Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2021-22 Semester: Even**

Name of Asstt./Ass. Prof : Dr. Hitender Kumar

Class: B.Sc. Physics (Pass Course 2nd Semester)

Name of Subject: Properties of Matter and Kinetic Theory of Gases (Physics- PH-201)

April 2022 to July 2022	
	Month (April)
Week 1	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)
Week 2	Moment of inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross–section
Week 3	Fly wheel, Moment of inertia of an irregular body, Acceleration of a body rolling down on an inclined plane.
	Month (May)
Week 4	Unit 2: Elasticity Elasticity, Stress and Strain, Hook's law, Elastic constant and their relations, Poisson's ratio, Torsion of cylinder and twisting couple
Week 5	Determination of coefficient of modulus of rigidity for the material of wire by Maxwell's needle, Bending of beam (Bending moment and its magnitude)
Week 6	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.
Week 7	Unit 3: Kinetic theory of gases-I Assumption of Kinetic theory of gases, pressure of an ideal gas (with derivation),
	Month (June)
Week 8	Kinetic interpretation of Temperature, Ideal Gas equation, Degree of freedom, Law of equipartition of energy and its application for specific heat of gases,
Week 9	Real gases, Vander wall's equation, Brownian motion(Qualitative)
Week 10	Unit 4: Kinetic theory of gases-II Maxwell's distribution of speed and velocities (derivation required),
Week 11	Experimental verification of Maxwell's law of speed distribution: most probable speed, average and r.m.s. speed,
	Month (July)
Week 12	Mean free path, Transport of energy and momentum, Diffusion of gases.
Week 13	**Revision, Assignment and Test**

Text and Reference Books: 1. Properties of Matter by D.S. Mathur.

2. Heat and Thermodynamics (5th Edition) by Mark W. Zermansky

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2021-22** **Semester: Even**

Name of Asstt./Ass. Prof : Dr. Hitender Kumar

Class: B.Sc. Physics (Pass Course 2nd Semester)

Name of Subject: Semiconductor Devices (Physics-PH-202)

April 2022 to July 2022	
	Month (April)
Week 1	Unit I: Semiconductors Energy bands in solids, Intrinsic and extrinsic semiconductors, carrier mobility and electrical resistivity of semiconductors, Hall effect,
Week 2	p-n junction diode and their characteristics, Zener and Avalanche breakdown, Zener diode, Zener diode as a voltage regulator. Light emitting diodes (LED), Photoconduction in semiconductors,
Week 3	Photodiode, Solar Cell, p-n junction as a rectifier, half wave and full wave rectifiers (with derivation), filters (series inductor, shunt capacitance, L-section or choke, n and R.C. filter circuits).
	Month (May)
Week 4	Unit 2: Transistors Junction transistors, Working of NPN and PNP transistors,
Week 5	Three configurations of transistor (C-B, C-E, C-C modes),Common base, common emitter and common collector characteristics of transistor,
Week 6	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.
Week 7	Unit 3: Transistor Amplifiers Amplifiers, Classification of amplifiers, common base and common emitter amplifiers
	Month (June)
Week 8	coupling of amplifiers, various methods of coupling, Resistance- Capacitance (RC) coupled amplifier (two stage, concept of band width, no derivation),
Week 9	Feedback in amplifiers, advantages of negative feedback, emitter follower, distortion in amplifiers.
Week 10	Unit 4: Oscillators Oscillators, Principle of oscillation, classification of oscillators,
Week 11	Condition for self sustained oscillation: Barkhausen criterion for oscillation,
	Month (July)
Week 12	Tuned collector common emitter oscillator, Hartley oscillator, C.R.O. (Principle and Working).
Week 13	**Revision, Assignment and Test**

Text and Reference Books:

1. Basic Electronics and Linear Circuits by N.N.Bhargava. D.C. Kulshreshtha and S.C.Gupta (TITI CHD).
2. Solid State Electronics by J.P. Agarwal, Amit Agarwal (Pragati Prakashan Meerut).
3. Electronics Fundamentals and Applications by J.D. Ryder (Prentice Hall India)
4. Solid State Electronics by B.L.Theraja .

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2021-22** **Semester: Even**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 4th Semester)
Name of Subject: Statistical Physics **(Physics-PH-401)**

April 2022 to July 2022	
	Month (April)
Week 1	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,
Week 2	combinations possessing maximum probability, combination possessing minimum probability, 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,
Week 3	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).
	Month (May)
Week 4	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.
Week 5	M. B. statistics applied to an ideal gas in equilibrium- energy distribution law (including evaluation of σ and β) , speed distribution law & velocity distribution law
Week 6	. Expression for average speed, r.m.s. speed, average velocity, r. m. s. velocity, most probable energy & mean energy for Maxwellian distribution.
Week 7	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,
	Month (June)
Week 8	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,
Week 9	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,
Week 10	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.
Week 11	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,
	Month (July)
Week 12	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.
Week 13	**Revision, Assignment and Test**

Text and Reference Books:

1. Prakash S and Agarwal J P, Statistical Mechanics, Kedar Nath Ram Nath & co, Meerur
2. Reif F. statistical Physics, Berleley Physics Course Volume 5, Mc Graw Hill Book Co Ltd, New Delhi
3. Mc Quarrie D A. Statistical Mechanics, Viva Books Pvt Ltd, New Delhi.
4. Ashley Cmter (August 1999), Classical and Statistical Thermodynamics .

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal
Academic Session 2021-22 Semester: Even
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 4th Semester)
Name of Subject: Wave and Optics II (Physics-PH-402)

April 2022 to July 2022	
	Month (April)
Week 1	**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)
Week 2	Analysis of polarized Light. 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.
Week 3	Optical activity, Fresnel's theory of optical rotation, Specific rotation, Polarimeters (half shade and Biquartz).
	Month (May)
Week 4	**Unit-II: Fourier analysis** Fourier theorem and Fourier series, evaluation of Fourier coefficient, importance and limitations of Fourier theorem, even and odd functions,
Week 5	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: solution of triangular and rectangular waves , half and full wave rectifier outputs,
Week 6	Parseval identity for Fourier Series, Fourier integrals.
Week 7	**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: f(x)= e- x2/2
	Month (June)
Week 8	**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.
Week 9	**Unit-IV: Geometrical Optics II** Chromatic, spherical, coma, astigmatism and distortion aberrations and their remedies.
Week 10	**Fiber Optics** Optical fiber, Critical angle of propagation, Mode of Propagation, Acceptance angle,
Week 11	Fractional refractive index change, Numerical aperture, Types of optics fiber, Normalized frequency, Pulse dispersion, Attenuation,
	Month (July)
Week 12	Applications, Fiber optic Communication,Advantages.
Week 13	**Revision, Assignment and Test**

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2021-22** **Semester: Even**

Name of Asstt./Ass. Prof : Dr. Hitender Kumar

Class: B.Sc. Physics (Pass Course 4th Semester)

Name of Subject: Wave and Optics II (Physics-PH-402)

Text and Reference Books:

1 Born M and Wolf E, Principles of Optics, Pergaman Press

2 Jenkins and white, Fundamentals of Optics, McGraw Hill Book Co Ltd, New

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2021-22** **Semester: Even**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 6th Semester)
Name of Subject: Solid State and Nano Physics (Physics-PH-601)

April 2022 to June 2022	
	Month (April)
Week 1	**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, Winger Seitz primitive Cell,
Week 2	Symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions. Crystal planes and Miller indices, Interplaner spacing, Crystal structures of Zinc Sulphide, Sodium Chloride and Diamond.
Week 3	**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, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c.
	Month (May)
Week 4	**Unit III: Super conductivity** Historical introduction, Survey of superconductivity, Super conducting systems, High Tc Super conductors, Isotopic Effect, Critical Magnetic Field, Meissner Effect,
Week 5	London Theory and Pippards' equation, Classification of Superconductors (type I and Type II),BCS Theory of Superconductivity, Flux quantization,
Week 6	Josephson Effect (AC and DC), Practical Applications of superconductivity and their limitations, power application of superconductors.
Week 7	**Unit IV: Introduction to Nano Physics** Definition, Length scale, Importance of Nano-scale and technology, History of Nantechnology,Benefits and challenges in molecular manufacturing.
	Month (June)
Week 8	Molecular assembler concept, Understanding advanced capabilities. Vision and objective of Nano-technology,
Week 9	Nanotechnology in different field, Automobile, Electronics, Nano-biotechnology, Materials, Medicine.
	Revision, Assignment and Test

Text and Reference Books:

1 C. Kittel, *Introduction to Solid State Physics*, 7th Ed (1996) John Wiley & Sons, New Delhi.
2. Pillai O S, *Solid State Physics*, New Age International Publishers (2007) New Delhi
3. Kachhava C M, Solid State Physics (1990) Tata Mc Graw Hill Co Ltd, New Delhi

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2021-22** **Semester: Even**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 6th Semester)
Name of Subject: Atomic and Molecular Spectroscopy(Physics-PH-602)

April 2022 to June 2022	
	Month (April)
Week 1	**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) , 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),
Week 2	variation in Rydberg constant due to finite mass, 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,
Week 3	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.
	Month (May)
Week 4	**Unit –II: Vector Atom Model (single valance electron)** Orbital magnetic dipole moment (Bohr megnaton), behavior of magnetic dipole in external magnetic filed; Larmors' precession and theorem. Penetrating and Non-penetrating orbits, Penetrating orbits on the classical model; Quantum defect, spin orbit interaction energy of the single valance electron, spin orbit interaction for penetrating and non-penetrating orbits. quantum mechanical relativity correction
Week 5	Hydrogen fine spectra, Main features of Alkali Spectra and their theoretical interpretation, term series and limits, Rydeburg-Ritze combination principle, 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 .
Week 6	**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 and periodic classification of the elements
Week 7	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.
	Month (June)
Week 8	**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), 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

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2021-22** **Semester: Even**

Name of Asstt./Ass. Prof : Dr. Hitender Kumar

Class: B.Sc. Physics (Pass Course 6th Semester)

Name of Subject: Atomic and Molecular Spectroscopy(Physics-PH-602)

	Hydrogen atom.
Week 9	**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, Assignment and Test

Text and Reference Books:

1 Beiser A, Concept of Modern Physics (1987), Mc Graw Hill Co Ltd, New Delhi
2. Ghoshal S N, Atomic and Nuclear Physics Vol I (1996) S Chand & Co, New Delhi
3. Gopalkrishnan K, Atomic and Nuclear Physics (1982), Mc Millan India New Delhi
4. Raj Kumar, Atomic and Moleculer Spectra:Laser , Kedarnath Ram nathpub.
5. S.L.Gupta, V.Kumar,R.C.Sharma, Elements of Spectroscopy,Pragati Prakashan.