

# Virginia Community College Course Content Summary

**Course Title:** MTH 267: 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

Course Prefix and Number      MTH 267 (proposed):       
(To be assigned by the VCCS)

Laplace Transforms

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(To be completed by VCCS) Course Approved: Month                      Year