SEWARD COUNTY COMMUNITY COLLEGE
COURSE SYLLABUS

I. TITLE OF COURSE: MA2903- Differential Equations

II. COURSE DESCRIPTION: 3 credit hours **credit hours**

3 credit hours of lecture **credit hours of lecture and** 0 credit hours of lab per week. A differential **credit hours of lab per week.**

A differential equation is an equation that contains derivatives or differentials of one or more functions. In this course, we will study Ordinary Differential Equations; that is, differential equations in which the unknown factor in the equation depends upon only one independent variable. We will consider First Order Differential Equations, Higher Order Differential Equations, Linear Differential Equations (both Homogeneous and Non-Homogeneous), Laplace Transforms, Inverse Laplace Transforms, Solutions by Infinite Series, and Solutions to Linear Systems of Differential Equations, with many applications. This course is designed for those majoring in Mathematics, Mathematical Sciences and Engineering.

For each unit of credit, a minimum of three hours per week with one of the hours for class and two hours for studying/preparation outside of class is expected.

Pre-requisite: A grade of "C" or better in Calculus III (MA 2625).

III. PROGRAM AND/OR DEPARTMENT MISSION STATEMENT:

The Mathematics Department at Seward County Community College will enhance a student's ability to think critically using mathematical principles, ideas, and concepts in order to function in a society with ever-changing technology.

IV. TEXTBOOK AND MATERIALS:

1. Zill, A First Course in Differential equations with Modeling Applications, 11th edition, Cengage.

2. WebAssign Access Code

3. TI-84+ and/or TI-89 graphing calculator

V. SCCC OUTCOMES

Students who successfully complete this course will demonstrate the ability to do the following SCCC Outcomes.

4: Demonstrate mathematical skills using a variety of techniques and technologies.

5: Demonstrate the ability to think critically by gathering facts, generating insights, analyzing data, and evaluating information

VI. COURSE OUTCOMES:

1. To apply differential equations to Chemical Engineering, Mechanical Engineering, Electrical Engineering, Civil Engineering, Physics, and Mathematics, by creating and solving mathematical models in a variety of contexts, including but not limited to chemical reactions,

mechanical systems, damped force vibrations, and electrical circuits.

2. To utilize the basic terminology and definitions necessary for studying differential equations and the terminology associated with each type of differential equation covered in the course.

3. To sketch the slope field of a differential equation (using technology) and interpret the results.

4. To solve first- order differential equations including separable, homogeneous, exact, and linear first-order differential equations.
5. To use linear and non-linear first order differential equations as models to solve a variety of applications.
6. To solve linear homogeneous and non-homogeneous higher-order differential equations.
7. To solve nonlinear higher-order differential equations.
8. To solve applications using linear and nonlinear higher-order models.
9. To determine power series solutions for differential equations.
10. To determine Laplace Transforms and Inverse Transforms.
11. To solve systems of linear first-order differential equations.
12. To solve differential equations numerically using the Euler Method

VII. COURSE OUTLINE:

1. Terminology, what constitutes a solution to a differential equation, solutions.
2. First Order Differential Equations: Separation of variables, substitution, exact differential equations, integrating factors, approximation methods, and applications.
3. Modeling with first-order linear, nonlinear, and systems of differential equations.
4. Homogeneous Linear Differential Equations: Terminology, existence theorems, general solution, reduction of order, homogenous linear equations with constant coefficients, repeated roots (both real and complex), undamped vibrations, damped vibrations.
5. Non-Homogeneous Differential Equations: General approach, undetermined coefficients, differential operators, inverse differential operators, variation of parameters, applications to mechanical systems, damped forced vibrations, and electrical circuits.
6. Laplace Transforms: Definition and general properties, which functions have Laplace transforms, inverse Laplace transforms, initial-valued problems and a step function.
7. Infinite Series Methods: Taylor series solutions, ordinary and singular points, power series solutions.
8. Linear Systems: The method of elimination, and applications.

VIII. INSTRUCTIONAL METHODS:

1. Terminology, what constitutes a solution to a differential equation, solutions.
2. First Order Differential Equations: Separation of variables, substitution, exact differential equations, integrating factors, approximation methods, and applications.
3. Modeling with first-order linear, nonlinear, and systems of differential equations.
4. Homogeneous Linear Differential Equations: Terminology, existence theorems, general solution, reduction of order, homogenous linear equations with constant coefficients, repeated roots (both real and complex), undamped vibrations, damped vibrations.
5. Non-Homogeneous Differential Equations: General approach, undetermined coefficients, differential operators, inverse differential operators, variation of parameters, applications to mechanical systems, damped forced vibrations, and electrical circuits.
6. Laplace Transforms: Definition and general properties, which functions have Laplace transforms, inverse Laplace transforms, initial-valued problems and a step function.
7. Infinite Series Methods: Taylor series solutions, ordinary and singular points, power series solutions.
8. Linear Systems: The method of elimination, and applications.

IX. INSTRUCTIONAL AND RESOURCE MATERIALS:

1. Online Textbook--the basic classroom material.
2. Online WebAssign homework assignments
3. Supplemental texts and library mathematics reference books.
4. Supplemental materials prepared by the instructor which are available on Canvas.
5. The SMART Podium is the major tool used for lecture presentation and demonstrations.

X. METHODS OF ASSESSMENT:

SCCC Outcome # 4 will be assessed and measured by class participation, quizzes, and tests.
SCCC Outcome # 5 will be assessed and measured by using assignments, tests, and non-traditional problem-solving activities.

XI. ADA STATEMENT:

Under the Americans with Disabilities Act, Seward County Community College will make reasonable accommodations for students with documented disabilities. If you need support or assistance because of a disability, you may be eligible for academic accommodations. Students should identify themselves to the Dean of Students at 620-417-1106 or go to the Student Success Center in the Hobble Academic building, room A149.

Syllabus Reviewed: 05/19/2021 18:36:38