SOUTHEAST COMMUNITY COLLEGE
DIVISION OF ARTS AND SCIENCES
Mathematics
Revision Date: 07-01-19
Syllabus Statements

I. CATALOG DESCRIPTION

Course Number:	MATH2080
Course Title:	Calculus & Analytical Geometry III
Prerequisite(s):	MATH1700
Catalog Description:	Study of calculus and analytic geometry for functions of two or more variables. Coordinates, three-dimensional vectors, three-dimensional analytic geometry, differentiation and integration of functions of many variables and integration in vector fields. Use of some mathematical software may be required.
Credit Hours:	4.0
Class Hours:	60
Lab Hours:	0
Total Contact Hours:	60

II. COURSE OBJECTIVES: *Course will:*

A. Investigate vectors, vector operations, and applications of vectors to curves and surfaces in space.
B. Investigate functions of two or more variables using geometric, numerical, and algebraic techniques.
C. Investigate applications of Differential and Integral Calculus to functions of two or more variables.
D. Introduce and develop concepts for Calculus in Vector Fields.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES

A. Student Learning Outcomes: *Student will be able to:*

1. Identify basic surface from equation, and write equations for basic curves and surfaces in three dimensions.
2. Perform basic vector operations (sum, difference, scalar multiplication, dot products, cross product, and box product) algebraically and interpret the operations graphically.
3. Write equations for lines and planes in space.
4. Compute and interpret derivatives, and integrals for vector valued functions.
5. Compute limits and derivatives for functions of two or more variables.
6. Use limits and derivatives to analyze functions of two or more variables.
7. Use various tools to find extrema of a function on the interior of its domain, and on the boundary of its domain.
8. Write, evaluate, and interpret iterated integrals (double and triple integrals).
9. Use triple integrals to determine the mass, moments, and center of mass for solids in space.
10. Use iterated integrals in cylindrical and spherical coordinates.
11. Evaluate line integrals.
12. Use line integrals in a vector field to compute flow, work, circulation, and flux.
13. Use Green's Theorem to evaluate line integrals to compute flux, and circulation in a vector field.
14. Evaluate surface integrals.
15. Use surface integrals to compute surface area, and the flux of a vector field through a surface.
16. Compute the Curl and Divergence of a vector field.
17. Use Stokes Theorem, and the Divergence Theorem to evaluate surface integrals in a vector field.

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. Three Dimensional Coordinate Systems
B. Vectors
C. The Dot Product
D. The Cross Product
E. Lines and Planes in Space
F. Cylinders and Quadratic Surfaces
G. Vector Functions and Their Derivatives
H. Integrals of Vector Functions
I. Functions of Several Variables
J. Limits and Continuity in Higher Dimensions
K. Partial Derivatives
L. The Multivariable Chain Rule
M. Directional Derivatives and Gradient Vectors.
N. Tangent Planes and Differentials
O. Extreme Values and Saddle Points
P. Lagrange Multipliers
Q. Taylor's Formula for Two Variables (Optional)
R. Double and Iterated Integrals
S. Double Integrals over General Regions
T. Area by Double Integration
U. Double Integrals in Polar Form
V. Triple Integrals in Rectangular Coordinates
W. Moments and Center of Mass
X. Triple Integrals in Cylindrical and Spherical coordinates
Y. Line Integrals
Z. Vector Fields, Work, Circulation, and Flux
AA. Path Independence, Potential Functions, & Conservative Fields
BB. Green's Theorem in the Plane
CC. Surface Integrals and Flux
DD. Stokes' Theorem
EE. The Divergence Theorem & Unified Theory

V. INSTRUCTIONAL MATERIALS

A. Required Text(s):
- **1**. Hass, *University Calculus, Early Transcendentals*, 4th Edition, Pearson, 2020. With Inclusive Access.

B. Additional resources:
- **1**. A graphing calculator is required.

VI. METHODS OF PRESENTATION/INSTRUCTION

A. Methods of presentation typically include a combination of the following:
- **1**. Lecture
- **2**. Small group discussions
- **3**. In-class activities
- **4**. MyMathLab assignments and supplements
- **5**. Exploration using a mathematical software MAPLE in the computer lab
- **6**. Exploring Multivariable Calculus with MAPLE by C.K. Cheung, Tim Murdoch, G. E. Keough.
- **7**. Topics are discussed algebraically, graphically, and numerically. A graphing calculator may used for graphical, and numerical points of view.

VII. METHODS OF EVALUATION

A. Methods of evaluation typically include a combination of the following:
- **1**. Quizzes
- **2**. Hour exams
- **3**. Maple Labs and/or MyMathLab assignments
- **4**. Group Projects
- **5**. Comprehensive final

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. Students need to have completed the equivalent of MATH1700 (Calculus II) with a grade of C or better.