

SYLLABUS :-

Partial differential equations (PDE) in Physics: preliminaries; classification of second-order quasilinear equations; elliptic, hyperbolic and parabolic type; characteristics; boundary conditions and types of equations; one-dimensional wave equation; one-dimensional diffusion equation; the two dimensional Laplace equation; Green's function for PDE; singular part of the Green's function for PDE with constant coefficients; Poisson's equation; the diffusion equation; the wave equation; Dirichlet and Neumann problems; the initial value problem for the wave equation; the method of images; the method of separation of variables; 3D Laplace equation in spherical polar coordinates; associated Legendre functions and spherical harmonics.

Group Theory: definitions and nomenclature; examples; rearrangement theorem; cyclic groups; subgroups and cosets; Cayley's theorem and Lagrange's theorem; conjugate elements and class structure; factor groups; isomorphism and homomorphism; direct product groups; symmetric groups. Representation of finite groups; definition ; unitary representation; Schur's Lemma; orthogonality theorem; reducible and irreducible representations; characters; regular representation; product representation; character table; examples of S_3 and C_{4v} ; introduction to Lie groups and Lie algebra; Clebsch-Gordan coefficients.