) Topic 18: Second Order Differential Equations Topic 19: Applications of Vector Calculus Topic 20: Final Review</p> <p>Assessments: Final Exam</p>
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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

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.