

CLUSTER UNIVERSITY SRINAGAR, KASHMIR
SYLLABUS – SEMESTER 5th (CBCS) PHYSICS
DISCIPLINE SPECIFIC ELECTIVE (DSE) COURSE - Theory)

Title: - Modern Physics

Course Code: PHY 516D

Credits: 04; Lectures 60

Total: 60 Marks

Unit-I

Black body radiation; Planck's radiation law; Photo-electric effect, Compton Effect. De-Broglie's matter wave; Heisenberg's uncertainty relation for p and x; its extension to energy and time; Applications of uncertainty principle

Unit II

Wave function, Schrödinger's wave equation (Time dependent and independent form); Expectation values; operators; Particle in a box, Potential barrier, Tunnel effect. Quantum numbers (n, l, m) for an electron in hydrogen atom; Space quantization; Electron probability density

Unit III

Electron spin; Stern-Gerlach experiment; Pauli's exclusion principle; Atomic structures (shells and sub-shells); Spin-orbit coupling; Total angular momentum J. L-S coupling; j-j coupling; Normal and anomalous Zeeman Effect; Lande g-factor.
Quantization of rotational energies; Rotational energy levels; pure rotational spectra; Vibrational energy levels, pure vibrational spectra.

Unit IV

Nuclear composition; Nuclear properties (size, spin, magnetic moment). Stable Nuclei (Nuclear decay, Binding energy), Liquid drop model, Meson theory of nuclear forces. Gammow's Theory of Alpha decay (no derivation), Pauli theory of beta-decay, gamma decay, Pair Production. Interaction and particles; Classification: Leptons and hadrons. Elementary particle quantum numbers; Baryon, lepton and strangeness numbers; Quarks: colour, flavour.

Text Book:

Concepts of Modern Physics by Arthur Beiser, (Tata McGraw Hill).

References:

1. Introductory Nuclear Physics, Kenneth S. Krane, 3rd Ed., Wiley.
2. Mani and Mehta, Modern Physics (Tata McGraw-Hill)

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Text Books:

1. Atomic Physics, S. N. Ghoshal, S. Chand & Co. Ltd
2. Introduction to Quantum Mechanics, D. J. Griffiths. Pearson

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SYLLABUS– SEMESTER 5th (CBCS) –PHYSICS

DISCIPLINE SPECIFIC ELECTIVE (DSE) COURSE - Practical

Title: - Modern Physics Lab

Course Code:

Credits: 02

Total: 30 Marks

1. To determine value of Plank's constant using LED's of at least 4 different colours/photocell.
2. Photo-electric effect; photo current versus intensity and wavelength of light, maximum energy of photoelectrons versus frequency of light.
3. To determine value of Boltzmann constant using V-I characteristics of a PN diode.
4. To determine the wavelength of H-alpha emission line of Hydrogen atom.
5. To determine the absorption lines in the rotational spectrum of iodine vapour.
6. To determine the ionization potential of mercury.
7. To study the diffraction patterns of single and double slits using lasers source and measure its intensity variation using photo sensor and compare with incoherent source-Na light.
8. To determine the value of e/m by magnetic focusing/helical/Thomson methods.
9. To set up the Millikan oil drop apparatus and determine the charge of an electron.
10. Study the spectrum of hydrogen, helium and mercury.
11. Absorption spectrum of iodine vapour.
12. Analysis of a given band spectrum.
13. Study of statistics in radioactive measurement.
14. Study of Zeeman effect.
15. Study of Raman spectrum using laser as an excitation source

Reference Books:-

1. Advanced Practical Physics for students, B.L Flint and H. T Workshop, 1977, Asia Publishing House.
2. Advanced Practical Physics, Vol. I & Vol. II, S. P. Singh, Pragati Prakashan, Meerut

Text Books:

1. B. Sc. Practical Physics, C. L. Arora, S. Chand & Co. Ltd
2. Practical Physics, Harnam Singh, S. Chand & Co. Ltd
3. Practical Physics, S. L. Gupta & V. Kumar, Pragati Prakashan, Meerut