PREM CHAND MARKANDA SD 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(Non-Medical & Computer Science)

Program Outcome: PO No.	Upon Completion of the B.Sc. 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	The course as a whole opens up several career doors for the students interested in various areas of science and technology in private, public and government sectors.

Teaching Plan
Session 2025-26
Odd Semester
CLASS: B.Sc. Sem 1st
SUBJECT: Electricity & Magnetism
Faculty Name: Dr. Jyoti Sharma & Dr. Vandna Bagga

TOPIC	DURATION	TEACHING TOOLS
Basic ideas of Vector Calculus Gradient, Divergence, curl and their physical significance. Laplacian in rectangular, cylindrical and spherical coordinates. Coulomb's Law for point charges and countinuous distribution of charges. Electric field due to dipole, line charge and sheet of charge. Electric flux, Gauss's Law and its applications. Gauss's divergence theorem and differential form of Gauss's Law. Green's theorem.	**July-August**	**Lecture based teaching learning** (chalk and talk) **Any other (**assignments)
Work and potential difference. Potential difference as line integral of field. Electric potential due to a point charge, a group of point charges, dipole and quadrupole moments, long uniformly charged wire, charged disc. Stoke's theorem and its applications in Electrostatic field, curl E=0. Electric fields as gradient of scalar potential. Calculation of E due to a	**September**	**Lecture based teaching learning** (chalk and talk)

point charge and dipole from potential. Potential due to arbitrary charge distribution and multipole moments.		
Poisson and Laplace's equation and their solutions in Cartesian and spherical coordinates. Concept of electrical images. Calculation of electric potential and field due to a point charge placed near an infinitely conducting sheet.Current and current density, equation of continuity. Microscopic form of Ohm's Law (J=σE) and conductivity, Failure of Ohm's Law.	**October**	**Lecture based teaching learning** (chalk and talk) **Technology based learning** Self study(library visit)
Interaction between moving charges and force between parallel currents. Behaviour of various substances in magnetic field. Definition of M and H and their relation to free and bound currents. Permeability and susceptibility and their interrelationship. Orbital motion of electrons and diamagnetism, Para-magnetism and Ferromagnetism.	**November**	**Lecture based learning**(chalk and talk) **Learning through problem solving**(numericals) **Individual learning**

Course outcome

CO.1	Understand the Gauss law and its application to obtain electric field in different cases and formulate the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and Dielectric constant.
CO.2	Distinguish between the magnetic effect of electric current and electromagnetic

	induction and apply the related laws in appropriate circumstances.
CO.3	Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.
CO.4	Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.
CO.5	Apply law such as Bio t - Savart's and Lenz's law for selected problems in electricity and magnetism.

Teaching Plan
Session 2025-26
Odd Semester
CLASS: B.Sc. 3rd Sem
SUBJECT: STATISTICAL PHYSICS & THERMODYNAMICS
Faculty Name: Dr. Jyoti Sharma & Dr. Vandna Bagga

TOPIC	DURATION	TEACHING TOOLS
Basic ideas of Statistical Physics, Scope of Statistical Physics, Basic ideas about probability, Distribution of four distinguishable particles into compartments of equal size. Concept of macrostates, microstates, Thermodynamic Priobability, Effects of constraints on the system. Distribution of particles in two compartments. Deviation from the state of maximum probability. Equilibrium state of dynamic system. Distribution of distinguishable n particles in k compartments of unequal sizes.	**July-August**	**Lab demonstration** **Numerical worksheet** **Group assignments** **Problem solving sessions**
Phase space and division into elementary cells. Three kinds of statistics. The basic approach in three statistics. Maxwell	**September**	**Group assignments** **E learning** **Chalk and Board** **Discussion in Classroom**

Boltzman (MB) statistics applied to an ideal gas in equilibrium. Experimental verification of law of distribution of molecular speeds. Need for Quantum Statistics – B.E. Statement of planck's law of Radiation Wien's Displacement and Stefan's law. Fermi Dirac (FD) statistics. Comparison of M.B, B.E and F.D statistics.		
Statistical definition of entropy, Change of entropy of system, additive naturwe of entropy, Law of increase of entropy, Reversible and irreversible processes, and their examples, work done in reversible process, examples of increase in entropy in natural processes, entropy and disorder, Brief review of Terms, Laws of Thermodynamics, Carnot Cycle, Entropy changes in carnot cycle, Applications of thermodynamics to thermoelectric effect, change of entropy along reversible path in P-V diagram. Heat death of universe.	**October**	**Hands on activities** **Numerical worksheet** **Quizzes and MCQ** **Powerpoint presentation**
Derivation of Maxwell Thermodynamics relations, Cooling produced by adiabatic stretching, Adiabatic Compression, change of internal energy with volume, Specific heat and constant pressure and constant volume.	**November**	**Lecture based teaching learning** Chalk and talk **Any other** (class tests.) **Self study**

Expression for CP-Cv, Change of state and Claypron equation.		

Course outcome

CO.1	Understand the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law, equipartition of energies, mean free path of molecular collisions and the transport phenomenon in ideal gases.
CO.2	Gain knowledge on the basic concepts of thermodynamics, the first and the second law of thermodynamics, the basic principles of refrigeration, the concept of entropy,the thermodynamic potentials and their physical interpretations.
CO.3	Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency.
CO.4	Develop critical understanding of concept of Thermodynamic potentials, the formulation of Maxwell's equations and its applications.
CO.5	Differentiate between principles and methods to produce low temperature and liquefy air and also understand the practical applications of substances at low temperatures.

Teaching Plan
Session 2025-26
Odd Semester
CLASS: B.Sc. 5th Sem
SUBJECT: CONDENSED MATTER PHYSICS
Faculty Name: Dr. Jyoti Sharma

TOPIC	DURATION	TEACHING TOOLS
Crystal structure, Symmetry operations for a two and three dimensional crystal, Two dimensional Bravais lattices, Three dimensional Bravais lattices, Basic primitive cells, Crystal planes and Miller indices, Diamond and NaCl structure.	**July-August**	**Lecture based teaching learning** Chalk and talk **Group discussion**
Crystal Diffraction: Bragg's law, Experimental methods for crystal structure studies, Laue equations, Reciprocal	**September**	**Lecture based teaching learning** Chalk and talk **Self study** (library visit)

lattices of SC, BCC and FCC, Brag's law in reciprocal lattice, Brillouin zones and its construction in two and three dimensions, Structure factor and atomic form factor.		
Lattice vibrations, Concepts of phonons, Scattering of photons by phonons, Vibration and mono- atomic, linear chains, Density of modes, Einstein and Debye models of specific heat.	**October**	**Lecture based teaching learning** Chalk and talk **Any other (**class test)
Free electron model of metals, Free electron, Fermi gas and Fermi energy, Band Theory: Kronig- Penney model, Metals and insulators, Qualitative discussion of the following: Conductivity and its variation with temperature in semiconductors, Fermi levels in intrinsic and extrinsic semiconductors, band gap in semiconductors.	**November**	**Lecture based teaching learning** Chalk and talk **Any other (assignment)** **Self study**

Course outcome

CO.1	Understand basic mechanics and properties of matter and structure.
CO.2	Understand crystal structures and X-ray diffraction methods to analyze crystal structures.
CO.3	Analyze crystal structures using Bragg's law, Laue equations, and experimental methods, understand reciprocal lattices and Brillouin zones, and evaluate structure and atomic form factors.
CO.4	Understand lattice vibrations, phonons, their role in thermal properties, scattering phenomena, vibrational modes in mono-atomic chains, and apply the Einstein and Debye models to analyze specific heat.
CO.5	Understand and analyze the electronic properties of materials using the Free Electron Model, Fermi gas, Band Theory (Kronig-Penney model), and

	semiconductor concepts such as conductivity variation, Fermi levels, and band gaps, to differentiate between metals, semiconductors, and insulators and their applications.

Teaching Plan
Session 2025-26
Odd Semester
CLASS: B.Sc. 5th Sem
SUBJECT: ELECTRONICS
Faculty Name: Dr. Vandna Bagga

TOPIC	DURATION	TEACHING TOOLS
Concepts of current and voltage sources, p-n junction, Biasing of diode, V-I characteristics, Rectification: half wave, full wave rectifiers and bridge rectifiers, Efficiency, Ripple factor, Qualitative ideas of filter circuits (LC and π filters), Zener diode and voltage regulation, Introduction to Photonic devices (solar cell, photodiode and LED). Basic concepts of Boolean algebra, AND OR NOT and NAND Gates.	**July-August**	**Lecture based teaching learning** Chalk and talk **Group discussion**
Junction transistor : Structure and working relation between different currents in transistors, Sign conventions, Amplifying action, Different configurations of a transistor and their comparison, CB and CE characteristics, Structure and characteristics of JEFT, Transistor biasing and stabilization of	**September**	**Lecture based teaching learning** Chalk and talk **Informational based videos (**you tube videos) **Self study** (library visit)

operating point, Voltage divider biasing circuit.		
Working of CE amplifier, Amplifier analysis using h-parameters, Equivalent circuits, Determination of current gain, Power gain, Input impedance, FET amplifier and its voltage gain, Feed back in amplifiers, Different types, Voltage gain, Advantage of negative feed back, Emitter follower as negative feed back circuit.	**October**	**Lecture based teaching learning** Chalk and talk **Any other (**class test)
Barkausen criterion of sustained oscillations, LC oscillator (tuned collector, tuned base Hartley), RC oscillators, phase shift and Wein bridge.	**November**	**Lecture based teaching learning** Chalk and talk **Any other (assignment)** **Self study**

Course outcome

CO.1	Various network which use to solve problems related to complicated circuits by converting them into simpler circuits. This has wide applications in electronic and transmission circuits.
CO.2	Knowledge about semiconductors since it is a basic materials used in many electronic components like diode, transistors FET, UJT etc.
CO.3	Characteristics and working of operational amplifiers which are useful in various medical and scientific investigations to amplify the signals.
CO.4	Generation of high frequency signals using oscillator circuits and their applications.
CO.5	Generation of high frequency signals using oscillator circuits and their applications.