New 8/2018

NOVA COLLEGE-WIDE COURSE CONTENT SUMMARY
MTH 267 – DIFFERANTIAL EQUATIONS (3 CR.)

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. Total 3 hours per week. Total 3 hours per week.

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

a) First Order Differential Equations
b) Numerical Approximations
c) Higher Order Differential Equations
d) Applications of Differential Equations, Springs-Mass-Damper, Electrical Circuits, Mixing Problems
e) Laplace Transforms