MTH 267 - Differential Equations

Course Description

Effective: 2017-08-01

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

- 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