ATLANTIC CAPE COMMUNITY COLLEGE
Math and Science Department

MATH 156 – CALCULUS II
Credits: 4-0-4

COURSE DESCRIPTION and PREREQUISITE:

Prerequisite: Completion of Calculus I with a grade of C or better.

Topics of study include applications of integration, integration techniques, indeterminate forms, improper integrals, sequences, series, conics, parametric equations, and polar coordinates.

LEARNING GOALS:
Students will:
- Work with techniques of integration to evaluate volume and area.
- Expand their knowledge of differentiation and integration techniques to include L'Hopital's Rule, Integration by Parts, and Improper Integrals.
- Understand sums that involve infinitely many terms.
- Explore conics, parametric equations, and polar coordinates.

STUDENT LEARNING OUTCOMES:
Students will be able to:
- Apply techniques of integration to evaluate volume and area.
- Apply knowledge of differentiation and integration techniques to evaluate integrals and limits involving Integration by Parts, and Improper Integrals.
- Manipulate and evaluate sums that involve infinitely many terms.
- Write, evaluate, and apply varied parametric and polar equations.

LEARINING OBJECTIVES:

Chapter 7 – Applications of Integration

7.1   Area of a Region Between Two Curves
- Students will be able to use initial conditions to find particular solutions of differential equations
- Students will be able to find the area of a region between two curves using integration
- Students will be able to find the area of a region between intersecting curves using integration
- Students will be able to describe integration as an accumulation process

7.2   Volume: The Disk Method
- Students will be able to find the volume of a solid of revolution using the disk method
- Students will be able to find the volume of a solid of revolution using the washer method
- Students will be able to find the volume of a solid with known cross sections

7.3   Volume: The Shell Method
- Students will be able to find the volume of a solid of revolution using the shell method
- Students will be able to compare the uses of the disk method and the shell method

7.4   Arc Length and Surfaces of Revolution
- Students will be able to find the arc length of a smooth curve
- Students will be able to find the area of a surface of revolution

Chapter 8 – Integration Techniques and Improper Integrals

8.1   Basic Integration Rules
- Students will be able to fit an integrand to one of the basic integration rules

8.2   Integration by Parts
- Students will be able to find an Antiderivative using integration by parts
- Students will be able to use a tabular method to perform integration by parts

8.3   Trigonometric Integrals
- Students will be able to solve trigonometrical integrals involving powers of sine and cosine
- Students will be able to solve trigonometrical integrals involving powers of secant and tangent
- Students will be able to solve trigonometrical integrals involving sine-cosine products with different angles

8.4   Trigonometric Substitution
- Students will be able to use trigonometric substitution to solve an integral
- Students will be able to use integrals to model and solve real-life applications

8.5   Partial Fractions
- Students will be able to understand the concept of a partial fraction decomposition
- Students will be able to use partial fraction decomposition with linear factors to integrate rational functions
- Students will be able to use partial fraction decomposition with quadratic factors to integrate rational functions

8.7   Integration by Tables and Other Integration Techniques
- Students will be able to evaluate an indefinite integral using a table of integrals
- Students will be able to evaluate an indefinite integral using reduction formulas
- Students will be able to evaluate an indefinite integral involving rational functions of sine and cosine

8.8   Improper Integrals
- Students will be able to evaluate an improper integral that has an infinite limit of integration
- Students will be able to evaluate an improper integral that has an infinite discontinuity

Chapter 9 – Infinite Series

9.1   Sequences
- Students will be able to list the terms of a sequence
- Students will be able to determine whether a sequence converges or diverges
- Students will be able to write a formula for the nth term of a sequence
- Students will be able to use properties of monotonic sequences and bounded sequences

9.2   Series and Convergence
- Students will be able to understand the definition of a convergent infinite series
- Students will be able to use properties of infinite geometric series
- Students will be able to use the nth-term Test for Divergence of an infinite series

9.3   The Integral Test and *p*-Series
- Students will be able to use the Integral Test to determine whether an infinite series converges or diverges
- Students will be able to use properties of p-series and harmonic series

9.4   Comparisons of Series
- Students will be able to use the Direct Comparison Test to determine whether a series converges or diverges
- Students will be able to use the Limit Comparison Test to determine whether a series converges or diverges

9.5   Alternating Series
- Students will be able to use the Alternating Series Test to determine whether an infinite series converges
- Students will be able to use the Alternating Series Remainder to approximate the sum of an alternating series
- Students will be able to classify a convergent series as absolutely or conditionally convergent
- Students will be able to rearrange an infinite series to obtain a different sum

9.6   The Ratio and Root Tests
- Students will be able to use the Ratio Test to determine whether a series converges or diverges
- Students will be able to use the Root Test to determine whether a series converges or diverges
- Students will be able to review the tests for convergence and divergence of an infinite series

9.7   Taylor Polynomials and Approximations
- Students will be able to find polynomial approximations of elementary functions and compare them with the elementary functions

- Students will be able to find Taylor and Maclaurin polynomial approximations of elementary functions
- Students will be able to use the remainder of a Taylor polynomial

9.8   Power Series
- Students will be able to understand the definition of a power series
- Students will be able to find the radius and interval of convergence of a power series
- Students will be able to determine the endpoint convergence of a power series
- Students will be able to differentiate and integrate a power series

9.9   Representation of Functions by Power Series
- Students will be able to find a geometric power series that represents a function
- Students will be able to construct a power series using series operations

9.10   Taylor and Maclaurin Series
- Students will be able to find a Taylor or Maclaurin series for a function
- Students will be able to find a binomial series
- Students will be able to use a basic list of Taylor series to find other Taylor series

Chapter 10: Conics, Parametric Equations, and Polar Coordinates

10.1   Conics and Calculus
- Students will be able to define a conic section.
- Students will be able to analyze and write equations of parabolas using properties of parabolas.
- Students will be able to analyze and write equations of ellipses using properties of ellipses.
- Students will be able to analyze and write equations of hyperbolas using properties of hyperbolas.

10.2   Plane Curves and Parametric Equations
- Students will be able to sketch the graph of a curve given by a set of parametric equations.
- Students will be able to eliminate the parameter in a set of parametric equations.
- Students will be able to find a set of parametric equations to represent a curve.

10.3   Parametric Equations and Calculus
- Students will be able to find the slope of a tangent line to a curve given by a set of parametric equations.
- Students will be able to find the arc length of a curve given by a set of parametric equations.
- Students will be able to find the area of a surface of revolution (parametric form).

10.4   Polar Coordinates and Polar Graphs
- Students will be able to demonstrate an understanding the polar coordinate system.
- Students will be able to rewrite rectangular equations in polar form and vice versa.

- o Students will be able to sketch a graph of an equation given in polar form.
- o Students will be able to find the slope of a tangent line to a polar graph.
- o Students will be able to identify several types of special polar graphs.

10.5 Area and Arc Length in Polar Coordinates
- o Students will be able to find the area of a region bounded by a polar graph.
- o Students will be able to find the points of intersection of two polar graphs.
- o Students will be able to find the arc length of a polar graph.
- o Students will be able to find the area of a surface of revolution (polar form).

ASSESSMENT STRATEGIES:

Student Learning Outcome	Assessment Strategies
• Apply the techniques of integration to evaluate volume and area.	• Comprehensive Exam • Classroom Observation
• Apply knowledge of differentiation and integration techniques to evaluate integrals and limits involving L'Hopital's Rule, Integration by Parts, and Improper Integrals.	• Comprehensive Exam • Classroom Observation
• Manipulate and evaluate sums that involve infinitely many terms.	• Comprehensive Exam • Classroom Observation
• Write, evaluate, and apply varied parametric and polar equations.	• Comprehensive Exam • Classroom Observation

College Grading Scale (except for Paralegal, Nursing, and Culinary Programs)

Grade	Percentage Range	Grade Point Value
A	93-100%	4.0
A-	90-92%	3.7
B+	87-89%	3.3
B	83-86%	3.0
B-	80-82%	2.7
C+	77-79%	2.3
C	70-76%	2.0
D	60-69%	1.0

TEXTBOOK AND MATERIALS

- <u>Textbook available online on WebAssign: Calculus Of A Single Variable – 11th edition with the student's solution manual</u> by Larson and Edwards.
- A scientific calculator. The TI-84 Graphing Calculator will be used during classroom demonstrations therefore, the TI-84 is strongly recommended. If you choose a calculator other than the TI-84, it is your responsibility to learn the applications by reading your user manual. You will not be permitted to use any other calculator for testing.

ADA Accommodations

As per the Americans with Disabilities Act (ADA), reasonable accommodations can be provided to students who present current documentation (within five years) of a disability to Atlantic Cape Community College's Center for Accessibility, located on the first floor of "J" Building in the Counseling and Support Services department (Mays Landing campus). Reasonable accommodations cannot be provided for a course until the student registers with the Center for Accessibility. For more information, please contact the Center for Accessibility via email at cfa@atlantic.edu or call 609-343-5680.