

**SOUTHEAST COMMUNITY COLLEGE  
DIVISION OF ARTS AND SCIENCES**

**Mathematics**

**Revision Date: 07-01-24**

**I. CATALOG DESCRIPTION**

Course Number: MATH1600  
Course Title: Calculus I and Analytic Geometry  
Prerequisite(s): A grade of C or higher in MATH1150 and MATH1200 or a C or higher in MATH1300 or appropriate placement score.  
Catalog Description: This course is a study of single variable calculus and analytical geometry. Topics include limits, continuity, derivatives, applications of derivatives, integrals, and applications of integrals.  
Credit Hours: 5.0  
Class Hours: 75  
Lab Hours: 0  
Total Contact Hours: 75

**II. COURSE OBJECTIVES:** *Course will:*

- A. Present analytical, numerical and graphical techniques to establish limits.
- B. Introduce analytical, numerical and graphical techniques to verify continuity.
- C. Present the definition to find derivatives.
- D. Provide the rules of differentiation to calculate derivatives.
- E. Relate the concepts of differentiation to analyze increasing and decreasing functions, locate extrema, and determine concavity.
- F. Use the concepts of differentiation to calculate rates of change.
- G. Apply techniques of differentiation to optimize functions.
- H. Develop the definition of integrals using approximation.
- I. Provide the rules of integration to calculate integrals.
- J. Apply the concepts of integration to calculate area between curves.
- K. Use the concepts of integration to calculate volumes of solids.

**III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES**

- A. Student Learning Outcomes: *Student will be able to:*
  - 1. Calculate rates of change.
  - 2. Find the equation of tangent to a curve.
  - 3. Calculate limits of a function using the limit laws.
  - 4. Evaluate one-sided limits and limits at infinity.
  - 5. Evaluate infinite limits and find vertical asymptotes.
  - 6. Verify continuity of functions.
  - 7. Find derivatives and equations of tangents at a point.
  - 8. Express the derivative as a function.
  - 9. Utilize differentiation rules for polynomials, products, and quotients.
  - 10. Interpret the derivative as a rate of change.
  - 11. Find the derivatives of transcendental functions.
  - 12. Utilize the chain rule.
  - 13. Determine higher order derivatives.
  - 14. Use implicit differentiation.
  - 15. Utilize the mean value theorem.
  - 16. Determine absolute extrema.
  - 17. Solve related rates problems.
  - 18. Utilize linearization and differentials.
  - 19. Use the first and second derivatives to identify local extrema and sketch curves.

- 20. Solve applied optimization problems.
  - 21. Utilize Newton's Method.
  - 22. Estimate with finite sums.
  - 23. Use sigma notation and limits of finite sums.
  - 24. Evaluate definite integrals.
  - 25. Utilize the fundamental theorem of calculus.
  - 26. Evaluate indefinite integrals.
  - 27. Use the substitution method to evaluate integrals.
  - 28. Find the area under a curve and between curves.
  - 29. Determine volumes of solids.
- B.** General Education Learning Outcomes
- 1. GELO #3: Critical Thinking & Problem Solving  
Outcome: Collect, interpret, and/or analyze data.  
Outcome: Synthesize information to arrive at reasoned solutions.  
Outcome: Evaluate the validity of arguments, alternatives, data, outcomes, and/or impact of actions.
  - 2. GELO #5: Analytical, Quantitative, and Scientific Reasoning  
Outcome: Apply mathematical and scientific methods/principles to develop strategies, algorithms, or experiments to solve or describe problems.  
Outcome: Implement strategies, algorithms, or experiments (or perform experiments) to describe the systems or solve problems.

**IV. CONTENT/TOPICAL OUTLINE (*course outline may provide more detailed information*)**

- A.** Limits and Continuity
  - 1. Rates of change
  - 2. Limits of functions
  - 3. Continuity
- B.** Derivatives
  - 1. Derivative at a point
  - 2. Derivative as a function
  - 3. Differentiation Rules
  - 4. Derivative as Rate of Change
  - 5. Derivatives of Transcendental Functions
  - 6. Chain Rule
  - 7. Implicit Differentiation
  - 8. Higher Order Derivatives
  - 9. Linearization and Differentials
- C.** Applications of Derivatives
  - 1. Extreme values of functions
  - 2. Mean value theorem
  - 3. First and Second Derivative Test
  - 4. Concavity
  - 5. Applied Optimization
  - 6. Related Rates
  - 7. Newton's Method
  - 8. Antiderivatives
- D.** Integrals
  - 1. Finite sums
  - 2. Definite integral
  - 3. Fundamental Theorem of Calculus
  - 4. Indefinite Integrals
  - 5. Substitution Method
- E.** Applications of Definite Integrals

1. Area between curves
2. Volumes of solids

**V. INSTRUCTIONAL MATERIALS**

- A. Required Text(s):
1. Hass, *University Calculus, Early Transcendentals*, 4<sup>th</sup> Edition, Pearson, 2020. With Inclusive Access.
- B. Other resources:
1. Graphing calculator is recommended.

**VI. METHODS OF PRESENTATION/INSTRUCTION**

- A. Methods of presentation typically include a combination of the following:
- A. Lecture
  - B. Class discussion
  - C. Presentation and discussion of solutions to problems and exercises

**VII. METHODS OF EVALUATION**

- A. Methods of evaluation typically include a combination of the following:
1. Unit Tests
  2. Comprehensive final exam
  3. Quizzes
  4. Assignments

Students will receive a course outline/syllabus indicating the instructor's specific attendance policy, course timeline, course requirements, and grading criteria.

**B. SCC GRADING SCALE**

A+	95-100	C+	75-79	F	59 or less
A	90-94	C	70-74		
B+	85-89	D+	65-69		
B	80-84	D	60-64		

**VIII. SPECIFIC COURSE REQUIREMENTS**

- A. None