

JOINT ENTRANCE SCREENING TEST SYLLABUS

MATHEMATICAL METHODS

Vector algebra and vector calculus, tensors, curvilinear coordinate systems, linear algebra;

Linear differential equations, elements of Sturm–Liouville theory;

Special functions; Complex analysis; Fourier series and Fourier transforms, Laplace transforms;

Elementary properties of discrete groups; Elements of probability theory, error analysis.

CLASSICAL MECHANICS

Newton's laws, conservation of energy and momentum, collisions; generalized coordinates, principle of least action,

Lagrangian and Hamiltonian formulations of mechanics;

Symmetry and conservation laws; central force problem, Kepler problem;

Small oscillations and normal modes; special relativity in classical mechanics.

ELECTROMAGNETISM & OPTICS

Electrostatics and magnetostatics, boundary value problems, multipole expansion;

Fields in conducting, dielectric, diamagnetic and paramagnetic media;

Faraday's law and time varying fields; displacement current;

Maxwell's equations; energy and momentum of electromagnetic fields;

Propagation of plane electromagnetic waves, reflection, refraction;

Electromagnetic waves in dispersive and conducting media;

diffraction, interference, polarization.

QUANTUM MECHANICS

Uncertainty principle; Schrodinger equation; central potentials, hydrogen atom;

Orbital and spin angular momenta, addition of angular momenta;

Matrix formulation of quantum theory, unitary transformations, Hermitian operators;

Variational principle, time independent perturbation theory, time dependent perturbation theory.

THERMODYNAMICS & STATISTICAL PHYSICS

Laws of thermodynamics, work and heat, thermodynamic potentials;

Elements of kinetic theory; Maxwell's relations;

Statistical ensembles; partition function; classical ideal gas, harmonic oscillators;

Classical and quantum statistics; Fermi and Bose gases;

black body radiation; statistics of paramagnetism

ELECTRONICS

Basics of semiconductor; p-n junctions, diodes, transistors;

LCR circuits, rectifiers, amplifiers, active filters and oscillators;

basics of OPAMPs and their applications; basics of digital electronics.