Math 45 : Differential Equations for Science & Engineering

California State University, Sacramento · Department of Mathematics & Statistics

This course provides an introduction to differential equations and their applications to the sciences for students majoring in Mathematics, Science, and Engineering.

Catalog Description

First order differential equations, second order differential equations with constant coefficients. Laplace transforms, small systems of linear differential equations, numerical methods, introduction to second order differential equations with variable coefficients. **Graded**: Graded Student. **Units**: 4.0.

Prerequisites

Math 31

Text

A First Course in Differential Equations with Modeling Applications, 10/e, by Dennis Zill

Assignments

A variety of reading and problem solving assignments will be part of the course.

Examinations

There will be regular midterm examinations and a comprehensive final examination for this course.

Course Outline

I. Introduction (1 Week)

    A. Definitions and vocabulary

    B. Questions of existence and uniqueness

    C. Geometric representation

II. First order differential equations (3 Weeks)

    A. Separable

    B. Homogeneous

    C. Exact

    D. Linear

    E. Miscellaneous - Including Bernoulli's equation

III. Higher order differential equations (3 Weeks)

    A. Linear dependence - independence

B. General solution

C. Reduction of order

D. Linear equations with constant coefficients

E. Method of undetermined coefficients

F. Method of variation of parameters

G. Cauchy-Euler equation

IV. Laplace transform (3 Weeks)

A. Definition

B. Properties

C. Inverse transform

D. Solution of differential equations

V. Systems of differential equations (1 Week)

A. Reduction to triangular form

B. Laplace transform method

VI. Applications - Selected from [1] (3 Weeks)

A. Growth and decay

B. Harmonic oscillator

C. Mechanical systems

D. Electrical systems

---

[1]Instructors are expected to introduce applications throughout the course, particularly in the coverage of sections II, III, and V.