LESSON PLAN

Program: B-Tech-CSE **Credit: 4** **Contact: 3L + 1T**

Course name: Physics- I **Course Code- PH101**

Lecture wise Break-up

Lecture No.	Subject	Text Books /Reference	Teaching Aids/ Methods	Course outcome satisfied	Blooms level
L1	Problems including constraints & friction. Basic ideas of vector calculus and partial differential equations.	Te4, 5, 6	Green Board, PPT & Lecturing	CO1	L3
L2	Potential energy function F = -grad V, equipotential surfaces. Vector and meaning of gradient, divergence and curl. Solenoidal vector, irrotational vectors	Te4	Green Board, PPT & Lecturing	CO1	L3
L3	Divergence and Stokes theorem. Conservative and non-conservative forces. Conservation laws of energy & momentum. Non-inertial frames of reference	Te4	Green Board, PPT & Lecturing	CO1	L3
L4	Simple harmonic motion(SHM), differential equation of SHM, energy of simple harmonic oscillator, Lissajous figures, Damped oscillation, under damped, overdamped and critical damping	Te2,6, 7	Green Board/ Lecturing	CO1	L3
L5	Log decrement, forced vibration, amplitude and velocity resonance, sharpness of resonance, quality factor, and analogy of electrical and mechanical systems.	Te5,6	Green Board/ Lecturing	CO1	L3
L6	Motion of a rigid body in a plane and in 3D. Angular velocity vector. Moment of inertia.	Te2, 5	Green Board/ Lecturing	CO1	L3
T1	Numerical problems of vector and harmonic oscillators	Te4,6	Green Board/ Tutorial	CO1	L3
L7	Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits	Te12	Green Board, PPT & Lecturing	CO3	L2

L8	Missing orders, diffraction grating, characteristics of diffraction grating and its applications. resolving power, Polarisation : Introduction, Malus law, double refraction	Te12	Green Board, PPT & Lecturing	CO3	L2
L9	Polarisation : Brewster's law, polarisation by reflection, polarisation by double reflection, scattering of light, circular and elliptical polarisation, optical activity, half and quarter wave plates, Nicol prism.	Te12, 11	Green Board, PPT & Lecturing	CO3	L2
L10	Principles and working of laser: Einstein's A & B coefficients, population inversion, pumping, light amplification, optical resonator, different modes of laser, three & four level lasers.	Te12, 11	Green Board, PPT & Lecturing	CO3	L2
T2	Solving numerical problems of diffraction and polarisation and laser.	Te12	Green Board/ Tutorial	CO3	L2
L11	Maxwell's equations in differential form and integral form in free space, Maxwell's equations in dielectric medium and conducting medium, significances of Maxwell's equation	Te1, 3	Green Board, PPT & Lecturing	CO4	L2
L12	Maxwell's fourth equation, correction to Ampere's circuital law, displacement current and significance,	Te1, 3	Green Board, PPT & Lecturing	CO4	L2
L13	Electromagnetic wave equation in conducting free space and medium , skin depth	Te1, 3	Green Board, PPT & Lecturing	CO4	L2
L14	dielectric constant, polar and non-polar dielectrics, internal fields in a solid,	Te16	Green Board, PPT & Lecturing	CO4	L2
L15	Electric susceptibility and dielectric constant, Relation between displacement current density, polarization and electric field	Te3	Green Board, PPT & Lecturing	CO4	L2
L16	Langevin-Debye equation, classical model of electronic polarizability, Clausius- Mossotti equation (expression only), applications of dielectrics.	Te1, 16	Green Board, PPT & Lecturing	CO4	L2
L17	Magnetisation , permeability and susceptibility, classification of magnetic materials: dia , para ,	Te16	Green Board, PPT & Lecturing	CO4	L2

	ferromagnetic material and their temperature variation of susceptibility, Curie-Weiss law				
L18	Hysteresis loop, domain theory of Weiss, hard and soft magnetic materials and their differences, anti-ferro magnetism, ferrimagnetism	Te3, 16	Green Board, PPT & Lecturing	CO4	L2
L19	Introduction to quantum physics, origin of quantum mechanics, dependence of mass on velocity, mass energy equivalence, significance of $E=mc^2$ equation, relativistic energy momentum relation and its special cases.	Te8, 9	Green Board, PPT & Lecturing	CO2	L3
L20	Black body radiation, emissive and absorptive power, Kirchhoff's law, Stefan-Boltzmann law	Te9, 10	Green Board, PPT & Lecturing	CO2	L3
L21	Energy distribution law of blackbody: Wien's law, Displacement law, Rayleigh-Jean's law and their limitations	Te8, 9, 10	Green Board, PPT & Lecturing	CO2	L3
L22	Ultraviolet catastrophe, Planck's energy distribution law, concept of quantum of energy, Stefan-Boltzmann law, Wien's law and Rayleigh-Jean's law from Planck's law	Te8, 10	Green Board, PPT & Lecturing	CO2	L3
L23	Explanation using the photon concept, wave particle duality, Compton effect,	Te8, 9	Green Board/ Lecturing	CO2	L3
L24	Wave aspect of particles: matter waves and properties, Phase and group velocity, de-Broglie hypothesis	Te9, 10	Green Board/ Lecturing	CO2	L3
L25	Relation between phase velocity and speed of light in free space, relation between group velocity and phase velocity, relation between group velocity and particles velocity	Te10	Green Board/ Lecturing	CO2	L3
L26	Concept of wave packets, localised and non-localised wave function, Heisenberg's uncertainty principle and its applications	Te8, 10	Green Board, PPT & Lecturing	CO2	L3
T3	Solving numerical problems of Compton effect ,de-Broglie hypothesis and uncertainty principle	Te8	Green Board/ Tutorial	CO2	L3

L27	Verification of matter waves, uncertainty principle, Davission-Germer experiment-1	Te10	Green Board, PPT & Lecturing	CO2	L3
L28	Wave function, time dependent Schrodinger wave equation, physical significance of wave function in Schrodinger wave equation, concept of position probability density		Green Board/ Lecturing	CO2	L3
L29	Normalisation and square integrability of wave function, operators in quantum mechanics, linear operators, Hamiltonian operator, Commutators and compatibility	Te10	Green Board/ Lecturing	CO2	L3
L30	Eigen value and eigen-function, conditions satisfied by and eigen function, postulates of quantum mechanics, time independent Schrodinger wave equation	Te10	Green Board/ Lecturing	CO2	L3
L31	Particle in one dimensional potential well, normalised wave function and energy eigen value, Particle in three dimensional potential box, normalised wave function and energy eigen value, concept of degeneracy and degenerate states.	Te10	Green Board/ Lecturing	CO2	L3
T4	Solving numerical problems of normalised function, operators ,eigen value, eigen function	Te9, 10	Green Board/ Tutorial	CO2	L3
L32	quantum harmonic oscillator, the energy eigenvalues	Te10	Green Board, PPT & Lecturing	CO2	L3
L33	hydrogen atom: Schrodinger Equation for the Hydrogen atom, stationary states and energy eigenvalue and spectrum	Te10	Green Board, PPT & Lecturing	CO2	L3
L34	Statistical mechanics: phase space and phase point, ensemble, micro canonical, canonical, grand canonical ensemble	Te14, 15	Green Board/ Lecturing	CO5	L2
T5	Macro state and microstate, most probable macrostate, density of states, solving numerical problems on microstate, macrostate	Te14, 15	Green Board/ Tutorial	CO5	L2

L35	Maxwell Boltzmann (MB) statistics, characteristics, distribution function, internal energy of 'N' gas molecules, limitations of MB statistics	Te14, 15	Green Board/ Lecturing	CO5	L2
L36	Bose-Einstein (BE) statistics, characteristics, distribution function, Bosons, Bose-Einstein (BE) condensation, Fermi-Dirac statistics, Fermions, characteristics, distribution function, concept of Fermi energy	Te13, 14	Green Board/ Lecturing	CO5	L2
L37	Temperature dependence of FD statistics, Fermi energy, total internal energy and average energy of free electrons in a metal	Te13, 14	Green Board, PPT & Lecturing	CO5	L2
T6	Solving numerical problems on MB, BE and FD statistics	Te15	Green Board/ Tutorial	CO5	L2
L38	Transformation of BE and FD statistics to MB statistics, comparison between MB, BE and FD statistics	Te13, 14	Green Board, PPT & Lecturing	CO5	L2

Books:

- **Te 1**. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India, Learning Private Limited
- **Te 2** Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker , Wiley
- **Te 3** Electricity and Magnetism : with electromagnetic theory and special theory of relativity, D. Chattopadhyay and P. C. Rakshit, Kolkata Central Book Agency
- **Te 4** Vector Analysis and an introduction to Tensor Analysis, Murray R. Spiegel, Schaum's Outline Series McGraw-Hill
- **Te 5** Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
- **Te 6** Engineering Mechanics, M.K. Harbola , Cengage India
- **Te 7** Mechanics (Dover Books on Physics) , J. P. Den Hartog , Dover Publications Inc.
- **Te 8** Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, Robert Eisberg, Robert Resnick, Wiley
- **Te 9** Introduction to Quantum Mechanics, J. Griffiths David , Pearson Education
- **Te 10** Introductory Quantum Mechanics, S. N. Ghoshal, Calcutta book house
- **Te 11** Optics , Hecht, Pearson Education
- **Te 12** Optics, Ghatak, McGraw Hill Education India Private Limited
- **Te 13** Thermal Physics (Heat & Thermodynamics), A. B. Gupta & Dr. H. P. Roy, Books and Allied Pvt. Ltd.
- **Te 14** Fundamentals of Statistical and Thermal Physics, Reif, Sarat Book Distributors
- **Te 15** Statistical Mechanics , Pathria , Elsevier