J. Sargeant Reynolds Community College
Course Content Summary

Course Prefix and Number: MTH 267 Credits: 3

Course Title: Differential Equations

Course Description

Introduces ordinary differential equations. Includes first order differential equations, second and higher order ordinary differential equations with applications and numerical methods. Lecture 3 hours per week. 3 credits.

General Course Purpose

The general purpose is to give the student a solid grasp of the methods solving and applying differential equations and to prepare the student for further coursework in mathematics, engineering, computer science and the sciences.

Course Prerequisites/Corequisites

Prerequisite: Completion of MTH 264 or equivalent with a grade of C or better.

Course Objectives

Upon completing the course, the student will be able to:

First Order Differential Equations

- Classify a differential equation as linear or nonlinear.
- Understand and create a directional field for an arbitrary first-order differential equation.
- Determine the order, linearity or nonlinearity, of a differential equation.
- Solve first order linear differential equations.
- Solve Separable differential equations.
- Solve initial value problems.

Numerical Approximations

- Use the Euler or tangent line method to find an approximate solution to a linear differential equation.

Higher Order Differential Equations

- Solve second order homogenous linear differential equations with constant coefficients including those with complex roots and real roots.
- Determine the Fundamental solution set for a linear homogeneous equation.
- Calculate the Wronskian.
- Use the method of Reduction of order.
- Solve nonhomogeneous differential equations using the method of undetermined coefficients.
- Solve nonhomogeneous differential equations using the method of variation of parameters.

Applications of Differential Equations, Springs-Mass-Damper, Electrical Circuits, Mixing Problems

- Solve applications of differential equations as applied to Newton's Law of cooling, population dynamics, mixing problems, and radioactive decay. (1st order)
- Solve springs-mass-damper, electrical circuits, and/or mixing problems (2nd order)

- Solve application problems involving external inputs (non-homogenous problems).

Laplace Transforms

- Use the definition of the Laplace transform to find transforms of simple functions
- Find Laplace transforms of derivatives of functions whose transforms are known
- Find inverse Laplace transforms of various functions.
- Use Laplace transforms to solve ODEs.

Major Topics to be Included

- First Order Differential Equations
- Numerical Approximations
- Higher Order Differential Equations
- Applications of Differential Equations, Springs-Mass-Damper, Electrical Circuits, Mixing Problems
- Laplace Transforms

Effective Date/Updated: August 1, 2022