

DEPARTMENT OF PHYSICS
Ph.D. Entrance Exam Syllabus – 2022

Classical Mechanics: Constrained motion, Lagrangian formulation, Calculus of Variation, Hamiltonian formulation, Canonical Transformations, Poisson Brackets, non-inertial frames, central forces, Rigid body dynamics, small oscillations

Quantum Mechanics: Schrodinger equation, one dimensional problem, Hermitian operators, Angular momentum, hydrogen atom, symmetry and conservation laws, variational method, WKB method, perturbation theory, scattering, relativistic quantum mechanics

Mathematical Physics: Matrices, tensors, power series methods, complex variables, integral transformations, partial differential equations, Green's function

Basic electronics: p-n junction, bipolar junction transistor and circuits, MOS transistors, integrated circuits, digital electronics, op-amps and circuits

Statistical Mechanics: Maxwell-Boltzmann statistics, partition function, ideal Bose-Einstein and Fermi-Dirac gases, non-equilibrium states and fluctuations

Electrodynamics: Electrostatics, magnetostatics, electrodynamics, electromagnetic waves in conductors, non-conductors, relativistic electrodynamics, radiation

Computational methods: Solution of Linear, Non –linear and Transcendental Equations, Solution of Simultaneous equations, Interpolation and Extrapolation, Curve Fitting, Numerical Integration

Condensed matter physics: crystal structure and analysis, X-ray diffraction, thermal properties, electronic properties, dielectric and magnetic properties

Nuclear and Particle Physics: Nuclear forces, nuclear reaction, nuclear models, nuclear decay, interaction of nuclear radiation with matter, nuclear detectors, particle physics, strange particles

Spectroscopic techniques: Electromagnetic spectrum, rotational, vibrational spectra, Raman Spectroscopy, broadening mechanism, NMR, NQR, MRI, ESR

Lasers science and fiber optics: Two and three level system, open resonator, quality factor, loss factor, gain, mode and mode locking, different laser systems, solid, liquid and gas phase. Optical fibers, wave propagation, wave guides, fiber optic communication, WDM, EDFO