DEPARTMENT OF PHYSICS
GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY
HISAR - 125 001, HARYANA (INDIA)
'A+'Grade Naac Accredited

No. PHY/2025/2221-2223
Dated: 21.05.2025

To

The Director, PDUCIC,

GJUS&T, Hisar

Sub: - Uploading the Syllabi for Entrance Tests for admissions to M.Sc. Physics Programmes for the academic session 2025-26.

Please find enclosed herewith the syllabi for Entrance Test of M.Sc. (Physics) for the session 2025-26, soft copy has been mailed and hard copy is duly sign by Chairperson of the Department, for your further necessary action:

CHAIRPERSON
21/5/25

Copy to: -

1. Controller of Examination, for the purpose of paper setting, GJUS&T, Hisar
2. Assistant Registrar (Academic), GJUS&T, Hisar

Department of Physics
Guru Jambheshwar University of Science & Technology, Hisar
M.Sc. Physics Entrance Syllabus
Session: 2025-26

MECHANICS (2%)

Generalised coordinates, displacement; velocity, accleration, momentum, force and potential. Hamilton's variational principle , Lagrange's equation of motion from Hamilton's Principle, Linear Harmonic oscillator, Simple pendulum.

ELECTROMAGNETIC THEORY (2%)

Maxwell's equation and their derivations, Displacement Current. Vector and scalar potentials, boundary conditions at interface between two different media, Propagation of electromagnctic wave, Poynting vector and Poynting theorem.

PROPERTIES OF MATTER AND RELATIVITY (3%)

Properties of Matter (Elasticity): Elasticity, Hookc's law, Elastic constants and their relations, Poisson's ratio, Lorentz transformations, length contraction, time dilation, velocity addition theorem, variation of mass with velocity and mass energy equivalence.

ELECTRONIC DEVICES (3%)

Series and parallel resonant circuit, Quality factor (Sharpness of resonance). Intrinsic and extrinsic semiconductor, P-N junction, half wave and full wave rectifier, Photo conduction in semiconductors, Solar Cell; Junction Transistors, (C-B, C-E, C-C mode). Feed-back in amplifiers, advantages of negative feedbacks.

THERMODYNAMICS (2%)

Clausius - Claperyron latent heat equation. Phase diagram and triple point of a substance, Maxwell thermodynamical relations, Internat energy (U), Helmhollz function (F), Enthalpy (H), Gibbs function (G) and the relations between them.

OPTICS (5%)

Fresnel's Biprism and-its applications, phase change on reflection. Colour of thin filins, Michelson's interferometer and ils applications, Fresnel's half period zones, zone plate, One slit diffraction, Two slit diffraction, Rayleigh's criterion, Polarisation and Double Refraction, Polarisation by scattering, Malus Law, Huygen's wave theory, Quarter wave

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plate and half wave plate, production and detection of: plane polarized light, circularly polarized light and elliptically polarized light. Polarimeters

STATISTICAL MECHANICS (3%)

Bose-Einstein statistics, Application of B.E, Statistics to Planck's radiation law, B.E. gas, Fermi-Dirac statistics, Bose Einstein Condensation, Fermi-Dirac Gas, electron gas in metals. Zero point energy, Specific heat of metals.

SOLID STATE PHYSICS (20%)

Crystal structure, periodicity, lattice and basis, crystal translational vectors and axes, Unit cell and primitive cell, Wigner Seitz primitive Cell, Symmetry operations for 2- dimensional crystal, Bravais lattices in 2- and 3-dimensions, crystal planes and Miller indices, Interplaner spacing, Crystal structures of Sodium Chloride and diamond, X-ray diffraction, Bragg's law and experimental x-ray diffraction methods, Reciprocal lattice and its physical significance, reciprocal lattice to a SCC, BCC, FCC. Specific heat of solids, Einstein's and Debye model of specific heat of solids.

QUANTUM MECHANICS (20%)

Quantum theory of radiation (old quantum theory), Concept of Photon, photoelectric effect, Compton effect, De-Broglie hypothesis, Davisson and Germer experiment, Phase and group velocity, Heisenberg's uncertainty principle, Time-energy and angular momentum; position uncertainty, wave-particle duality, Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance, Normalization of wave function, concept of observable and operator. Application of Schrodinger equation to one dimensional problems.

ATOMIC AND MOLECULAR PHYSICS (20%)

Vector atom model, quantum numbers associated with vector atom model, penetrating and nonpenetrating orbits. spectral lines in different series of ailkali spectra, spin orbit interaction and doublet term separation, LS or Russel-Saunder Coupling, jj coupling, Zeeman effect, Paschen-Back cffect of a single valance electron system. Weak field Stark effect of Hydrogcn atom. Quantisation of Vibrational and rotational energies, Raman effect, Stoke's and anti Stoke's lines. spatial and lemporal cohcrence, Einstein's coeflficients, Threshold condition for laser emission, Laser pumping, He-Ne laser and RUBY-laser.

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NUCLRAR PIYSICS (20%)

Nuclcar mass and binding energy, nuclear stability, Nuclear size, spin, parity statistics, magnetic dipole moment, quadrupole moment, interaction of heavy charged particles (Alpha particlcs), Energy loss of heavy charged particle, Range and straggling of alpha particles. Geiger-Nuttai law. Introduction of light charged particle (Beta-particle), Origin of continuous beta-spectrum (neutrino hypothesis), types of beta decay and energetics of beta decay, Energy loss of beta particles (ionization), Range of electrons absorption of-beta-particles. Interaction of Gamma Ray, Nature of gamma rays, Energetics of gamma rays, Gamma radiations through matter (Photoelectric, Compton and pair-production effects), electron position annihilation. Absorption of Gamma rays, Mass attenuation, Nuclear reactions, Nuclear disintegration, Nuclear Reactors, Nuclear fission and fusion reactors, Linear accelerator, Cyclotron and Betatron.

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