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. Replaces MTH 279 or MTH 291. Prerequisite: Completion of MTH 264 with a grade of C or better. Lecture 3 hours per week.

General Course Purpose: Designed primarily for mathematical, physical, and engineering science programs. 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 and Co-requisites:
Prerequisite: Completion of MTH 264 with a grade of C or better

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

1. (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;

2. (Numerical Approximations)
   - Use the Euler or tangent line method to find an approximate solution to a linear differential equation;

3. (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 non-homogeneous differential equations using the method of undetermined coefficients;
   - Solve non-homogeneous differential equations using the method of variation of parameters;

4. (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);

5. (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; and
    - Use Laplace transforms to solve ODEs.

Major Topics to Be Included

1. First Order Differential Equations
2. Numerical Approximations
3. Higher Order Differential Equations
4. Applications of Differential Equations, Springs-Mass-Damper, Electrical Circuits, Mixing Problems
5. Laplace Transforms

Effective Date of Course Content Summary: August 4, 2017