Lesson Plan
Session: 2024-25

Name of the Assistant Professor: Amandeep Singh

Class: B.Sc. 2nd semester **Subject:** PHYSICS

Paper : DSC/103-Thermal Physics **Credit**: 3

Dates	Week	Topic
11.01.2025 to 17.01.25	**1**	**Unit 1:** Extensive and intensive thermodynamic variables, Thermodynamic equilibrium, zeroth law and Concept of Temperature,
20.01.25 To 25.01.25	**2**	Work and heat, State functions, Firstlawof thermodynamics, Internal energy, Applications of first law,
27.01.25 To 01.02.25	**3**	General relation between Cp and Cv, Work done during isothermal and adiabatic processes.
03.02.25 To 08.02.25	**4**	**UNIT 2:** Concept of entropy, Clausius theorem, Clausius Inequality,
10.02.25 To 15.02.25	**5**	Second Law of Thermodynamics in terms of Entropy, Entropy of a Perfect Gas and Universe, Entropy Changes in Reversible and Irreversible Processes, Principle of Increase of Entropy,
17.02.25 To 22.02.25	**6**	Third Law of The rmodynamics, Unattainability of absolute zero, T-S Diagrams, Phase Change, Classification of Phase Changes.
24.02.25 To 01.03.25	**7**	**UNIT 3:** Extensive and Intensive Thermodynamic Variables; Internal Energy; Definition, importance, properties and applications of Chemical Potential,
03.03.25 To 08.03.25	**8**	Enthalpy, Gibbs function and Helmholtz function. **Maxwell's Thermodynamic Relations**

Dates	Week	Topic
17.03.25 To 22.03.25	**9**	Derivations of Maxwell's Relations and their applications: (1) Clausius- Clapeyronequation(2) C_P- $C_V$value, (3) Energy equations
24.03.25 To 29.03.25	**10**	**MID TERM EXAM**
31.03.25 To 05.04.25	**11**	(4) Change of temperature during adiabatic process.Van -der Waal's Equation of State for Real Gases. .
07.04.25 To 12.04.25	**12**	**Thermo-electricity**: Seeback effect, Paltier effect,
14.04.25 To 19.04.25	**13**	Thomson effect and their explanations
21.04.25 To 26.04.25	**14**	**Revision**
28.04.25 To 30.04.25	**15**	**Revision**

Signature

Lesson Plan
Session: 2024-25

Name of the Assistant Professor: Amandeep Singh
Class: B.Sc. 4th semester
Subject: Physics **Paper:** Statistical physics

Dates	Week	Topics
11.01.2025 to 17.01.25	1	Microscopic and Macroscopic systems, events-mutually exclusive, dependent and independent, Probability, statistical probability, A priori probability and relation between them, probability theorem, some probability considerations
		Combinations possessing maximum probability, combination possessing minimum probability, Tossing of 2,3 and any number of coins, Permutations and combinations.
20.01.25 To 25.01.25	2	Distribution of N (for N=2,3,4) distinguishable and indistinguishable particles in two boxes of equal size,micro and Macro states, Thermodynamical probability, Constraints and Accessible states
		Statistical fluctuations, general distribution of distinguishable particles in compartments of different sizes, Condition of equilibrium between two systems in thermal contact- β parameter,
27.01.25 To 01.02.25	3	Postulates of statistical physics, phase space, Division of phase space into cells, three kind of statistics, basic approach in three statistics. **Class test**
		M.B. statistics applied to an ideal gas in equilibrium- energy distribution law (including evaluation of α and β), speed distribution law and velocity distribution law.
03.02.25 To 08.02.25	4	Expression for average speed r.m.s. speed, average velocity. **Assignment**
		r.m.s. velocity, most probable energy & mean energy for Maxwellian distribution.
10.02.25 To 15.02.25	5	Need for quantum statistics: Bose-Einstein energy distribution law, Application of B.E. statistics to Planck's radiation law B.E.gas, Degeneracy and B.E. Condensation.
		Fermi-Dirac energy distribution law, F.D. gas and degeneracy, Fermi energy and Fermi temperature, Fermi-Dirac energy distribution law, Fermi Dirac gas and degeneracy
17.02.25 To 22.02.25	6	Fermi energy and Fermi temperature; Fermi-Dirac energy distribution law for electron gas in metals, zero point energy, zero point pressure and average speed (at 0 K)of electron gas
		Specific heat anomaly of metals and its solution. M.B. distribution as a limiting case of B.E. and F.D. distributions, comparison of three statistics
24.02.25 To 01.03.25	7	Dulong and Petit law. Derivation of Dulong and Petit law from classical physics. Specific heat at low temperature.
		Einstein theory of specific heat, Criticism of Einstein theory, Debye model of specific heat of solids.
		Success and shortcomings of Debye theory, comparison of Einstein and Debye theories.

Paper: Optics

Dates	Week	Topics
03.03.25 To 08.03.25	8	polarization and double refraction, polarisation by reflection, polarisation by scattering, malus law, phenomenon of double refraction
		Huygen's wave theory of double refraction, analysis of polarised light, Nicol prism, quarter wave plate and half wave plate
17.03.25 To 22.03.25	9	production and detection of plane polarised light, circularly polarized light and elliptically polarized light
		optical activity, fresnel theory of rotation, specific rotation
24.03.25 To 29.03.25	10	polarimeters, numericals problems ,Fourier Series, fourier coefficients, odd functions
		even function, fourier theorem **MID TERM EXAM**
31.03.25 To 05.04.25	11	analysis of complex waves and its application for the solution of triangle and rectangular waves
		half and full wave rectifier outputs,unit Test, numerical problems.
07.04.25 To 12.04.25	12	fourier transform and its properties Matrix method in paraxial optics, effect of translation and refraction
14.04.25 To 19.04.25	13	derivation of thin lens and thick lens formula
		Unit plane nodal planes, system of thin lenses.
21.04.25 To 26.04.25	14	chromatic, spherical, coma, astigmatism and distortion
		aberrations, Optical Fibre, critical angle of propagation, mode of propagation, Assignment, Numerical problems.
28.04.25 To 30.04.25	15	acceptance angle, fractional refractive index change, numerical aperture types of optical fibre, normalised frequency, fibre optic communication, advantages, numerical problems. Revision

(Amandeep Singh)

Lesson Plan

Session: 2024-25

Name of the Assistant Professor: Amandeep Singh

Class: B.Sc. 6th semester

Subject: Physics **Paper:** Atomic and Molecular Physics

Dates	Week	Topics
11.01.2025 to 17.01.25	1	Unit first historical background of atomic spectroscopy. Introduction of early observations, emission and absorption spectra, atomic spectra, wave number, spectrum of hydrogen atom in Balmer series, Bohr atomic model. Bohr postulates spectra of hydrogen atom of explanation of spectral series in hydrogen atom and un- quantized states and continuous spectra, correction of finite nuclear mass variation in constant
		shortcomings of Bohr theory, Wilson sommerfield quantization rule, Di Broglie interpretation of Bohr quantization Law, Bohr corresponding principal.
20.01.25 To 25.01.25	2	vector atom model, space quantization, electron spin coupling of Orbital and spin angular momentum, spectroscopic terms and their notation, Quantum numbers associated with vector atom model, transition Probability and selection rule
		Orbital magnetic dipole moment, Bohr magnetic, Behaviour of magnetic dipole in external magnetic field ,Larmor precession and theorem. penetrating and non penetrating orbits.
27.01.25 To 01.02.25	3	penetrating orbits on the classical model Quantum defect spin Orbit interaction energy of the single valence electron spin interaction of penetrating and non penetrating orbits quantum mechanical relativity correction. Hydrogen fine spectra ,main features of alkali spectra and their theoretical interpretation term series and limits
03.02.25 To 08.02.25	4	absorption spectra of alkali atoms observed doublet fine structure in the spectra of alkali metals and its interpretation. intensity is rule for doublets, comparison of alkali spectra and hydrogen spectrum
		Problem Discussion of unit-1 & unit-2, unit test, Assignment
10.02.25 To 15.02.25	5	Essential feature of spectra of alkaline earth elements vector model for two valence electron atom: application of spectra, LS coupling& J-J coupling
		interaction energy in LS coupling (sp. pd) configuration land interval rule, Pauli principle and periodic classification of the element interaction energy. interaction energy in JJ coupling as (sp.pd) configuration.
17.02.25 To 22.02.25	6	equivalent and non-equivalent electrons . comparison of spectral terms in LS and JJ coupling. hyperfine structure of spectral lines and its origin isotope effect ,nuclear spin
		Zeeman effect(normal and Anomalous) experimental setup for studying zeeman effect. explanation of normal Zeeman effect
24.02.25 To 01.03.25	7	Classical and Quantum mechanical explanation of Anomalous Zeeman effect. lande factor and pattern of D1 and D2 lines of Na atom. Paschen -back effect of a single Valence Electrons system, weak field stark effect of hydrogen atom
		General considerations, electronic states of diatomic molecules, rotational spectra (far IR and microwave region)
03.03.25 To 08.03.25	8	Numerical discussion , problem discussion of all three units
		Problem discussion of unit-4 , unit test

Paper: Solid State and Nano Physics

Dates	Week	Topics
17.03.25 To 22.03.25	9	Crystalline and Glassy forms, liquid crystals. crystal structure, periodicity, lattice and basis crystal translational vectors and axes. unit cell and primitive cell, Winger Seitz primitive cell symmetry operation for a two dimensional crystal
		Bravais lattice in two and three dimensions. Crystal plane and Miller Indices Interplanar spacing
24.03.25 To 29.03.25	10	crystal structure of sodium chloride and diamond and Zine sulphide. Problem discussion of unit -1
		X-ray diffraction Bragg's law and experimental x-ray diffraction method k-space reciprocal lattice and its physical significance of reciprocal lattice vectors. reciprocal lattice to a simple cubi,c BCC,FCC **MID TERM EXAM**
31.03.25 To 05.04.25	11	reciprocal lattice and its physical significance of reciprocal lattice vectors reciprocal lattice to a simple cubic
		reciprocal lattice to a lattice BCC reciprocal lattice to a FCC
07.04.25 To 12.04.25	12	Problem Discussion of unit-1 & unit-2, unit test, Assignment Submission
		Unit III superconductivity Historical introduction, Survey of superconductivity. superconducting system. high temperature superconductors, isotopic effect critical magnetic field
14.04.25 To 19.04.25	13	Meissner effect, London's theory and peppard equation classification of superconductors (Type 1 and Type II
		BCS theory of superconductivity ,flux quantization, josephson effect(AC and DC) practical application of superconductivity and their limitations power applications of superconductors
21.04.25 To 26.04.25	14	Practical application of superconductivity and their limitations. power applications of superconductors, Numerical discussion ,class test of unit-3
		Definition, length scale, importance of nano scale and Technology. history of Nano Technology. benefits and challenges in molecular manufacturing. molecular assembler concept
28.04.25 To 30.04.25	15	Understanding advanced capability. Vision and objectives of Nanotechnology Nanotechnology in different field like automobile
		Nanotechnology in electronics, Nanotechnology in Nano-biotechnology ,nanotechnology in material, Nano- technology in medicine

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