Middlesex Community College
COURSE OUTLINE

MAT	256	Calculus II	4
Dept. Abbr.	**Course No.**	**Course Title**	**Credits**

Course Description

The definite integral applied to algebraic and transcendental functions, techniques of integration, polar coordinates and applications, infinite series, and vectors.

Prerequisite: Eligible for ENG*101 and MAT*254 (or higher) with a grade of "C" or better OR eligible for ENG*101 and math placement.

General Objectives of the Course
(Statement identifying educational goals 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 evaluate as applicable

  - Anti-derivatives
  - Integration techniques
  - Applications of integration
  - Infinite series
  - Polar coordinates

- Apply integration to find areas and volumes generated by various curves, and interpret and evaluate the validity of results
- Analyze, identify and apply the appropriate integration technique for the given scenario
- Form clear distinction between the concept of sequence and infinite series, understand the interrelation between limits of sequences and limits at infinity of functions
- Compare patterns in series, and determine the appropriate test for convergence and divergence in order to arrive at a well-supported inference as a conclusion
- Use technology throughout the course to enhance their conceptual understanding of these topics
- Provide clear, logical and organized explanations through verbal and written responses

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*** (The specific objectives reflect the behavioral outcomes, which include what the student will be able to do at the completion of the unit. Evaluation is then to be based on the student's accomplishment of these objectives. Assume that each statement is prefixed with "The student will be able to".)
1	Review of differential rules and formulas; Definite and indefinite integrals	1. Evaluate the indefinite integrals. 2. Understand the definition of definite integrals via Riemann Sum and evaluate the definite integrals using the definition. 3. Evaluate the definite integrals using the fundamental theorems of calculus. 4. Evaluate integrals by substitution
2	Applications	1. Find the areas between two curves. 2. Find volumes by disks, washers, and cylindrical shells. 3. Find the arc length and surface area of a surface of revolution. 4. Solve certain problems related to work, force, economics, and biology.
3	Methods of Integration	1. Integrate by parts. 2. Integrate by trigonometric substitutions. 3. Integrate rational functions by partial fraction. 4. Integrate using tables. 5. Evaluate improper integrals. 6. Approximate definite integrals by numerical methods.

4	Infinite Series	1. Understand the difference between a sequence and a series. 2. Find the limit of an infinite sequence and determine its convergence or divergence. 3. Understand the difference between convergence and absolute convergence of infinite series. 4. Determine the convergence of infinite series by the integral test, comparison test, ratio test, or root test. 5. Identify various series: geometric series, p-series, alternating series. 6. Use the test for divergence. 7. Represent certain functions as power series. 8. Differentiate and integrate a power series term by term. 9. Find the interval of convergence of a power series. 10. Understand Taylor series and find the Maclaurin series of functions.
5	Polar Coordinates and Applications	1. Convert points and equations from polar to Cartesian coordinates and vice versa. 2. Sketch the graph of a polar equation. 3. Find the slope of the tangent line to a polar curve. 4. Find the areas and arc lengths in polar coordinates.
6	Vectors (optional)	1. Represent vectors in 2-dimensional spaces analytically and geometrically. 2. Construct a 3-dimensional rectangular coordinate system. 3. Represent vectors in 3-dimensional spaces analytically and geometrically. 4. Add (subtract) vectors and multiply vectors by scalars. 5. Perform the dot product of two vectors. 6. Perform the cross product of two vectors. 7. Find the direction cosines and direction angles. 8. Determine the amount of work performed by a constant force.