

**MATH 5332: Differential Equations
Syllabus**

- 1. Introduction to Differential Equations**
 - 1.1 Preliminaries
 - 1.2 Basic Terminology
 - 1.3 n -Parameter Family of Solutions and General Solution
 - 1.4 Initial Conditions; Initial-Value Problems

- 2. First Order Differential Equations**
 - 2.1 Preliminaries
 - 2.2 Linear Differential Equations
 - 2.3 Separable Differential Equations
 - 2.4 Change of Variable: Extensions to Other First Order Equations
 - 2.5 Some Applications of First Order Differential Equations
 - 2.6 Direction Fields; Existence and Uniqueness
 - 2.7 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 Preliminaries
 - 4.2 The Laplace Transform
 - 4.3 Basic Properties of Laplace Transforms
 - 4.4 Inverse Laplace Transforms and Initial-Value Problems
 - 4.5 Piecewise Continuous Functions, Part I: Laplace Transforms
 - 4.6 Piecewise Continuous Functions, Part II: Inverse Laplace Transforms
 - 4.7 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