1. **Introduction to Differential Equations**
   1.1 Basic Terminology
   1.2 \( n \)-Parameter Family of Solutions; Initial-Value Problems

2. **First Order Differential Equations**
   2.1 Linear Differential Equations
   2.2 Separable Differential Equations
   2.3 Extensions to Other First Order Equations
   2.4 Some Applications of First Order Differential Equations
   2.5 Direction Fields; Existence and Uniqueness
   2.6 Some Numerical Methods

3. **Second Order Linear Differential Equations**
   3.1 Introduction; Basic Terminology and Results
   3.2 Second Order Linear Homogeneous Equations
   3.3 Homogeneous Equations with Constant Coefficients
   3.4 Nonhomogeneous Equations
   3.5 Nonhomogeneous Equations with Constant Coefficients; Undetermined Coefficients
   3.6 Vibrating Mechanical Systems
   3.7 Higher-Order Linear Differential Equations

**Exam 1**

4. **Laplace Transforms**
   4.1 Introduction
   4.2 Basic Properties of Laplace Transforms
   4.3 Inverse Laplace Transforms and Initial-Value Problems
   4.4 Piecewise Continuous Functions, Part I: Laplace Transforms
   4.5 Piecewise Continuous Functions, Part II: Inverse Laplace Transforms
   4.6 Initial-Value Problems with Piecewise Continuous Nonhomogeneous Terms

5. **Systems of Linear Differential Equations**
   5.1 Systems of Linear Differential Equations
   5.2 Homogeneous Systems
   5.3 Homogeneous Systems with Constant Coefficients, Part I
   5.4 Homogeneous Systems with Constant Coefficients, Part II
   5.5 Nonhomogeneous systems
   5.6 *Direction Fields and Phase Planes

6. **Series Solutions of Differential Equations**
   6.1 The Taylor Series Method
   6.2 The Power Series Method

**Exam 2**

* Optional Section