ENAS S194

NOTE: This class will be an online course using Zoom. The course material, assignments and exams will be comparable to that given as an "on campus" course.

Professor Mitchell D. Smooke July 5, 2022
ENAS 194: Ordinary and Partial Differential Equations with Applications
Time: TWTh 10:00AM-12:30PM
Office: Becton 205
Phone: 432-4344

Overview

The course will introduce the engineering and applied science student to ordinary and partial differential equations for use in solving problems of physical interest. The course will focus on the solution of linear and nonlinear equations. Methods for first and second order equations, Laplace transforms methods, linear systems solution methods, and separation of variables techniques will be considered.

Prerequisites

A working knowledge of basic concepts from calculus (Math 112, 115, 120) and some linear algebra (Math 222) is helpful.

Requirements

The course grade will be composed of homework (20%), and four midterms (20% each). The homework is designed to expand the material covered in the lectures. Assignments will be posted on the class server each week and will be due in class the following week. The midterms will be given online on Friday of each week starting in week two. The exams will be open book.

Texts

The required text is the 11th edition of Elementary Differential Equations and Boundary Value Problems by Boyce and DiPrima and Meade.

Miscellaneous

Office hours: After class or by appointment via Zoom.

Teaching Assistants: TBD

Syllabus

I. Introduction

II. First Order Equations

1. Linear Equations
2. Separable Equations
3. Applications
4. Existence and Uniqueness

III. Second Order Equations

1. Homogeneous with Constant Coefficients
2. Fundamental Solutions
3. Wronskians
4. Complex Roots
5. Reduction of Order
6. Undetermined Coefficients
7. Variation of Parameters
8. Applications

IV. Higher Order Equations

1. Homogeneous with Constant Coefficients
2. Undetermined Coefficients
3. Variation of Parameters

V. Series Solutions

1. Power Series
2. Series Solutions Near an Ordinary Point
3. Regular Singular Points
4. Euler Equations
5. Series Solutions Near a Regular Singular Point

VI. Laplace Transform

1. Solution of IVPs
2. Step Functions
3. Discontinuous Forcing Functions
4. Convolution Integrals

VII. Systems of First Order Equations (if time permits)

1. Matrices
2. Basic Linear Algebra
3. Homogeneous Linear Systems
4. Complex and Repeated Eigenvalues

VIII. Partial Differential Equations

1. Separation of Variables
2. Fourier Series
3. Even and Odd Functions
4. Wave Equation
5. Laplace Equation