

**DEPARTMENT OF APPLIED PHYSICS
INDIAN SCHOOL OF MINES, DHANBAD**



**COURSE STRUCTURE & SYLLABUS
FOR
I & II SEMESTER OF
1-YEAR PREPARATORY COURSE**

Effective from 2007-2008

COURSE STRUCTURE
PREPARATORY COURSE

SEMESTER-I

Subject name	Paper name	L-T-P
Physics	Physics-I	3-3-0
Chemistry	Chemistry-I	3-3-0
Mathematics	Mathematics-I	4-2-0
English	English-I	2-2-0
Physics Practical	Physics Lab-I	0-0-2
Chemistry Practical	Chemistry Lab-I	0-0-2

SEMESTER-II

Subject name	Paper name	L-T-P
Physics	Physics-II	3-3-0
Chemistry	Chemistry-II	3-3-0
Mathematics	Mathematics-II	4-2-0
English	English-II	2-2-0
Physics Practical	Physics Lab-II	0-0-2
Chemistry Practical	Chemistry Lab-II	0-0-2

SEMESTER-I

(APC 81101)

PHYSICS-I

(3-3-0)

Mechanics and Properties of Matter:

Laws of motion; Collision; Conservation of linear momentum; Motion with variable mass. Circular motion; Brief qualitative idea of motion in a central field; Conservation of angular momentum; work, energy and power; work-energy theorem.

Surface tension and surface energy; angle of contact; Pressure inside a bubble; Experimental determination of surface tension.

Viscosity: Streamline and turbulent flow; Critical velocity and Reynold's number; Terminal velocity and Stokes' law, Poiseuille's equation; Experimental determination of the co-efficient of viscosity, Hydrodynamics; Equation of continuity; Bernoulli's principle and its applications; Velocity of efflux.

Waves & Oscillations:

Simple harmonic motion; Simple pendulum; Vibration of springs; Damped vibration, forced vibration and resonance (qualitative discussions only). Transverse and longitudinal wave, phase velocity and group velocity, Superposition principle, Interference, beats and standing waves. Transverse vibration of strings; Formation of stationary waves.

Propagation of sound through gaseous and solid media; speed of propagation: Newton formula; Laplace's correction; Effect of pressure, temperature and humidity. Vibrations of air columns; closed and open organ pipes. Doppler effect.

Kinetic Theory of Gases and Thermodynamics:

Pressure of a perfect gas; Kinetic interpretation of temperature; Equation of state for an ideal gas; Mean-free path; Vander waal's equation. Thermal equilibrium; Thermodynamic systems; Zeroth law of Thermodynamics; Isothermal and adiabatic processes; Internal energy; Specific heats of gases.

Geometrical and Wave Optics:

Refraction of light through prism, Angle of minimum deviation; Dispersion; Dispersion without Deviation and deviation without Dispersion; Refraction through spherical surfaces; Lenses; Lens makers' formula; Conjugate foci relation; Magnification; Combination of lenses.

Huygens' principle – reflection and refraction; Interference; Diffraction (Qualitative idea) Young's double-slit experiment; Fresnel's Biprism; Newton's rings.

(APC 81201)

PHYSICS LAB - I

(0-0-2)

Determination of Least count of Vernier calliper, Screw gauge, Spherometer & Traveling microscope, Measurement of density of wire using screw gauge, Radius of curvature using spherometer, Experiments on measurement of refractive indices of solids and liquids using traveling microscope, Joule's equivalent of heat by Joule's Calorimeter, Experiments on Deflection Magnetometer.

SEMESTER-II

(APC 82101)

PHYSICS-II

(3-3-0)

Electrostatics & Current Electricity:

Coulomb's law; Electric field and potential; Electric dipole and dipole moment; Potential and field due to a dipole in end-on and broadside-on positions; Potential energy; Torque. Capacitors-Parallel plate, spherical and cylindrical, Potential energy; Combination of capacitors.

Kirchhoff's laws; Wheatstone's bridge and its sensitivity; E. M. F and internal resistance of a cell. P. O. box; Metre bridge; Carey – Foster's bridge; Potentiometer. Seebeck, Peltier and Thomson's effect; Thermoelectric equation; Thermocouple.

Magnetostatics & Magnetism:

Magnetic effect of current; Biot-savart's law and the tesla; Magnetic field due a straight conductor, circular coil and solenoid; Toroid – Helmholtz Coil; Line integral and Ampere's circuital law. Lorentz force; Force on current-carrying conductor in a magnetic field; Moving coil galvanometer.

Current element concept; Magnetic dipole; Diamagnetism, Paramagnetism and Ferromagnetism; Tangent Law; Magnetometers.

Electromagnetic Induction & Alternating current:

Faraday's and Lenz's laws; Inductance; Mutual and self-inductions; Torque on a current carrying coil; Generator, Transformer, Electric motor.

Alternating currents; peak and average values; AC across pure R, pure L and pure C; Phase lag and phase lead; Reactance; AC across L-R, C-R, and L-C-R Circuit; Impedance and impedance diagrams; Electrical resonance; Choke coil; Power and power factor.

Atomic & Nuclear Physics:

Bohr's quantisation rule; Hydrogen spectrum; Sommerfield's modifications; Introduction to Vector Atom Model.

Natural radioactivity; α , β and γ rays and their properties; Rutherford-Soddy formula; Half-life and mean-life; Successive disintegration: Radioactive Series, Mass defect, binding energy and packing fraction; Mass-energy equivalence. Introduction to Nuclear Reactions, Nuclear fission and fusion - Nuclear Reactor.

(APC 82201)

PHYSICS LAB - II

(0-0-2)

Experiments on measurement of acceleration due to gravity, Experiments on Moment of Inertia of regular solids, Use of Spectrometer for measuring angle of prism and refractive index, Verification of Newton's law of cooling, Measurement of frequency of A.C. Mains, Experiments on Oscillation magnetometer. Electrical experiments on Potentiometer & Carey Foster's bridge.