SYLLABUS

Advanced Differential Equation-II **Course code: MAT508**

Credit:04

Partial Differential Equations-I

Formation and Solutions of PDE, Complete Integral, General solution of Lagrange Equation, working rule (Example based), Surface and normal's in three Dimensions, Curve in three dimensions intersection of two surfaces. Integral Surfaces passing through a given curve (The Cauchy Problem), Surface orthogonal to a given system of surfaces, Geometrical description of Lagrange's equation $Pp + Qq = R$ and Lagrange's auxiliary equations $\frac{dx}{p} = \frac{dy}{Q} = \frac{dz}{R}$ Geometrical interpretation of $Pp + Qq = R$, Linear Partial Differential Equations of order one with n independent variables , Non-Linear Partial Differential Equations of order one, Fundamentals: Classification and Canonical Forms of PDE, Monge's Method

Partial Differential Equations-II

Derivation of Laplace and Poisson Equation, Dirichlet's Problem and Newmann Problem for a Rectangle, Interior and Exterior Dirichlet's Problem for a circle, Interior Newmann problem for a circle, Solution of Laplace equation in Cylindrical and spherical coordinates, Examples. Formation and Solution of diffusion Equation.

Partial Differential Equation-III

Dirac-Delta function, Solution of Diffusion Equation in Cylindrical and Spherical Coordinates, Examples. Formation and Solution of One-Dimensional wave equation, Canonical Reduction, D' Alembert's Solution, Two- Dimensional Wave Equation, Periodic Solution of One- Dimensional Wave Equation in Cylindrical and Spherical Coordinate Systems, Uniqueness of the Solution for the Wave Equation, Examples. Green's function for Laplace equation, Methods of Images, Eigen Function Method, Green's Function for the Wave and Diffusion Equations. Laplace Transform method: Solution of Diffusion and Wave equation by Laplace Transform.

Numerical Solutions of PDEs

Finite differences of Partial Differential Equations(PDEs), Applications to Integral Equations, Finite Element Method.

REFERENCES

1. Earl A. Coddington **(**1961).An Introduction to Ordinary Differential Equations, Dover Publications.
2. Lawrence C. Evans (2010).Partial Differential Equations. (2^{nd} edition).American Mathematical Society.
3. Daniel A. Murray (2003). Introductory Course in Differential Equations, Orient.
4. Ian.N.Sneddon, (2006), Elements of Partial Differential Equation, Dover Publications.
5. M.D. Raisinghania,(2021). Ordinary and Partial Differential equation (20^{th} Edition), S. Chand.