

## MATHEMATICS - II

**UNIT – I Vector Calculus:** Vector Calculus: Scalar point function and vector point function, Gradient- Divergence- Curl and their related properties. Solenoidal and irrotational vectors – finding the Potential function. Laplacian operator. Line integral – work done – Surface integrals - Volume integral. Green's Theorem, Stoke's theorem and Gauss's Divergence Theorems (Statement & their Verification).

**UNIT – II Fourier series and Fourier Transforms:** Definition of periodic function. Fourier expansion of periodic functions in a given interval of length  $2\pi$  . Determination of Fourier coefficients – Fourier series of even and odd functions– Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions. Fourier integral theorem - Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

**UNIT – III Interpolation and Curve fitting Interpolation:** Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations of symbols. Difference expressions – Differences of a polynomial-Newton's formulae for interpolation - Gauss Central Difference Formulae – Interpolation with unevenly spaced points-Lagrange's Interpolation formula. Curve fitting: Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares.

**UNIT – IV Numerical techniques:** Solution of Algebraic and Transcendental Equations and Linear system of equations: Introduction – Graphical interpretation of solution of equations .The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method .Solving system of non-homogeneous equations by L-U Decomposition method (Crout's Method). Jacobi's and Gauss-Seidel iteration methods.

**UNIT – V Numerical Integration and Numerical solutions of differential equations:** Numerical integration - Trapezoidal rule, Simpson's 1/3rd and 3/8 Rule , Gauss-Legendre one point, two point and three point formulas. Numerical solution of Ordinary Differential equations: Picard's Method of successive approximations. Solution by Taylor's series method – Single step methods-Euler's Method-Euler's modified method, Runge-Kutta (second and classical fourth order) Methods. Boundary values & Eigen value problems: Shooting method, Finite difference method and solving eigen values problems, power method