ORDINARY DIFFRENTIAL EQUATIONS

Course No: **MM24301CR** Total Credits: **04**
Semester: **M.A/M.Sc 3rd Semester** Total Marks: **100**
Continuous Assessment: **Marks 20**, **Theory Marks: 80** Time Duration: **2½ Hrs**

Course objectives: To enable the student to solve problems pertaining to ordinary differential equations for various applications day to day life and to understand the practical importance of solving differential equations and to recognize an appropriate solution method for a given problem. The course enables a student to apprehend and appreciate the importance of establishing the existence and uniqueness of solutions.

Course Outcomes: The course typically focuses on developing students' ability to understand, solve, and analyze various types of ordinary differential equations and their applications. This will help in exploring stability analysis for first-order and second-order autonomous systems including equilibrium points.

UNIT -I

First order ODE, singular solutions, p −discriminate and c −discriminate, initial value problem of first order ODE, general theory of Homogeneous and non-homogeneous linear ODE, simultaneous linear equations with constant coefficients, normal form, factorization of operators, method of variation of parameters, Picard's theorem for the existence and uniqueness of solutions to an initial value problem.

UNIT -II

Solution in Series: (i) roots of an indicial equation, unequal and differing by a quantity not an integer. (ii) roots of an indicial equation, which are equal. (iii) roots of an indicial equation differing by an integer making a coefficient infinite. (iv) roots of an indicial equation differing by an integer making a coefficient indeterminate. Simultaneous equation $dx/P = dy/Q = dz/R$ and its solutions by use of multipliers and a second integral found by the help of first, total differential equations $Pdx + Qdy + Rdz = 0$, necessary and sufficient condition that an equation may be integrable, geometric interpretation of the $Pdx + Qdy + Rdz = 0$

UNIT -III

Existence of solutions, initial value problem, Ascoli- lemma, Cauchy Piano existence theorem, uniqueness of solutions with examples, Lipchitz condition and Gronwall inequality, method of successive approximation, Picard-Lindelof theorem, continuation of solutions, system of differential equations, dependence of solutions on initial conditions and parameters.

UNIT -IV

Maximal and minimal solutions of the system of ordinary differential equations, Caratheodary theorem, linear differential equations, linear homogeneous equations, linear system with constant coefficients, linear systems with periodic coefficients, fundamental matrix and its properties, non-homogeneous linear systems, variation of constant formula, Wronskian and its properties.

Recommended Books:

1. H.T.H. Piaggio, Differential Equations, CBS Publishers and Distributors, New Delhi.
2. D. Somasundaram, Ordinary Differential Equations, Narosa Publishers, New Delhi.
3. P. Hartmen, Ordinary Differential Equations, Society for Industrial and Applied Sciences (1987).
4. W. T. Reid, Ordinary Differential Equations, John Wiley & Sons Inc. (1971).
5. E. A. Coddington and N. Levinson, Theory of Ordinary Differential Equations, McGraw Hill Edu. (2017).