B.Sc. (Mathematics) (Part I) (Level 4.5)(Semester – II)
(NEP-2020)
Syllabus to be implemented from Academic Year 2024-25

Course type	:	**DSC – III**
Title of course	:	**Differential Equations - I**
Credit	:	**02**

Course Learning Outcomes: Upon successful completion of the course students will able to:

CO 1. classify differential equations.
CO 2. solve different types of differential equations.
CO 3. find orthogonal trajectories.
CO 4. apply the knowledge of differential equations to tackle problems occurring in physics and engineering.

Unit 1. Ordinary differential equations of first order and first degree **(15 hrs.)**

1.1 Introduction.
1.2 Exact differential equations.
  1.2.1 Necessary and sufficient condition for exactness.
  1.2.2 Differential equations reducible to exact, integrating factors with rules.
1.3 Linear differential equations.
1.4 Differential equations reducible to linear.
1.5 Applications of differential equations of first order and first degree:
  1.5.1 Law of growth.
  1.5.2 Law of decay.
  1.5.3 Newton's law of cooling.
  1.5.4 Orthogonal trajectories to Cartesian and Polar curves.
1.6 Examples based on 1.1 to 1.5.

Unit 2. Linear differential equations with constant coefficients **(15 hrs.)**

2.1 Introduction.
2.2 Auxiliary equation, Complementary function.
2.3 Types of complementary functions:
  2.3.1 Distinct real roots, repeated real roots, complex roots, repeated complex roots,
2.4 Particular integrals:
  2.4.1 Particular integrals of the functions: e^{ax}, sinax, cosax, x^m, $e^{ax}.V$ and $x.V$.

2.5 Applications to Electrical circuits.
2.6 Examples based on 2.1 to 2.5.

Recommended Book:

1. M. D. Raisinghania, Ordinary and Partial Differential Equations, 20th Revised Edition 2022; S.Chand and Company Pvt.Ltd.NewDelhi.
   Scope: Part 1 : Unit 2: 2.12 to 2.32, Unit 3: 3.1 to 3.8, Unit 5 : 5.1 to 5.25.

Reference Books:

1. Dr. A. B. Mathur and V. P. Jaggi, Advanced Engineering Mathematics, Khanna Publishers, 2nd edition, 2001.
2. R. K. Ghosh and K. C. Maity, An Introduction to Differential Equations, Book and Allied (P) Ltd., Seventh Edition, 2000.
3. D. A. Murray, Introductory Course in Differential Equations, Khosala Publishing House, Delhi.
4. Zafar Ahasan, Differential Equations and Their Applications, Second Edition, PHI2004.