Syllabus for M.Sc. Physics Entrance Examination, IUST, AWANTIPORA

MATHEMATICAL METHODS : Vector algebra, Vector Calculus, Multiple integrals, Calculus of single and multiple variables, partial derivatives, Taylor expansion. First order differential equations and linear second order differential equations with constant coefficients. Matrices and determinants, Algebra of complex numbers.

MECHANICS & WAVE PHENOMENA : Multiplication and differentiation of vectors, gradient,divergence and curl of a vector, Gauss and Stoke's theorems,Centre of mass, Work and energy, Conservative and non Conservative forces. Law of conservation of energy, Motion in central field, Two particle central force problem and reduced mass, Compound pendulum, Linear and angular momenta, Torque and angular momentum. Moment of inertia. Calculation of M.I. of some simple objects, Flywheel. Elastic constants, Torsion of cylinder, Viscosity, Poiseuille's formula, Stoke's law. S.H.M., Differential equation of wave motion, Lissajous figures, Damped and forced oscillations. Fourier analysis.

OPTICS: Fermat's principle, Cardinal points, Aberrations, Eyepieces. Interference, Fresnel's biprism, Interference in thin film, Newton's rings, Michelson Interferometer. Diffractions, Simple theory of Fresnel diffraction with applications. Fraunhoffer diffraction- single slit, double slit, plan diffraction grating. Resolution, Rayleigh criteria, Resolving power of prism, Grating and telescope. Polarisation, Malus law , Brewester's law, Double refraction, Nicol prism, Production and detection of plane, Circular and elliptically polarised light. Optical rotation.

THERMODYNAMICS: Kinetic theory of gases, Maxwell's distribution law, Specific heat, Mean free path, Vander-waal's equation, Critical constants, Ist law of thermodynamics, Isothermal and adiabatic processes, Reversible and irreversible processes, Carnot's engine and Carnot's theorem, Absolute scale of temperature, Second law of thermodynamics, Identity of perfect gas scale and absolute scale, Entropy, Clausius-Clayperon's heat equation, Joule-Thomson effect, Maxwell's thermodynamical relations, Conductivity, Radiation, Kirchhoff's law, Stefan-Boltzmann law, Energy distribution in the spectrum of black body.

ELECTRICITY AND MAGNETISM: Gauss theorem and its applications, Electric field and electric potential, Electric polarisation of matter, Polarisation and displacement vectors, Dielectrics, Kirchhoff's laws and their applications, Biot-Savart law and its applications, Electromagnetic induction, Faraday's law, Ballistic galvanometer, Growth and decay of currents, A.C. circuits, Transformer, Network theorems and A.C. bridges, Magnetic permeability and susceptibility, Dia, para and ferromagnetism, Measurement of susceptibility, Hysteresis loop.

QUANTUM MECHANICS: Black body radiation, Planck's theory, photoelectric effect, Compton effect, Frank-Hertz experiment, Uncertainty principle, Wave particle duality, de Broglie theory, Davission-Germer experiment, Schrondinger equation with application to simple potential problems.

ATOMIC PHYSICS: Bohr, Sommerfield and vector atom model, Electron spin, Pauli exclusion principle, Normal Zeeman effect, Stern-Gerlach experiment, Various coupling schemes.

NUCLEAR PHYSICS: Binding energy, Nuclear forces, Nuclear spin, Magnetic moment, Liquid drop and shell models, Fission and fusion, Radioactivity.

SOLID STATE PHYSICS: Space lattice, Unit cell, Miller indices, sc, bcc and fcc lattices, CsCl and NaCl structure, Bragg's law, X-ray diffraction, Kronig Penny Model.

RELATIVITY: Special theory of relativity, Galilion invariance, Michelson- Morley experiment, Lorentz transformation, Relativistic addition of velocities, Mass variation with velocity, Mass energy equivalence.

ELECTRONICS: Thermionic emission, Vacuum diode, triode, tetrode and pentode, Intrinsic and extrinsic semiconductors, PN junction, Half wave and full wave rectification, Filter circuits, Zener diode, Voltage stabilization, Bipolar Junction Transistor, Transistor biasing, Transistor configurations: CE,CB and CC transistor amplifiers.