

Prepared by the Department of Mathematics
Date of Departmental Approval: November 6, 2017
Date approved by Curriculum and Programs: January 18, 2018

Effective: Fall 2018

1. Course Number: MAT240
Course Title: Calculus I

2. Description: This calculus course is designed for engineering, natural sciences, computer science, and mathematics majors. Topics include limits, continuity, derivatives, integrals, the fundamental theorem, applications on curve sketching, optimization, areas, and volumes, differentiation and integration (up to substitution) involving trigonometric, inverse trigonometric, logarithmic, and exponential functions.

3. Student Learning Outcomes (instructional objectives, intellectual skills):

Upon successful completion of this course, students are able to do the following.

- Demonstrate an intuitive understanding of continuity, derivative, antiderivative, and definite integral.
- Find one-sided limits, limits, infinite limits, and limits at infinity.
- Find derivatives by applying addition rule, product rule, quotient rule, chain rule, power rule and rules for trigonometric, inverse trigonometric, exponential, and logarithmic functions.
- Use implicit differentiation to solve related rates problems.
- Find critical numbers, extreme values, and sketch graphs of functions by identifying critical points, points of inflection, intervals of increase/decrease, and concavity.
- Estimate finite sums and find limit of a finite sum by using sigma notation.
- Find indefinite integral by basic formulas and substitution method.
- Apply the fundamental theorem of calculus.
- Evaluate area between curves, volume of a solid, arc length, surface area of revolution.
- Solve application problems in mathematics, natural sciences, and engineering.

4. Credits: 4 credits

5. Satisfies General Education Requirement: No

6. Prerequisite: A grade of C- or higher in MAT190 (Precalculus Mathematics II) or MAT195 (Precalculus with Trigonometry) or satisfactory basic skills assessment score

7. Semesters Offered: Fall, Spring, Summer

8. Suggested General Guidelines for Evaluation: Comprehensive final examination, hour tests, problems, cases, and quizzes

9. General Topical Outline: See attached.

- I. Introduction to Calculus and Applications
 - A. Distance
 - B. Velocity
- II. Circular Motion, Trigonometry, Computation
- III. Derivatives: Power and Polynomials
- IV. Slope and Tangent Lines
- V. Derivatives: Sine, Cosine, Product, Quotient, Power Rule
- VI. Limits and Continuous Functions
- VII. Applications of the Derivative
 - A. Linear approximations
 - B. Maximum-Minimum Problems
- VIII. The Second Derivative
- IX. Graphs: Ellipses, Parabolas, and Hyperbolas
- X. Iterations, Newton's method, the Mean Value Theorem, L'Hospital's Rule
- XI. The Chain Rule, Implicit Differentiation, Related Rate Applications
- XII. Inverse Functions and Their Derivatives, Applications to Trigonometric Functions
- XIII. Integrals, Anti-Derivatives, Summation, and Integration
- XIV. Indefinite Integrals, Substitutions
- XV. Definite Integral, Properties of the Integral, Average Value
- XVI. The Fundamental Theorem and Its Consequences
- XVII. Numerical Integration
- XVIII. Applications Problems