Government College, Nagda, Distt. – Ujjain (M. P.)
B.Sc. 3rd year planner Minor/Open Elective

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Faculty's Name - Dr. K.C. Mishra **Subject- Physics**
Class- B.Sc. 3rd year **Paper- Minor/Open elective**
Session- 2023-24

week	TIME	UNIT (no.)	Unit name	(SYLLABUS & TOPICS)
1		1	Introduction of Quantum Mechanics	A Brief biography of Chandrasekhara Venkata Raman and their major contribution to science. Limitations of classical mechanics, black body radiation, photoelectric effect, Compton effect, De- Broglie hypothesis , Davisson-Germer experiment Davisson-Germer experiment, Wave packet, Phase velocity and Group velocity. Heisenberg uncertainty principle, Different forms of uncertainty principle, Schrödinger wave equation:
2		1	Introduction of Quantum Mechanics	Time dependent and time independent equation, Physical interpretation of wave function, Equation of Continuity. Operator in quantum mechanics: Eigenfunctions and Eigenvalues, Hermitian operator, Position and Momentum operator, Total energy operator (Hamiltonian), Expectation value, Parity operator, Ehrenfest Theorem.
3		2	Application of quantum Mechanics and Atomic structure	Application of Schrödinger equation: Free particle, Particle in one-dimensional box, Rectangular potential barrier, Tunnel effect, One dimensional Harmonic Oscillator. Three-dimensional Schrödinger equation, The radial and angular equation, Hydrogen atom, electron probability density. Bohr's atomic model, atomic spectra of Hydrogen, Sommerfeld model, electron spin, Stern Gerlach experiment, Orbital and spin angular momentum, Concept of space quantization, Quantum numbers.
4		3	Many - Electron atom	Pauli's exclusion principle, Electronic configuration, Symmetric and antisymmetric wave function (Bosons and Fermions). Spin-Orbit interaction, Selection rules, Spectra of alkaline atom, Fine structure of Sodium D line, Spectral terms of two electron atoms, L-S and j-j

				coupling, Multiplicity of energy levels, Spectra of Helium atom, Zeeman effect: Types and Experimental arrangement. Various types of molecular spectra, Electronic, Rotational and vibrational spectra of diatomic molecule, Raman effect: Experimental setup and explanation by quantum principle, Production of X-rays, Continuous and characteristics X-ray spectrum, Moseley's law.
5		4	Solid State Physics	Crystalline and amorphous solids, Space lattice; Basis, Lattice translational vector, Primitive cell, Bravais lattice, seven crystal systems, Symmetry, Miller indices, Interplanar spacing. Crystal structures: Simple cubic, Face centered cubic (NaCl), Body centered cubic (CSCl), Hexagonal closed packed, Diamond structure, Coordination numbers and atomic packing fraction, Laue's and Bragg's equations, Reciprocal lattice
6		4	Solid State Physics	Dulong and Petit's theory of Specific heat, Einstein's theory of specific heat, Debye's theory of specific heat, Lattice vibrations in crystal: Mono-atomic lattice vibration and dispersion relation, Brillouin Zones, Concept of phonons, Lorentz Drude theory, Ohm's Law (J= oE), Wiedemann Frenz law, Hall effect.
7		5	Semiconductor and Devices	Energy bands in solids, Intrinsic and extrinsic semiconductors; Fermi energy level, Mobility, Conductivity of semiconductors, Concentration of electrons and holes in semiconductors. P-N Junction, depletion layer, Potential barrier, Shockley diode equation (without derivation), Zener diode and its application,
8		5	Semiconductor and Devices	Elementary knowledge of photodiode, Light Emitting diode and Solar cell, Bipolar Junction Transistors and its characteristic curves, Current gains (a, ß and y), Junction Field Effect Transistor. Amplifiers and their classification, Single stage common emitter amplifier, Q-point, load line and frequency response curve, Feedback amplifiers, Barkhausen criterion, Phase shift and Wien bridge oscillator.