SOUTHEAST COMMUNITY COLLEGE
DIVISION OF ARTS AND SCIENCES
Mathematics
Revision Date: 7-01-25

I. CATALOG DESCRIPTION

Course Number:	MATH2200
Course Title:	Differential Equations
Prerequisite(s):	MATH1700 with a grade of C or better required MATH2080 with a grade of C or better recommended
Catalog Description:	Introductory course in differential equations. Using differential equations to model physical problems and techniques to solve linear differential equations, elementary existence theorems, solving systems of linear differential equations, and using Laplace transforms to solve initial value problems.
Credit Hours:	3.0
Class Hours:	45
Lab Hours:	0
Total Contact Hours:	45

II. COURSE OBJECTIVES: *Course will:*

A. Develop concepts and techniques for finding solutions of differential equations using geometric, numeric and algebraic approach.

B. Use differential equations to create mathematical models for problems from science, industry, and engineering.

C. Use Calculus and techniques from this course to find numeric, graphical, and/or analytic solutions for a variety of ordinary differential equations.

D. To learn mathematics through investigation of practical problems.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES

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

1. Use a variety of techniques to solve ordinary differential equations analytically, and numerically (using a Computer Algebra System).

2. Define appropriate variables and write differential equations for basic problems from science, industry, and engineering.

3. Verify and explore solutions to ordinary differential equations analytically, numerically, and graphically.

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. Differential Equations and Mathematical Models
B. Integrals as General and Particular Solutions
C. Slope Fields and Solution Curves
D. Separable Equations and Applications
E. Linear First-Order Equations
F. Substitution Methods and Exact Equations
G. Population Models
H. Equilibrium Solutions and Stability
I. Acceleration-Velocity Models
J. Numerical Approximations: Euler's Method
K. Second Order Linear Equations
L. Homogeneous Equations w/ Constant Coefficients
M. Nonhomogeneous Equations and Undetermined Coefficients
N. First Order Systems and Applications
O. Matrices and Linear Systems
P. Eigenvalue Methods for Homogeneous Systems
Q. Multiple Eigenvalue Solutions
R. Stability and the Phase Plane
S. Laplace Transforms and Inverse Laplace Transforms
T. Transformation of Initial Value Problems
U. Translation and Partial Fractions
V. Derivatives, Integrals, and Product Transforms
W. Periodic and Piecewise Continuous Functions

V. INSTRUCTIONAL MATERIALS

A. Required Text(s):
1. Edwards, C. Henry, David E. Penney, David T. Calvis. *Differential Equations and Boundary Value Problems: Computing and Modeling*, 6th Edition, Pearson, 2022. eTextbook ISBN-13: 9780137540365; rental + hardcover ISBN-13: 9780137540129; MyLab 18-Week Access ISBN-13: 9780137540402; MyLab 24-Month Access ISBN-13: 9780137540419.

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. Computer Lab Activities using computer algebra software *Maple*.
5 A graphing calculator is required.
6. Topics are discussed algebraically, graphically, and numerically. A graphing calculator or *Maple* is 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
4. 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 MATH2080 (Calculus III – Multivariable Calculus) with a grade of "C" or better.