MATH 285: Differential Equations (3 credit hours)

Description

Math 285 covers techniques and applications of ordinary differential equations, including Fourier series and boundary value problems, and an introduction to partial differential equations. It is intended for engineering majors and others who require a working knowledge of differential equations.

Prerequisite: MATH 241 or equivalent

Course Objectives

After successful completion of the course, students should expect to achieve the following goals:

- Be able to apply existence and uniqueness theorem to determine whether a solution exists or not
- Be able to solve ODE or simple PDE using separation of variables
- Have a good understanding about eigenvalues and eigenfunctions of ODE's and also learn how to determine eigenvalues and eigenfunctions
- Be able to apply Laplace transform to find the solution of a given ODE
- Be able to find particular solution of ODE using variation of parameters.

Course Content

1. Introduction to differential equations, separable equations and solving differential equations and verifying solutions

2. Exact equations, linear nonhomogenous equations, first order linear equations, autonomous equations and bifurcations

3. Superposition principle, linear independence, Euler formula, Fundamental Theorem of Algebra

4. Constant coefficient equations, method of undetermined coefficients, hrmonic oscilltors, Laplace transforms, and variation of parameters

5. Systems of differential equations, matrix exponentials and boundary value problems

6. Orthogonality and orthogonal decomposition

7. Fourier series, heat equation, wave equation

Format

- This course features video lectures from the UIUC Spring 2022 course taught by Professor Jared Bronski and includes online lecture notes via Moodle.

- The text for this course is an expansion of lecture notes created by Jared Bronski and Aldo Manfroi.

- Students must be able view assignments online, write out solutions, then scan or take a photo of their written work and upload it to Moodle to meet set deadlines. There are additional homework assignments and worksheet accessed via the PrairieLearn system.

- This course has three 90-minute midterm tests and a 3-hour final exam. It uses PrairieTest to administer exams. More information can be found here: https://www.prairietest.org/pt/docs/students/online.