BROWARD COLLEGE
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Course Outline

Course Title: Calculus And Analytical Geometry I
Common Course Title: MAC2311
Effective Term: Fall 2021 (Aug 9, 2021)
Credit Hours: 5 Units

Next Review : Aug 8, 2026
Contact Hour Breakdown: *(Per 16 week Term)*
Total: 80
Lecture: Lab:
Clinic: Other:

Requirements

Pre-requisite(s) with minimum grade required
MAC1147 (C)
OR
MAC1114 (C) ***AND*** MAC1140 (C)

Course Description:

This is the first of a three-course sequence in calculus. Topics include: analytic geometry, functions, limits, continuity, derivatives and their applications, transcendental functions, antiderivatives, and definite integrals. Certain sections of this course may require the use of a graphing calculator. Recommendation of the Mathematics Department or at least a grade of "C in each of the prerequisite courses is required.

Course Outline

Alignment of General Education Competencies with General Outcomes of this Course (for general education assessment purposes)

1. Critical Thinking
   - 2.0,3.0

2. Effective Communication
   - 3.0

3. Ethical Reasoning

4. Global Awareness

5. Information Literacy

6. Mathematical and Scientific Reasoning
   - 2.0,3.0,4.0,5.0

UNITS

Unit 1: Functions, Limits, and Continuity

General Outcome
1.0 Evaluate limits, and determine when a function is continuous.

Specific Learning Outcomes
1.1 Graphically estimate limits.
1.2 Graphically recognize if a limit exists.
1.3 Demonstrate knowledge of the ε–δ definition of limits.
1.4 Evaluate limits using the theorems on limits, including the “squeeze” theorem.
1.5 Evaluate one-sided limits.
1.6 Determine if a function is continuous at a number “c” and on an interval for selected algebraic and transcendental functions.
1.7 Distinguish between removable and non-removable discontinuities using algebraic and graphical techniques.
1.8 Apply the Intermediate Value Theorem.
1.9 Graphically determine the domain and range of a function.

Unit 2: The Derivative and Differentiation

General Outcome
2.0 Find derivatives using the definition of a derivative and special formulas, and apply derivatives to geometrical and physical problems.

Specific Learning Outcomes
2.1 Define the derivative, and use it to find the slope of a curve.
2.2 Calculate the derivative by its limit definition.
2.3 Use the derivative to calculate instantaneous rates of change.
2.4 Explain the relationship between the differentiability and continuity of a function.
2.5 Graphically interpret if a function is continuous and/or differentiable.
2.6 Apply the power rule, the scalar multiple rule, the sum rule, the product rule, and the quotient rule to find the derivative.
2.7 Use the chain rule to find the derivative.
2.8 Calculate second-, third-, and higher-order derivatives.
2.9 Distinguish between explicit and implicit forms of an equation.
2.10 Demonstrate the technique of implicit differentiation, and apply it to equations in implicit form.
2.11 Solve related rate problems.
2.12 Define the differentials dy and dx, and demonstrate their use.

Unit 3: Extreme Function Values and Techniques of Graphing

General Outcome
3.0 Find relative and absolute maxima and minima of a function, solve related geometrical and physical problems, and sketch graphs using the techniques of calculus.

Specific Learning Outcomes
3.1 Apply Rolle's Theorem and the Mean Value Theorem.
3.2 Use the derivative to determine the intervals on which a function is increasing or decreasing.
3.3 Use the derivative of a function to locate its absolute and relative extrema.
3.4 Graphically estimate the absolute and relative extrema of a function.
3.5 Use the first and second derivatives of a function to determine concavity and points of inflection.
3.6 Sketch the graph of a function using calculus techniques.
3.7 Solve optimization problems using the concepts of extrema.
3.8 Use derivatives to determine the velocity and acceleration of objects traveling along linear paths.

Unit 4: The Definite Integral and Integration

General Outcome
4.0 Demonstrate knowledge of the theory of antiderivatives, and demonstrate the ability to evaluate and apply antiderivatives.

Specific Learning Outcomes
4.1 Use summation notation.
4.2 Evaluate antiderivatives using basic theorems and substitution techniques.
4.3 Calculate the definite integral and the area under a curve as the limit of a Riemann sum.
4.4 Use the Fundamental Theorem of Calculus to calculate the value of a definite integral.
4.5 Apply the properties of the definite integral when evaluating an integral.
4.6 Demonstrate knowledge of the Mean Value Theorem for Integrals.
4.7 Estimate the value of a definite integral.

Unit 5: Transcendental Functions

General Outcome
5.0 Differentiate and integrate transcendental functions.

Specific Learning Outcomes
5.1 Define the natural logarithmic function and use the definition to establish its properties.
5.2 Calculate the derivative of a logarithmic function.
5.3 Apply logarithmic differentiation to functions that are not themselves logarithmic.
5.4 Calculate the derivative of an exponential function.
5.5 Use integration formulas for exponential functions.
5.6 Derive and apply formulas for the derivatives of trigonometric functions.
5.7 Derive and apply the formulas for integrating trigonometric functions.

Unit 6: Inverse Trigonometric Functions

General Outcome
6.0 Differentiate and integrate inverse trigonometric functions.

Specific Learning Outcomes
6.1 Demonstrate an understanding of the relationship between the derivative of a function and the derivative of the function's inverse.
6.2 Derive and apply the formulas for the derivatives of the inverse trigonometric functions.
6.3 Identify and integrate functions whose antiderivatives are inverse trigonometric functions including the use of completing the square in the denominator.
6.4 Evaluate definite and indefinite integrals yielding inverse trigonometric functions.