PREM CHAND MARKANDA S.D.COLLEGE FOR WOMEN, JALANDHAR CITY

Re-accredited 'A+' grade (2nd Cycle) by NAAC Bangalore

A unique prestigious Post Graduate Institution of Northern India

DEPARTMENT OF PHYSICS TEACHING PLAN
(Session 2025-26)

Program: Bachelor of Science

Program Outcome: PO No.	**Upon Completion of the Bachelor of Science Programme, the graduates will be able to:**
PO.1	After completing graduation, Students can pursue an M.Sc. in Physics, Chemistry, Mathematics, Information Technology, or Nuclear Medicines
PO.2	Students may get job opportunities in higher education, research organizations, science consultancy, radiology, radiation oncology and many others. Some of the institutions where non-medical students can start their carrier are: BARC, DRDO, NPTC, IISc, ISRO, ONGC, BHEL, PRL, NPL, SINP, VECC, IITs, NITs, IIPR etc.
PO.3	Students can work as a quality control manager in the government or private sector.
PO.4	Students can work as a medical representative.
PO.5	Use modern techniques, lab equipment to have experiment knowledge about subject.

Teaching Plan
Session 2025-26
Even Semester
CLASS: Semester 2nd
SUBJECT: VIBRATIONS & WAVES
Faculty Name: Dr. Jyoti Sharma

TOPIC	DURATION	TEACHING TOOLS
Simply harmonic motion, energy of an SHO. Compound pendulum. Torsional pendulum Electrical oscillations Transverse vibrations of a mass on string,	January	• Lecture based teaching learning (chalk and talk) • Any other (assignments) • Learning through problem solving (numericals)
Superposition of two perpendicular SHMs having periods in the ratio 1:1 and 1:2, Decay of free Vibrations due to damping. Differential equation of damped harmonic motion, types of motion, types of damping. Determination of damping coefficient logarithmic decrement, relaxation time and Q–Factor.	February	• Lecture based teaching learning (chalk and talk)
Differential equation for forced mechanical and electrical oscillators. Transient and steady state behaviour. Displacement and velocity variation with driving force frequency, variation of phase with frequency, resonance. Power supplied to an oscillator and its variation with frequency. Coupled oscillators, Normal co–ordinates and normal modes of vibration.	March	• Lecture based teaching learning (chalk and talk) • Technology based learning • Self-study (library visit)
Inductive coupling of electrical oscillators. Types of waves, wave equation	April	• Lecture based learning (chalk and talk) • Learning through problem

		solving(numerical)
(transverse) and its solution, characteristic impedance of a string. Impedance matching. Reflection and transmission of waves at boundary. Reflection and transmission of energy. Reflected and transmitted energy coefficients. Standing waves on a string of fixed length. Energy of vibrating string. Wave and group velocity.		• Individual learning

Course outcome

CO.1	Understand the principles of simple, damped, and forced oscillations in mechanical and electrical systems.
CO.2	Analyze energy, damping parameters, relaxation time, and quality factor of oscillatory motion.
CO.3	Apply oscillation concepts to pendulums, LC circuits, and coupled oscillator systems.
CO.4	Explain wave motion, standing waves, impedance, and energy transmission in strings.
CO.5	Develop analytical and problem-solving skills related to resonance, phase, and normal modes.

Teaching Plan
Session 2025-26
Even Semester
CLASS: Semester 4th
SUBJECT: QUANTUM PHYSICS
Faculty Name: Dr. Jyoti Sharma

TOPIC	DURATION	TEACHING TOOLS
Application of Schrodinger wave equation to one dimensional problems: Fundamental postulates of wave mechanics, Schrodinger's wave equation for a free particle and equation of a particle subject to forces. One-dimensional step potential for E>V0.	**January**	• Lecture based teaching learning (chalk and talk) • Any other (assignments) • Learning through problem solving (numericals)
one-dimensional step potential for 0<E<V0, one dimensional potential barrier of finite height and width, Quantum mechanical tunnelling effect, particle in one dimensional box with infinitely hard walls, one dimensional square well of finite depth.	**February**	• Lecture based teaching learning (chalk and talk)
Application of Schrodinger equation to three dimensional problems: Free particle in three dimensional rectangular box, eigen wave function, eigenvalues of momentum, energy and degeneracy, three dimensional harmonic oscillator (Cartesian coordinates) wave function.	**March**	• Lecture based teaching learning (chalk and talk) Technology based learning • Self-study (library visit)

Energy levels, degeneracy, Schrodinger's wave equation in spherical polar coordinates, Schrsodinger wave equation for spherically symmetric potential for hydrogen atom, wave function of H atom, solution of $R(r)$,ϴ(θ),Φ(Φ) equations.	**April**	Lecture based learning(chalk and talk) Learning through problem solving(numericals) Individual learning

Course outcome

CO.1	Explain the fundamental postulates of wave mechanics and interpret the physical significance of the Schrödinger wave function.
CO.2	Solve the one-dimensional Schrödinger equation for standard potential problems such as free particle, step potential, finite potential barrier, and particle in a box.
CO.3	Analyze quantum mechanical tunnelling and distinguish between classical and quantum behavior of particles.
CO.4	Derive and interpret eigen values, eigen functions, and degeneracy for particles in one-
	and three-dimensional potential systems.
CO.5	Apply the Schrödinger equation in Cartesian and spherical polar coordinates to understand three-dimensional systems, including the rectangular box and harmonic oscillator.

Teaching Plan
Session 2025-26
Even Semester
CLASS: Semester 6th
SUBJECT: RADIATION AND PARTICLE PHYSICS
Faculty Name: Dr. Jyoti Sharma

TOPIC	DURATION	TEACHING TOOLS
Interaction of Radiation and Charged Particles With Matter: Energy loss of electrons and positrons, Positrons annihilation in condensed media, Sopping power and range of heavier charged, derivation of Bethe-Bloch formula, interaction of gamma rays with matter.	**January**	• Lecture based teaching learning (chalk and talk) • Any other (assignments) • Learning through problem solving (numericals)
Nuclear Radiation Detection: Gas-filled detectors, proportional and Geiger-Muller counters, Scintillation detectors, semiconductor detectors, Cherenkov effect, solid state nuclear track detectors, bubble chambers, nuclear emulsions.	**February**	• Lecture based teaching learning (chalk and talk)
Accelerators: Accelerators, linear accelerators, cyclic accelerators: cyclotron, synchrocyclotron, betatron, electron and proton synchrotron, phase stability, colliding beam	**March**	• Lecture based teaching learning (chalk and talk) Technology based learning • Self-study (library visit)

machines: introduction to Large Hadron Collider and Fermilab Tevatron.		
Elementary Particles: Historical introduction, fermions and bosons, particles and antiparticles, Classification of particles, types of interactions, electromagnetic, weak, strong interactions, gravitational interactions, Quantum numbers and conservation laws, isospin, charge conjugation, Introduction to quarks and qualitative discussion of the quark model, high energy physics units.	**April**	Lecture based learning(chalk and talk) Learning through problem solving (numericals) • Individual learning

Course outcome

CO.1	Explain the mechanisms of interaction of charged particles and gamma radiation with matter, including energy loss processes and positron annihilation.
CO.2	Derive and apply the Bethe–Bloch formula to analyze stopping power and range of heavy charged particles in different media.
CO.3	Describe the working principles, construction, and applications of various nuclear radiation detectors such as gas-filled, scintillation, semiconductor, and track detectors.
CO.4	Understand the principles and operational features of particle accelerators**,** including linear and cyclic accelerators, phase stability, and colliding beam machines like LHC.
CO.5	Classify elementary particles and explain fundamental interactions, quantum numbers, conservation laws, and the basic concepts of the quark model and high-energy physics units.