

Course Objectives:

To enable the students to –

- Analyze the solution of differential equations of the first order and of the first degree by variables separable, Homogeneous and Non-Homogeneous methods.
- Evaluate a solution of differential equations of the first order and of a degree higher than the first by using methods of solvable for p, x and y.
- Compute all the solutions of second and higher order linear differential equations with constant coefficients, linear equations with variable coefficients.
- Solve simultaneous linear equations with constant coefficients and total differential equations
- Find the solution of First order partial differential equations for some standard types
- Apply Laplace transform to solve second order linear differential equation and simultaneous linear differential equations
- Compute all the solutions of Higher Order Linear Differential Equations with Constant Coefficients and non-Constant Coefficients

Course Outcomes:

After successful completion of this course, the student will be able to

1. Solve first order first degree linear differential equations.
2. Convert a non-exact homogeneous equation to exact differential equation by using an integrating factor.
3. Know the methods of finding solution of a differential equation of first order but not of first degree.
4. Solve higher-order linear differential equations for both homogeneous and non-homogeneous, with constant coefficients.
5. Understand and apply the appropriate methods for solving higher order differential equations.

COURSE CONTENT

UNIT – 1

DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE

Linear Differential Equations – Bernoulli's Equations - Exact Differential Equations –Integrating factors - Equations reducible to Exact Equations by Integrating Factors -

i) Inspection Method ii) $\frac{1}{Mx+Ny}$ iii) $\frac{1}{Mx-Ny}$

UNIT – 2: DIFFERENTIAL EQUATIONS OF FIRST ORDER BUT NOT OF FIRST DEGREE:

Equations solvable for p , Equations solvable for y , Equations solvable for x – Clairaut's equation - Orthogonal Trajectories: Cartesian and Polar forms.

UNIT – 3

HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS: Solutions of homogeneous linear differential equations of order n with constant coefficients - Solutions of non-homogeneous linear differential equations with constant coefficients by means of polynomial operators

$$(i) Q(x) = e^{ax} \quad (ii) Q(x) = \sin ax \text{ (or) } \cos ax$$

UNIT – 4: HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS (CONTINUED.): Solution to a non-homogeneous linear differential equation with constant coefficients

$$\text{P.I. of } (D) = Q \text{ when } Q = bx^k$$

$$\text{P.I. of } (D) = Q \text{ when } Q = e^{ax}V, \text{ where } V \text{ is a function of } x$$

$$\text{P.I. of } (D) = Q \text{ when } Q = xV, \text{ where } V \text{ is a function of } x$$

UNIT – 5: HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS WITH NON-CONSTANT

COEFFICIENTS: Linear differential Equations with non-constant coefficients; Cauchy-Euler Equation; Legendre Equation; Method of variation of parameters

ACTIVITIES: Seminar/ Quiz/ Assignments/ Applications of Differential Equations to Real life Problem /Problem Solving Sessions.

TEXT BOOK : Differential Equations and Their Applications by V.Venkateswara rao, N.Krishna Murthy, B.V.S.S.Sarma and S.Anjaneya Sastry, published by S. Chand &Company, New Delhi.

REFERENCE BOOKS:

1. Ordinary and Partial Differential Equations by Dr. M.D. Raisinghania, published by S. Chand &Company, New Delhi.
2. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha-Universities Press.
3. Differential Equations -Srinivas Vangala&Madhu Rajesh, published by Spectrum University Press.
4. Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Pvt. Ltd, New Delhi-Second edition.

