Lesson plan for the even semester April to June 2020-21

Subject-Properties of Matter and Kinetic Theory of Gases

Class-B.Sc.-First Year (2nd Semester)

Teacher Name: Meenu Sharma

April,2021 **3rd Week**	**Unit I:** Moment of inertia Rotation of rigid body, Moment of inertial, Torque, angular momentum, Kinetic Energy of rotation. Theorem of perpendicular and parallel axes (with proof), Moment of inertia of solid sphere
4th Week	Hollow sphere, spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross–section, Fly wheel
5th Week	Moment of inertia of an irregular body, Acceleration of a body rolling down on an inclined plane.
May,2021 **1st Week**	**Unit 2:** Elasticity Elasticity, Stress and Strain, Hook's law, Elastic constant and their relations, Poisson's ratio, Torsion of cylinder
2nd Week	twisting couple, Determination of coefficient of modulus of rigidity for the material of wire by Maxwell's needle, Bending of beam (Bending moment and its magnitude)
3rd Week	Cantilever and Centrally loaded beam, Determination of Young's modulus for the material of the beam and Elastic constants for the material of the wire by Searle's method. **Class test**
4th Week	**Unit 3**: Kinetic theory of gases-I Assumption of Kinetic theory of gases, pressure of an ideal gas (with derivation), Kinetic interpretation of Temperature
June,2021 **1st Week**	Ideal Gas equation, Degree of freedom, Law of equipartition of energy and its application for specific heat of gases
2nd Week	Real gases, Vander wall's equation, Brownian motion(Qualitative) **Unit 4:** Kinetic theory of gases-II Maxwell's distribution of speed and velocities (derivation required)
3rd Week	Experimental verification of Maxwell's law of speed distribution: most probable speed, Average and r.m.s. speed, Mean free path, Transport of energy and momentum, Diffusion of gases.
4th Week	**Revision**

Subject-Semiconductor Devices

Class-B.Sc.-First Year (2nd Semester)

Teacher Name: Shruti Jain

April,2021 **3rd Week**	**Unit I:** Semiconductors Energy bands in solids, Intrinsic and extrinsic semiconductors, carrier mobility and electrical resistivity of semiconductors, Hall effect, p-n junction diode and their characteristics, Zener and Avalanche breakdown, Zener diode
4th Week	Zener diode as a voltage regulator. Light emitting diodes (LED), Photoconduction in semiconductors, Photodiode, Solar Cell, p-n junction as a rectifier, half wave and full wave rectifiers (with derivation)
5th Week	filters (series inductor, shunt capacitance, L-section or choke, π and R.C. filter circuits).
May ,2021 **1st Week**	**Unit 2:** Transistors Junction transistors, Working of NPN and PNP transistors, Three configurations of transistor (C-B, C-E, C-C modes),Common base, common emitter and common collector characteristics of transistor
2nd Week	Constants of a transistor and their relation, Advantages and disadvantages of C-E configuration. D.C. load line .Transistor biasing; various methods of transistor biasing and stabilization.
3rd Week	**Unit 3:** Transistor Amplifiers Amplifiers, Classification of amplifiers, common base and common emitter amplifiers, coupling of amplifiers
4th Week	various methods of coupling, Resistance- Capacitance (RC) coupled amplifier (two stage, concept of band width, no derivation)
June,2021 **1st Week**	Feedback in amplifiers, advantages of negative feedback, emitter follower, distortion in amplifiers. **Class Test**
2nd Week	**Unit 4:** Oscillators Oscillators, Principle of oscillation, classification of oscillators, Condition for self sustained oscillation:
3rd Week	Barkhausen criterion for oscillation, Tuned collector common emitter oscillator
4th Week	Hartley oscillator, C.R.O. (Principle and Working). **Revision**

Subject-: Statistical Physics

Class-:B.Sc.-Second Year (4th Semester)

Teacher Name: Vandana

April ,2021 **3rd Week**	**Unit –I: Statistical Physics I** Microscopic and Macroscopic systems, events-mutually exclusive, dependent and independent. Probability, statistical probability, A- priori Probability and relation between them, probability theorems, some probability considerations, combinations possessing maximum probability, combination possessing minimum probability
4th Week	Tossing of 2,3 and any number of Coins, Permutations and combinations, distributions 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
5th Week	Statistical fluctuations, general distribution of distinguishable particles in compartments of different sizes, Condition of equilibrium between two systems in thermal contact-- β parameter, Entropy and Probability (Boltzman's relation).
May,2021 **1st Week**	**Unit –II: Statistical Physics II** Postulates of statistical physics, Phase space, Division of Phase space into cells, three kinds of statistics, basic approach in three statistics. M. B. statistics applied to an ideal gas in equilibrium
2nd Week	energy distribution law (including evaluation of σ and β) , speed distribution law & velocity distribution law
3rd Week	Expression for average speed, r.m.s. speed, average velocity, r. m. s. velocity, most probable energy & mean energy for Maxwellian distribution.
4th Week	**Unit-III: Quantum Statistics 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, FermiDirac energy distribution law, F.D. gas and Degeneracy
June,2021 **1st Week**	Fermi energy and Fermi temperature, Fermi Dirac energy distribution law, Fermi Dirac gas and degeneracy, Fermi energy and Fermi temperature, Fermi Dirac energy distribution law for electron gas in metals, Zero point energy
2nd Week	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.
3rd Week	**Unit-IV:** Theory of Specific Heat of Solids Dulong and Petit law. Derivation of Dulong and Petit law from classical physics. Specific heat at low temperature, Einstein theory of specific heat **Class Test**
4th Week	Criticism of Einstein theory, Debye model of specific heat of solids, success and shortcomings of Debye theory, comparison of Einstein and Debye theories. **Revision**

Subject-Wave and Optics II

Class-B.Sc.-Second Year (4th Semester)

Teacher Name: Meenu Sharma

April ,2021 **3rd Week**	**Unit-1:** Polarization Polarization: Polarisation by reflection, refraction and scattering, Malus Law, Phenomenon of double refraction, Huygen's wave theory of double refraction (Normal and oblique incidence), Analysis of polarized Light
4th Week	Nicol prism, Quarter wave plate and half wave plate, production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii) Elliptically polarized light.
5th Week	Optical activity, Fresnel's theory of optical rotation, Specific rotation, Polarimeters (half shade and Biquartz).
May,2021 **1st Week**	**Unit-II:** Fourier analysis Fourier theorem and Fourier series, evaluation of Fourier coefficient, importance and limitations of Fourier theorem, even and odd functions
2nd Week	Fourier series of functions f(x) between (i) 0 to 2pi, (ii) –pi to pi, (iii) 0 to pi, (iv) –L to L, complex form of Fourier series, Application of Fourier theorem for analysis of complex waves
3rd Week	Solution of triangular and rectangular waves , half and full wave rectifier outputs, Parseval identity for Fourier Series, Fourier integrals.
4th Week	**Unit III:** Fourier transforms Fourier transforms and its properties, Application of Fourier transform (i) for evaluation of integrals, (ii) for solution of ordinary differential equations, (iii) to the following functions: 1. f(x)= e- x2/2 1 |X|a
June ,2021 **1st Week**	Geometrical Optics I Matrix methods in paraxial optics, effects of translation and refraction, derivation of thin lens and thick lens formulae, unit plane, nodal planes, system of thin lenses.
2nd Week	**Unit-IV:** Geometrical Optics II Chromatic, spherical, coma, astigmatism and distortion aberrations and their remedies. **Class Test**
3rd Week	Fiber Optics Optical fiber, Critical angle of propagation, Mode of Propagation, Acceptance angle, Fractional refractive index change
4th Week	Numerical aperture, Types of optics fiber, Normalized frequency, Pulse dispersion, Attenuation, Applications Fiber optic Communication, Advantages. **Revision**

Subject-Solid State and Nano Physics

Class-B.Sc.-Third Year (6th Semester)

Teacher Name: Shruti Jain

April 2021 **3rd week**	**Unit I: Crystal Structure I** Crystalline and glassy forms, liquid crystals, crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and Primitive Cell
4th week	Winger Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions.
5th week	Crystal planes and Miller indices, Interplaner spacing, Crystal structures of Zinc Sulphide, Sodium Chloride and Diamond.
May,2021 **1st Week**	**Unit II: Crystal Structure II** X-ray diffraction, Bragg's Law and experimental X-ray diffraction methods. K-space and reciprocal lattice and its physical significance
2nd Week	reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c.
3rd Week	**Unit III: Super conductivity** Historical introduction, Survey of superconductivity, Super conducting systems, High Tc Super conductors, Isotopic Effect, Critical Magnetic Field
4th Week	Meissner Effect, London Theory and Pippards' equation, Classification of Superconductors (type I and Type II), BCS Theory of Superconductivity
June,2021 **1st Week**	Flux quantization, Josephson Effect (AC and DC), Practical Applications of superconductivity and their limitations, power application of superconductors.
2nd Week	**Unit IV: Introduction to Nano Physics** Definition, Length scale, Importance of Nano-scale and technology, History of Nantechnology, Benefits and challenges in molecular manufacturing. Molecular assembler concept,
3rd Week	Understanding advanced capabilities. Vision and objective of Nano-technology, Nanotechnology in different field, Automobile, Electronics, Nano-biotechnology, Materials, Medicine.
4th Week	**Revision And Class Test**

Subject- Atomic and Molecular Spectroscopy

Class-B.Sc.-Third Year (6th Semester)

Teacher Name: Vandana

April ,2021 **3rd Week**	**Unit – I: 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's postulates) ,
4th Week	spectra of Hydrogen atom , explanation of spectral series in Hydrogen atom, un-quantized states and continuous spectra, spectral series in absorption spectra, effect of nuclear motion on line spectra (correction of finite nuclear mass), variation in Rydberg constant due to finite mass
5th Week	short comings of Bohr's theory, Wilson sommerfeld quantization rule, de-Broglie interpretation of Bohr quantization law, Bohr's corresponding principle, Sommerfeld's extension of Bohr's model, Sommerfeld relativistic correction, Short comings of Bohr-Sommerfeld theory
May,2021 **1st Week**	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 rules.
2nd Week	**Unit –II: Vector Atom Model** (single valance electron) Orbital magnetic dipole moment (Bohr megnaton), behavior of magnetic dipole in external magnetic field; Larmors' precession and theorem. Penetrating and Non-penetrating orbits, Penetrating orbits on the classical model; Quantum defect **Class Test**
3rd Week	spin orbit interaction energy of the single valance electron, spin orbit interaction for 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, Rydeburg-Ritze combination principle
4th Week	, Absorption spectra of Alkali atoms. observed doublet fine structure in the spectra of alkali metals and its Interpretation, Intensity rules for doublets, comparison of Alkali spectra and Hydrogen spectrum . **UNIT-III:** Vector Atom model (two valance electrons) Essential features of spectra of Alkaline-earth elements, Vector model for two valance electron atom: application of spectra.Coupling Schemes;LS or Russell – Saunders Coupling Scheme and JJ coupling scheme, Interaction energy in L-S coupling (sp, pd configuration), Lande interval rule, Pauli principal
June,2021 **1st Week**	periodic classification of the elements. Interaction energy in JJ Coupling (sp, pd configuration), equivalent and non-equivalent electrons, Two valance electron system-spectral terms of non-equivalent and equivalent electrons. comparison of spectral terms in L-S And J-J coupling. Hyperfine structure of spectral lines and its origin; isotope effect, nuclear spin.
2nd Week	**Unit –IV:** Atom in External Field Zeeman Effect (normal and Anomalous),Experimental set-up for studying Zeeman effect, Explanation of normal Zeeman effect(classical and quantum mechanical)
3rd Week	Explanation of anomalous Zeeman effect(Lande g-factor), Zeeman pattern of D1 and D2 lines of Naatom, Paschen-Back effect of a single valence electron system. Weak field Stark effect of Hydrogen atom.
4th Week	**Molecular Physics:** General Considerations, Electronic States of Diatomic Molecules, Rotational Spectra (Far IR and Microwave Region),Vibrational Spectra (IR Region), Rotator Model of Diatomic Molecule, Raman Effect, Electronic Spectra. **Revision**