

Lesson Plan (2024-25)

Name of the Assistant/ Associate Professor: Dr. Anju Kumari

Class and Section: B.Sc.2nd semester

Subject: PHYSICS

Paper: **Electricity and Magnetism & EM Theory**

Weeks	Topics
Week-1	Vector Background and Electric Field:
	Gradient of a scalar and its physical significance,
	Line integrals of a vector and their physical significance,
	Surface integrals of a vector and their physical significance and
	Volume integrals of a vector and their physical significance,
	Flux of a vector field,
	Divergence and curl of a vector and their physical significance,
Week-2	Gauss's divergence theorem,
	Stoke's theorem.
	Conservative nature of Electrostatic Field,
	Electrostatic Potential,
	Potential as line integral of field,
	Potential difference Derivation of electric field E from potential as gradient.
Week-3	Derivation of Laplace and Poisson equations. Electric flux,
	Gauss's Law,
	Differential form of Gauss's law and
	Applications of Gauss's law.
	Mechanical force of charged surface,
	Energy per unit volume.
Week-4	Magnetic Field:
	Biot-Savart law
	and its simple applications
	straight wire and
	Circular loop,
	Current Loop as a Magnetic Dipole and its Dipole Moment,
Week-5	Ampere's Circuital Law
	and its applications
	(1) Solenoid and

	(2) Toroid,
	properties of B
	curl and divergence
Week-6	Magnetic Properties of Matter: Force on a dipole in an external field, Electric currents in Atoms,
	Electron spin and Magnetic moment, types of magnetic materials,
	Magnetization vector (M),
	Magnetic Intensity (H),
	Magnetic Susceptibility and permeability,
	Relation between B, H and M,
Week-7	Electronic theory of dia and paramagnetism,
	Domain theory of ferromagnetism (Langevin's theory),
	Cycle of Magnetization- B-H curve and
	Hysteresis loop: Energy dissipation,
	Hysteresis loss and importance of Hysteresis Curve.
Week-8	Time varying electromagnetic fields:
	Electromagnetic induction,
	Faraday's laws of induction and
	Lenz's Law,
	Self-inductance,
	Mutual inductance,
	Energy stored in a Magnetic field,
Week-9	Derivation of Maxwell's equations,
	Displacement current,
	Maxwell's equations in differential and integral form and their physical significance.

Week-10	Electromagnetic Waves: Electromagnetic waves,
	Transverse nature of electromagnetic wave,
	energy transported by electromagnetic waves,
	Poynting vector, Poynting's theorem.
	Propagation of Plane electromagnetic waves in free space and
	Dielectrics
Week-11	DC current Circuits:
	Electric current and
	current density,
	Electrical conductivity and
	Ohm's law (Review),
	Kirchhoff's laws for D.C. networks,
Week-12	Network theorems:
	Thevenin's theorem,
	Norton theorem,
	Superposition theorem.
Week-13	Alternating Current Circuits: A resonance circuit,
	Phasor,
	Complex Reactance and
	Impedance,
	Analysis for RL,
	RC and LC Circuits,
Week-14	Series LCR Circuit:
	(1) Resonance,
	(2) Power Dissipation
	(3) Quality Factor and
	(4) Band Width,
	Parallel LCR Circuit.

Lesson Plan (2024-25)

Name of the Assistant/ Associate Professor: Dr. Anju Kumari

Class and Section: B.Sc.4th semester

Subject: PHYSICS

Paper: STATISTICAL MECHANICS AND OPTICS II

Week	Topics
Week-1	Probability
	some probability considerations
	combinations possessing maximum probability
	Numerical problem
	Distribution of molecules in two boxes
	Case with weightage (general)
	distribution of molecules in two boxes
Week-2	Phase space,
	Microstates, Macrostates,
	statistical fluctuations constraints, accessible States
	Thermodynamical probability.
	Numerical Problems
	Revision
	Test
Week-3	Postulates of Statistical Physics
	Division of Phase space into cells
	Condition of equilibrium between two system in thermal contact
	b-Parameter.
	Entropy
	Entropy and Probability
Week-4	Boltzman's distribution law
	Evaluation of A and b
	Bose-Einstein statistics
	Application of B.E. Statistics to Plancks's radiation law
	B.E. gas
	Numerical Problems
	Revision
	Test
Week-5	Basics Fermi-Dirac statistics,
	Fermi-Dirac statistics,
	M.B. Law

	Basics Fermi-Dirac statistics,
	Fermi-Dirac statistics,
	B.E. Degeneracy
Week-6	M.B. Law as limiting case of B.E. Degeneracy
	B.E.,
	Condensation
	F.D. Gas 1
	electron gas in metals
	Zero point energy
Week-7	Specific heat of metals and its solution1
	Specific heat of metals and its solution2
	Numerical Problems
	Revision
	Test
Week-8	Introduction to Optics
	Interference by Division of Amplitude : Colour of thin films,
	wedge shaped film
	Newton's rings
	Interferometers: Michelson's interferometer
	-Do-
	application
	(I) Standardization of a meter
	(II) determination of wavelength
Week-9	Fresnel's Diffraction
	Fresnel's half period zones
	zone plate
	diffraction at a straight edge
	diffraction at a rectangular slit
	diffraction at a circular aperture
	Problems
	Revision
	Test

Week-10	Frainhoffer diffraction
	One slit diffraction
	Two slit diffraction
	N-slit diffraction
	Frainhoffer diffraction
Week-11	Plane transmission grating spectrum
	Dispersive power of a grating
	resolving power of telescope and a grating
	Problems
	Revision
	Test
Week-12	Polarization and Double Refraction
	Polarization by Refraction, Polarization by scattering
	Malus law, Phenomenon of double refraction
	Huygens's wave theory of double refraction
	Analysis of Polarised light : Nicol prism
	Quarter wave plate
Week-13	half wave plate,
	production and detection of (i) plane polarized light, (ii) Circularly polarized light and (iii) Elliptically polarized light
	Optical activity,
	Fresnel's theory of rotation, Specific rotation,
	Polarimeters (half shade and biquartz)
	Problems
Week-14	Problems
	Problems
	Test
	Revision
	Revision
	Revision

