Middlesex Community College
COURSE OUTLINE

MAT	254	Calculus I	4
Dept. Abbr.	**Course No.**	**Course Title**	**Credits**

Course Description

A course in differential calculus. Topics include limits, continuity, derivatives, antiderivatives, and applications.

Prerequisite: Eligible for ENG*101 and MAT*186 (or higher) with a grade of "C" or better OR eligible for ENG*101 and math placement

General Objectives of the Course

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

- Represent the following concepts and mathematical information symbolically, graphically, , numerically and verbally and identify their interrelations
    a. Limits and continuity.
    b. Derivatives and antiderivatives
- Analyze, identify and apply the appropriate differentiation and integration rules for various functions and evaluate the results for specific values
- investigate the use of differentiation and integration in various applications
- interpret and evaluate the validity of results, and provide clear, logical and organized explanations through verbal and written responses
- Compare patterns in differentiation and integration as a unifying conclusion to the two processes
- use technology throughout the course to enhance their conceptual understanding of these topics

General Education Competencies

Students in this course will:

- Quantitative Reasoning (D)

  (1) Represent mathematical and quantitative information symbolically, graphically, numerically, and verbally.
  (2) Apply quantitative methods to investigate routine and novel problems. This includes calculations, procedures, mathematical and /or statistical modeling, prediction, and evaluation.
  (3) Interpret mathematical and quantitative information and draw logical inferences from
  Representations such as formulas, equations, graphs, tables and schematics
  (4) Evaluate the results obtained from quantitative methods for accuracy and/or reasonableness.

- Critical Analysis and Logical Thinking (E)
  (2) Formulating arguments: Formulates good arguments, including a significant focus on inductive reasoning.
  (3) Analysis: Break subject matter into components and identify their interactions to ascertain the defining features of the work and their contributions to the whole.
  (5) Synthesis: Draw together disparate claims into a coherent whole in order to arrive at well-reasoned and well-supported inferences that can be justified as a conclusion.

- Written Communication (E)

  (3) Craft Logical Arguments
    - Generate a controlling idea or thesis
    - Provide clear and logical evidence, support, or illustration for their assertions
    - Choose appropriate and effective organizing methods, employing effective transitions and signposts.

Unit No.	Instructional Unit	Specific Objectives of Instructional Unit Assume that each statement is prefixed with "The student will be able to".
1	Limits and Continuity	• Use and apply vocabulary and symbols associated with limits and continuity. • Develop and apply the definition of limit and concepts associated with finding limits. • Find limits of functions. • Use properties of limits. • Demonstrate understanding of the concept of continuity and apply this to functions.
2	Differentiation	• Use and apply vocabulary and symbols associated with differentiation • Develop and apply the definition of the derivative and concepts associated with differentiation • Find the derivative of functions. • Use the Chain Rule and implicit differentiation. • Apply derivatives to solve problems.
3	Applications of the Derivative	• Identify extreme values of functions. • Use the Mean Value Theorem. • Use the first and second derivative tests to describe and sketch curves. • Use L'Hopital's Rule. • Solve related rates and optimization problems.
4	Antidifferentiation	• Use and apply vocabulary and symbols associated with antidifferentiation. • Develop and apply the definition of the definite integral and concepts associated with integration. • Find antiderivatives • Use properties of integrals. • Use the Fundamental Theorem of Calculus. • Perform integration by substitution. • Apply integrals to solve problems.