SOUTHEAST COMMUNITY COLLEGE
DIVISION OF ARTS AND SCIENCES
Mathematics
Revision Date: 07-01-21
Syllabus Statements

I. CATALOG DESCRIPTION

Course Number:	MATH1600
Course Title:	Analytic Geometry and Calculus I
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 analytical geometry and single variable calculus. 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. Present model functions and use techniques of differentiation to optimize the function.
H. Use the definition of integrals and approximation.
I. Provide the rules of integration to calculate integrals.
J. Relate 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. Evaluate 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 by slicing and rotation about an axis.
30. Evaluate volumes by cylindrical shells.

B. General Education Learning Outcomes

1. GELO #3: Critical Thinking & Problem Solving
Outcome: Collect, identify, interpret and analyze data.
Outcome: Synthesize information to arrive at reasoned solutions to problems.
Outcome: Evaluate the validity of arguments, alternatives, data, outcomes, and/or impacts of actions.
Outcome: Acquire and integrate knowledge and construct relationships across disciplines.

2. GELO #5: Analytical, Quantitative, and Scientific Reasoning
Outcome: Apply mathematical and scientific methods to solve problems from an array of contexts and everyday situations.
Outcome: Understand and create logical arguments supported by quantitative and scientific evidence and communicate those arguments in a variety of formats.
Outcome: Effectively develop strategies, algorithms, or experiments (or performing experiments) to better describe the systems or to solve the problems.
Outcome: Manipulate formulas, data sets, graphs, tables, etc. in a way to produce a meaningful outcome.

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 Transcendentals 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
6. Area between curves

E. Applications of Definite Integrals
1. Volumes using cross-sections
2. Volumes using cylindrical shells

V. INSTRUCTIONAL MATERIALS

A. Required Text(s):
1. Hass, *University Calculus, Early Transcendentals*, 4th 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