

Birzeit University

Mathematics Department

Math 331

Course outline

Text: Boyce, DiPrima, *Elementary Differential Equations and Boundary Value Problems*, 10th ed.

Topics

Ch 1: Introduction

- 1.1 Some Basic Models and Direction Fields
- 1.2 Solutions of some Differential Equations
- 1.3 Classification of Differential Equations

Ch 2: First Order Differential Equations

- 2.1 Linear Equations, Method of Integrating Factors
- 2.2 Separable Equations
- 2.3 Modeling with First Order Equations
- 2.4 Differences between Linear and Nonlinear Equations
- 2.5 Autonomous Equations and Population Dynamics
- 2.6 Exact Equations and Integrating Factors
- 2.8 The Existence and Uniqueness Theorem

Ch 3: Second Order Linear Equations

- 3.1 Homogeneous Equations with Constant Coefficients
- 3.2 Solutions of Linear Homogeneous Equations, the Wronskian
- 3.3 Complex Roots of the Characteristic Equation
- 3.4 Repeated Roots, Reduction of Order
- 3.5 Nonhomogeneous Equations, Method of Undetermined Coefficients
- 3.6 Variation of Parameters

Ch 4: Higher Order Linear equations Equations

- 4.1 General theory of nth order linear equations
- 4.2 Homogeneous Equations with Constant Coefficients
- 4.3 The method of undetermined coefficients

Ch 5: Series Solutions of Second Order Linear Equations

- 5.1 Review of Power Series
- 5.2 Series Solutions near an Ordinary Point, Part 1
- 5.3 Series Solutions near an Ordinary Point, Part 2
- 5.4 Euler Equations, Regular Singular Points
- 5.5 Series Solutions near a Regular Singular Point, Part 1

Ch6: The Laplace Transform

6.1 Definition of the Laplace Transform

6.2 Solution of Initial Value Problems

6.3 Step Functions

6.4 Differential Equations with Discontinuous Forcing Functions

6.5 Impulse Functions

6.6 The Convolution Integral

Ch 7: Systems of First Order Linear Equations

7.5 Homogeneous Linear Systems with Constant Coefficients

7.6 Complex Eigen values

7.8 Repeated Eigen Values

Evaluation:

20% Best 3 out of 4 short exams

35% Midterm Exam

45% Final Test

- Attend all classes. If you miss a class, you are responsible for the material covered in that class.
- **Missing the final test will result in a makeup test with the same weight as the other students, only if a written and accepted excuse is delivered at the assigned date posted by the department; otherwise only 70% of the makeup final grade will be counted.**
- A student should be honest in every aspect. Trying to copy or cheat other students' ideas is not accepted in any ways
- Disrupting classes is not tolerated in any case, such as entering the class late and start dragging chairs, ringing mobiles, talking with neighbors throughout a class, etc.

Outline for Homework Problems

| Section | Problem Number |
|---------|--|
| 1.1 | 1, 7, 11, 22, 23, 25 |
| 1.2 | 1, 3, 7, 12, 13, 14, 15, 17 |
| 1.3 | 1, 3, 5, 7, 9, 21, 25 |
| 2.1 | 1, 9, 15, 18, 27, 28, 32, 33 |
| 2.2 | 1, 3, 11, 13, 21, 30, 32, 34 |
| 2.3 | 1, 3, 13, 18, 20, 22 |
| 2.4 | 1, 6, 7, 13, 15, 23, 24, 25, 26, 27, 28, 32, 33 |
| 2.6 | 1, 7, 10, 13, 18, 24, 31 |
| 2.8 | 1, 3, 5 , (13 – 19 optional) |
| 2.9 | 1-32, 36, 37, 42, 45 |
| 3.1 | 1-9, 20, 21 |
| 3.2 | 1, 6, 8, 10, 14, 17, 20, 21, 34, 36 |
| 3.3 | 4, 5, 9, 10, 18, 27, 29, 34, 37, 43, 44 |
| 3.4 | 1, 5, 11, 17, 19, 20, 33, 34 |
| 3.5 | 1, 8, 14, 20, 22, 25, 29 |
| 3.6 | 1, 7, 12, 13, 17, 22, 23 |
| 4.1 | 3, 5, 7, 15 |
| 4.2 | 1, 5, 7, 8, 11, 13, 17, 19, 25 |
| 4.3 | 1, 3, 6, 12, 16, 17 |
| 5.1 | 5, 7, 9, 11, 13, 15, 21, 23, 25 |
| 5.2 | 1, 2, 3, 5, 9, 11, 19, 21 |
| 5.3 | 3, 4, 5, 6, 7, 10, 22, 23 |
| 5.4 | 1, 3, 5, 7, 17, 21, 31, 35, 37 |
| 5.5 | 1, 3 |
| 6.1 | 1, 6, 7, 11, 26, 27 |
| 6.2 | 1, 3, 5, 7, 9, 11, 19, 23, 27, 28, 29 |
| 6.3 | 1, 5, 7, 14, 16, 19, 21, 25, 28, 34, 35 |
| 6.4 | 1, 9, 10, 11, 18 |
| 6.5 | 1, 3, 7, 16, 25 |
| 6.6 | 1(a), 4, 5, 8, 9, 13, 14, 22, 26 |
| 7.5 | 1, 3, 15 |
| 7.6 | 1, 3, 9 |
| 7.8 | 1, 4, 10 |