

<b>Course code</b>	:	DSC – C5
<b>Title of course</b>	:	Elements of Differential Equations
<b>Theory</b>	:	32 Hrs. (40 lecturers of 48 min.)
<b>Marks</b>	:	50 (Credit: 02)

**Course Learning Outcomes: This course will enable the students to:**

CO1: identify types of higher order ordinary differential equations.

CO2: solve different types of higher order ordinary differential equations.

CO3: understand geometrical interpretation of simultaneous and total differential equations.

**Unit 1: (20 Hrs.)**

**1.1. Homogeneous linear differential equations**

- 1.1.1. Definition: Homogeneous linear differential equation (Cauchy - Euler differential equation).
- 1.1.2. Method of solution and examples.
- 1.1.3. Definition: Legendre's linear differential equation.
- 1.1.4. Method of solution of Legendre's linear differential equation and examples.

**1.2. Second order linear differential equations**

- 1.2.1. Definition (general form): Second order linear differential equation.
- 1.2.2. Methods of solution of Second order linear differential equation.
  - 1.2.2.1. Complete solution when one integral is known: method and examples.
  - 1.2.2.2. Transformation of the equation by changing the dependent variable (removal of first order derivative) and examples.
  - 1.2.2.3. Transformation of the equation by changing the independent variable and examples.
  - 1.2.2.4. Method of variation of parameters and examples.

**Unit 2: (12 Hrs.)**

**2.1. Ordinary Simultaneous linear differential equations**

- 2.1.1. Definition: Ordinary Simultaneous linear differential equations.
- 2.1.2. Geometrical interpretation of ordinary simultaneous differential equations.
- 2.1.3. Methods of Solving Simultaneous Linear Differential Equations and examples.

**2.2. Total differential equations.**

- 2.2.1. Definition: Total differential equation.
- 2.2.2. Necessary condition for integrability of total differential equation
- 2.2.3. Geometrical interpretation of total differential equation. Geometrical relation between total differential equations and simultaneous Linear differential equations
- 2.2.4. Methods of solving total differential equations:
  - a) Method of Inspection.
  - b) Solution of homogeneous equations.

- c) Use of Auxiliary equation.
- d) Treating one variable as a constant.

**Recommended book:**

1. Ordinary and Partial Differential Equations, M. D. Raisinghania, Eighteenth revised edition 2016; S. Chand and Company Pvt. Ltd. New Delhi.

**Scope:**

**[Part I – Chapter 6:** 6.1, 6.2, 6.3, 6.4, 6.9, 6.10, 6.11;

**Part I – Chapter 10:** 10.1, 10.2, 10.3, 10.4 (excluding 10.4A and 10.4B), 10.5, 10.6, 10.7, 10.8, 10.9, 10.10, 10.11, 10.13, 10.14;

**Part II – Chapter 2:** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11;

**Part II – Chapter 3:** 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13]

**Reference books:**

1. Differential Equations, Shepley L. Ross, Third Edition 1984; John Wiley and Sons, New York.
2. Elements of Partial Differential Equations, Ian Sneddon, Seventeenth Edition, 1982; McGraw-Hill International Book Company, Auckland
3. Introductory course in Differential Equations, D. A. Murray, Khosala Publishing House, Delhi.