PhD-July 2026-Admissions
Syllabus for Written Test (Physics)

Part-A (50 marks)

Mathematical Physics: Linear vector space; basis, orthogonality and completeness; matrices; similarity transformations, diagonalization, eigen values and eigen vectors; linear differential equations; second order linear differential equations and solutions involving special functions; complex analysis; Laplace Transforms; Fourier Analysis.

General Physics: Basics of Classical Mechanics; Lagrangian Formulation, D'Alembert's equation; Scalar and vector potentials; Flux, divergence of a vector, Gauss's theorem, Curl-rotational and irrational vector fields, Stoke's theorem; Electrostatic fields and potentials; Dielectrics, capacitors, and conductors; Lorentz force law, Bio-Savart's law and Ampere's law in magneto statics, Divergence and curl of B; Maxwell's equations.

PART-B (50 marks)

The candidate can attend <u>any TWO modules</u> from Part-B

Quantum Mechanics: Postulates of quantum mechanics; Uncertainty principle; Schrodinger equation; One-dimensional potentials: Step potential, finite rectangular well, tunnelling from a potential barrier, particle in a box, harmonic oscillator.

Solid State Physics: Elements of crystallography; Diffraction methods for structure determination; Bonding in solids; Free electron theory; Band theory of solids; Metals, semiconductors and insulators; Conductivity, mobility and effective mass; Optical properties of solids; Magnetic properties of solids; Dia-, para-, ferro-magnetism; Superconductivity.

Electronics: Semiconductors in equilibrium: Electron and hole statistics in intrinsic and extrinsic semiconductors; Direct and indirect band gap transitions, p-n junctions, Current-Voltage (I-V) characteristics of p-n junction diode, and its applications, Bipolar junction transistors; Current-Voltage (I-V) characteristics, Operational amplifiers, basics of digital logic circuits/gates.

Thermodynamics: Thermodynamic systems and processes; properties of pure substances, behaviour of ideal and real gases; zeroth and first laws of thermodynamics, calculation of work and heat in various processes; second law of thermodynamics; thermodynamic property charts and tables, availability and irreversibility; thermodynamic relations.

Fluid Mechanics: Fluid properties; fluid statics, forces on submerged bodies, stability of floating bodies; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; dimensional analysis; viscous flow of incompressible fluids, boundary layer, elementary turbulent flow, flow through pipes, head losses in pipes, bends and fittings; basics of compressible fluid flow.

Optics: Interference; Superposition of waves, Division of Amplitude and Division of wavefront, Diffraction; Single slit and double slit diffraction, Grating, Polarization; Types of polarized waves, Double refraction, wave plates, ordinary and extraordinary waves, ellipsoid of polarization, Reflection and refraction of electromagnetic waves in dielectric media and Fresnel relations.