



MERCER
COUNTY COMMUNITY COLLEGE

COURSE OUTLINE

Course Number	Course Title	Credits
MAT 149	Calculus	4
Hours: Lecture/Lab/Other	Co- or Pre-requisite	Implementation Semester & Year
4/0/0	MAT146 with a minimum grade of C Or Multiple measures placement	Spring 2022

Catalog description:

Application-based topics include the fundamental techniques of differentiation and integration of algebraic, trigonometric, exponential and logarithmic functions. Study focuses on optimization, maxima-minima and marginal analysis for differentiation and includes substitution method among other specific integration techniques. This course is not a prerequisite for MAT152.

General Education Category:
Goal 2: Mathematics

Course coordinator:
Betty Peterson, petersob@mccc.edu, 609-570-3421

Required texts & Other materials:

Calculus with Applications 11th Edition, Margaret Lial, Raymond Greenwell, Nathan Ritchey. Pearson Publishing, ISBN – 10: 0 321 74900 6

Or

Open Educational Resource similar to above selected by the course instructor or course coordinator.

Course Student Learning Outcomes (SLO):

Upon successful completion of this course, the student will be able to:

1. Calculate and demonstrate understanding of limits and their application to calculus. [Supports ILG #2, 4]
2. Differentiate functions: polynomial, rational, trigonometric, exponential and logarithmic. [Supports ILG #2, 4]
3. Apply the techniques of differentiation to solve application problems. [Supports ILG #2, 4, 11]
4. Integrate functions: polynomial, rational, trigonometric, exponential and logarithmic. [Supports ILG #2, 4]
5. Apply the techniques of integration to solve application problems. [Supports ILG #2, 4, 11]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Units of study in detail – Unit Student Learning Outcomes:

Unit I [Functions and Limits] [Supports Course SLO #1]

Learning Objectives

The student will be able to:

- Explain continuous functions and locate points of discontinuity
- Define the limit concept and calculate limits algebraically
- Calculate one-sided limits, limits for transcendental functions and infinite limits.
- Apply formal definition of continuity for polynomial and transcendental functions
- Apply Intermediate Value Theorem

Unit II [Differentiation] [Supports Course SLOs #2, 3]

Learning Objectives

The student will be able to:

- Apply the definition of the derivative
- Apply the basic rules of differentiation: power rule, constant multiple rule, sum and difference rules, product rule, quotient rule and chain rule.
- Find higher-order derivatives
- Calculate the derivative implicitly
- Calculate a derivative using logarithmic differentiation
- Define and apply relative minimum and relative maximum
- Determine where a function is increasing or decreasing
- Define open and closed intervals including open to the right and left
- Define and apply the absolute extrema of a function on an interval

Unit III [Applications of the Derivative] [Supports Course SLO #3]

Learning Objectives

The student will be able to:

- Apply the relative maximum and minimum to application problems
- Apply the second derivative to application problems
- Define the derivative as a rate of change for application problems
- Define the second derivative in the context of an application problem
- Apply derivatives to sketch a graph of a function
- Define the constant e
- Apply marginal analysis to application problems
- Solve application problems using related rates
- Apply derivative to find limits by using L'Hopital's rule

Unit IV [Integration] [Supports Course SLO #4]

Learning Objectives

The student will be able to:

- Define an antiderivative
- Determine if a function is an antiderivative of another
- Calculate an integral by applying the basic formulas
- Calculate an integral by using u-substitution
- Calculate Riemann sums and define definite integrals
- Define and evaluate definite integrals

Unit V **[Applications of Integration] [Supports Course SLO #5]**

Learning Objectives

The student will be able to:

- Solve exponential growth and decay models using differential equations
- Calculate the area of a region under a curve
- Calculate the area of a region between two curves
- Apply the summation notation for any given function
- Define the average value of a function over an interval
- Define the present value of a business application
- Calculate present value

Evaluation of student learning:

Evaluation of a student's progress from performance on unit tests, quizzes, homework assignments and projects. Test questions and assignments written to assess the student learning outcomes listed above. A comprehensive final exam in this course written with questions selected that assess the course student learning outcomes.

Suggested grading distribution below.

Unit tests(4) – 60%

Cumulative Final – 25%

Homework, Quizzes and Projects – 15%

Please check the section syllabus for the exact distribution of assignments and weights.