DIFFERENTIAL EQUATIONS AND NUMERICAL ANALYSIS

Credits: 4 **Semester: I**

Subject Code: DS19102 **No. of Lecture Hours:60**

Objective: To impart basics and solving differential equations applications of differential equations.

Outcomes: The students would be able to

CO1: Classify the differential equations with respect to their order and linearity. Solve differential equations of first order using numerical and analytical methods such as Integrating Factors.

CO2: Analyze and Solve basic application problems described by first order differential equations. such as orthogonal trajectories.

CO3: Solve second order Homogeneous Equations with Constant Coefficients. Obtain exact and Numerical solutions using differential equations technology.

CO4: Analyse and evaluate the accuracy of common numerical methods.

CO5: Select appropriate numerical methods to apply to various types of problems in engineering and science in consideration of the mathematical operations.

UNIT-I

Exact differential equations **12hrs**

1. Solving Exact differential Equations 3
2. Equations reducible to Exact differential Equations
3. Integrating factors 3

Applications of first order Differential Equations

1. Orthogonal trajectories - Cartesian coordinates- Polar coordinates. 6

UNIT II

Linear Differential Equations with constant coefficients **12hrs**

1. Auxiliary equation, Rules for finding the Complementary function 3
2. Rules for finding the Particular integral 3
3. Working rule for finding P.I. when X=eax, Sinax, Cosbx, xm, eaxv, xm.v 6

UNIT - III **12hrs**

The calculus of finite differences

1. Definition, Forward Difference, Backward Difference, and shift operator 2
2. Difference formulae – The difference table. 3
3. To express any value of the function in terms of leading terms and the leading difference of a difference table 3
4. Simple Problems on ∇, Δ and E 2
5. Newton- Gregory Forward and backward

Interpolation formulae	2

UNIT - IV **12hrs**

Interpolation with equal intervals

1. Interpolation with unequal intervals -divided differences (Only Definition.) Newton's divided difference Interpolation formula (Newton's formulae for unequal intervals)	2
2. Lagrange's Interpolation formula for unequal intervals	2
3. Central difference Interpolation formulae	2
4. Gauss Interpolation formula	2
5. Stirling's Interpolation formula	2
6. Bessel's Interpolation formula	2

UNIT- V

Numerical differentiation and Integration **12hrs**

1. Determination of First second and third order derivatives of the tabulated function	3
2. Using Newton forward and backward Interpolation formulae	3
3. Differentiation using Central difference Interpolation formulae	3
4. Numerical Integration using Trapezoidal rule, Simpson's 1/3 – rule, 3/8 Simpson's 3/8 rule – Simple problems there on.	3