



B. P. Poddar Institute of Management and Technology
Department of Electrical Engineering
Academic Year: 2024-2025 (Odd Semester)

LESSON PLAN

Program: B. Tech in Program: B. Tech in Electrical Engineering,

Sec: A

Credit: 4

Contact: 3L+1T

Paper : Physics-I

Course Code: BS-PH-201

L. NO	Topics Covered	Teaching Aids	Teaching Methodology
L1	Problems including constraints & friction. Basic ideas of vector calculus and partial differential equations.	Green Board	Lecturing
L2	Potential energy function $F = -\text{grad } V$, equipotential surfaces. Vector and meaning of gradient, divergence and curl. Solenoidal vector, irrotational vectors.	Green Board	Lecturing
L3	Divergence and Stokes theorem. Conservative and non-conservative forces. Conservation laws of energy & momentum. Non-inertial frames of reference	Green Board	Lecturing
L4	Simple harmonic motion(SHM), differential equation of SHM, energy of simple harmonic oscillator, Lissajous figures, Damped oscillation, under damped, overdamped and critical damping,	Green Board	Lecturing
L5	Log decrement, forced vibration, amplitude and velocity resonance, sharpness of resonance, quality factor, analogy of electrical and mechanical systems	Green Board	Lecturing
L6	Motion of a rigid body in a plane and in 3D. Angular velocity vector. Moment of inertia.	Green Board	Lecturing
T1	Numerical problems of vector and harmonic oscillators	Green Board	Tutorial
L7	Distinction between interference and diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits	Projector	PPT
L8	Missing orders, diffraction grating, characteristics of diffraction grating and its applications. resolving power, Polarisation : Introduction, Malus law, double refraction,	Green Board	Lecturing
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.	Green Board	Lecturing
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.	Green Board	Lecturing
T2	Solving numerical problems of diffraction and polarisation and laser.	Green Board	Tutorial
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	Green Board	
L12	Maxwell's fourth equation, correction to Ampere's circuital law, displacement current and significance,	Green Board	Lecturing

L13	Electromagnetic wave equation in conducting free space and medium , skin depth	Green Board	Lecturing
L14	dielectric constant, polar and non-polar dielectrics, internal fields in a solid,	Green Board	Lecturing
L15	Electric susceptibility and dielectric constant, Relation between displacement current density, polarization and electric field	Green Board	Lecturing
L16	Langevin-Debye equation, classical model of electronic polarizability, Clausius- Mossotti equation (expression only), applications of dielectrics.	Projector	Lecturing
L17	Magnetisation , permeability and susceptibility, classification of magnetic materials: dia , para , ferromagnetic material and their temperature variation of susceptibility, Curie-Weiss law	Green Board	Lecturing
L18	Hysteresis loop, domain theory of Weiss, hard and soft magnetic materials and their differences, anti-ferro magnetism, ferrimagnetism	Projector	Lecturing
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.	Green Board	Lecturing
L20	Black body radiation, emissive and absorptive power, Kirchhoff's law, Stefan-Boltzmann law	Green Board	Lecturing
L21	Energy distribution law of blackbody: Wien's law, Displacement law, Rayleigh-Jean's law and their limitations	Green Board	Lecturing
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	Green Board	Lecturing
L23	Explanation using the photon concept, wave particle duality, Compton effect,	Green Board	Lecturing
L24	Wave aspect of particles: matter waves and properties, Phase and group velocity, de-Broglie hypothesis	Green Board	Lecturing
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	Green Board	Lecturing
L26	Concept of wave packets, localised and non-localised wave function, Heisenberg's uncertainty principle and its applications	Green Board	Lecturing
T3	Solving numerical problems of Compton effect ,de-Broglie hypothesis and uncertainty principle	Green Board	Tutorial
L27	Verification of matter waves, uncertainty principle, Davission-Germer experiment-1	Green Board	Lecturing
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
L29	Normalisation and square integrability of wave function, operators in quantum mechanics, linear operators, Hamiltonian operator, Commutators and compatibility	Green Board	Lecturing
L30	Eigen value and eigen-function, conditions satisfied by and eigen function, postulates of quantum mechanics, time independent Schrodinger wave equation	Green Board	Lecturing
L31	Particle in one dimensional potential well, normalised wave function and energy eigen value, Particle in three dimensional potential box, normalised wave function and	Green Board	Lecturing

	energy eigen value, concept of degeneracy and degenerate states.		
T4	Solving numerical problems of normalised function, operators ,eigen value, eigen function	Green Board	Tutorial
L32	quantum harmonic oscillator, the energy eigenvalues	Green Board	Lecturing
L33	hydrogen atom: Schrodinger Equation for the Hydrogen atom, stationary states and energy eigenvalue and spectrum	Green Board	Lecturing
L34	Statistical mechanics: phase space and phase point, ensemble, micro canonical, canonical, grand canonical ensemble	Green Board	Lecturing
T5	macro state and microstate, most probable macrostate, density of states, solving numerical problems on microstate, macrostate	Green Board	Tutorial
L35	Maxwell Boltzmann (MB) statistics, characteristics, distribution function, internal energy of 'N' gas molecules, limitations of MB statistics	Green Board	Lecturing
L36	Bose-Einstein (BE) statistics, characteristics, distribution function, Bosons, Bose-Einstein (BE) condensation	Green Board	Lecturing
L37	Fermi-Dirac statistics, Fermions, characteristics, distribution function, concept of Fermi energy,	Green Board	Lecturing
L38	Temperature dependence of FD statistics, Fermi energy, total internal energy and average energy of free electrons in a metal	Projector	PPT
T6	Solving numerical problems on MB, BE and FD statistics	Green Board	Tutorial
L39	Transformation of BE and FD statistics to MB statistics, comparison between MB, BE and FD statistics	Green Board	Lecturing

References

1. Introduction to Electrodynamics, David J. Griffiths, Pearson Education India, Learning Private Limited
2. Principles of Physics, 10ed, David Halliday, Robert Resnick Jearl Walker , Wiley
3. Electricity and Magnetism : with electromagnetic theory and special theory of relativity, D. Chattopadhyay and P. C. Rakshit, Kolkata Central Book Agency
4. Engineering Mechanics (In SI Units) (SIE), S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati , McGraw Hill Education
5. VECTOR ANALYSIS and an introduction to TENSOR ANALYSIS, Murray R. Spiegel, SCHAUM'S OUTLINE SERIES McGraw-Hill
6. Introduction to Classical Mechanics, R Takwale, P Puranik, McGraw Hill Education
7. Engineering Mechanics, M.K. Harbola , Cengage India
8. Mechanics (Dover Books on Physics) , J. P. Den Hartog , Dover Publications Inc.
9. Engineering Mechanics: Dynamics, L.G. Kraige J.L. Meriam, Wiley
10. Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles, Robert Eisberg, Robert Resnick, Wiley
11. Introduction to Quantum Mechanics, J. Griffiths David , Pearson Education
12. Introductory Quantum Mechanics, S. N. Ghoshal, Calcutta book house
13. Optics , Hecht, Pearson Education
14. Optics, Ghatak, McGraw Hill Education India Private Limited
15. THERMAL PHYSICS (Heat & Thermodynamics), A. B. Gupta & Dr. H. P. Roy, Books and Allied Pvt. Ltd.
16. Fundamentals of Statistical and Thermal Physics, Reif, Sarat Book Distributors
17. Statistical Mechanics , Pathria , Elsevier