Catalog Description:
Ordinary differential equations, their series solutions, numerical methods, Laplace transforms, physical applications.

Prerequisite:
C- or better in 2153, 2162.xx, 2173, 2182H, or 4182H; or credit for 254.xx, 263.xx, 263.01H, or 264H.

Text:

Topics List:

INTRODUCTION
1.3 Classification of Differential Equations
2.1 Linear Equations with Variable Coefficients

FIRST ORDER DIFFERENTIAL EQUATIONS
2.2 Separable Equations
2.4 Differences between Linear and Nonlinear Equations
2.5 Autonomous Equations and Population Dynamics
2.6 Exact Equations and Integrating Factors
2.7 Numerical Approximations: Euler’s Method
2.8 The Existence and Uniqueness Theorem
2.9 First Order Difference Equations

SECOND ORDER LINEAR EQUATIONS
3.1 Homogeneous Equations with Constant Coefficients
3.3 Complex Roots of the Characteristic Equation
3.2 Solutions of Linear Homogeneous Equations; the Wronkian
3.4 Repeated Roots; Reduction of Order

Midterm 1
3.5 Nonhomogeneous Equations; Method of Undetermined Coefficients
3.6 Variation of Parameters
3.7 Mechanical and Electrical Vibrations
3.8 Forced Vibrations
THE LAPLACE TRANSFORM
6.1 Definition of the Laplace Transform
6.3 Step Functions
6.2 Solution of Initial Value Problems
6.4 Differential Equations with Discontinuous Forcing Functions
6.5 Impulse Functions
6.6 The Convolution Integral

Midterm 2

HIGHER ORDER LINEAR EQUATIONS
4.1 General Theory of nth Order Equations
4.2 Homogeneous Equations with Constant Coefficients
4.3 The Method of Undetermined Coefficients Material
4.4 The Method of Variation of Parameters

SERIES SOLUTIONS OF SECOND ORDER LINEAR EQUATIONS
5.1 Review of Power Series
5.2 Series Solutions near an Ordinary Point, Part I
5.3 Series Solutions near an Ordinary Point, Part II
5.4 Euler's Equation; Regular Singular Points

Midterm 3

5.5 Series Solutions near a Regular Singular Point, Part I
5.6 Series Solutions near a Regular Singular Point, Part II
5.7 Bessel's Equation