SOUTHEAST COMMUNITY COLLEGE
DIVISION OF ARTS AND SCIENCES
Mathematics
Revision Date: 07-01-26

I. CATALOG DESCRIPTION

Course Number:	MATH1600
Course Title:	Calculus I and Analytic Geometry
Prerequisite(s):	A grade of C or higher in MATH1200 or 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*, Pearson, Current Edition. 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