Lesson Plan (Session 2025-26)

Physics Semester 2nd (Electricity & Magnetism)

Week No.	Dates	Unit	Topics to be Covered
1	9–10 Jan	**Unit 1**	Vector background, gradient of scalar, physical significance
2	12–17 Jan		Line, surface & volume integrals; flux of vector field
3	19–24 Jan		Divergence, curl; Gauss divergence theorem; Stokes theorem
4	26–31 Jan		Electrostatic field, conservative nature, potential, $E = -\nabla V$
5	2–7 Feb		Laplace & Poisson equations; Gauss law and applications
6	9–14 Feb		Mechanical force on charged surface; energy density
7	16–21 Feb	**Unit II**	Biot–Savart law; straight wire & circular loop
8	23–28 Feb		Magnetic dipole; Ampere's law; solenoid & toroid
—	1–8 Mar	**—**	Holi Break
9	9–14 Mar	**Unit II**	Properties of B; dia & paramagnetism
10	16–21 Mar		Ferromagnetism; B–H curve; hysteresis
11	23–28 Mar	**Unit III**	Faraday's laws; Lenz's law; electromagnetic induction
12	30 Mar–4 Apr		Self & mutual inductance; energy in magnetic field
13	6–11 Apr		Maxwell's equations; displacement current
14	13–18 Apr		EM waves; Poynting vector; propagation
15	20–25 Apr	**Unit IV**	DC circuits; Kirchhoff's laws; network theorems
16	27 Apr–2 May		AC circuits; phasor; RL, RC, LC circuits
17	4–9 May		LCR circuits; resonance; Q-factor; bandwidth
18	11–15 May		Parallel LCR circuit; revision & internal assessment

COURSE OUTCOME

After completing this course, the learner will be able to:

1. Explain and differentiate the vector and scalar formalisms of electrostatics. Also be able to apply Gauss's Divergence & Stokes theorem to solve various problems in electrostatics.
2. Describe the magnetic materials & important properties of magnetic field. Understand the properties and theories of dia-, para- & ferromagnetic materials.
3. Derive Maxwell equations and their physical significance and familiar about the propagation of electromagnetic waves i.e. boundary conditions at the interface between different media. The students will also be able to have basic idea about the propagation of electromagnetic waves in free space and in medium.
4. Understand D.C. and A.C. circuits, able to apply and analyse using networks. Analyze DC/AC circuits consisting of parallel and/or series combinations of voltage sources and resistors and to describe the graphical relationship of resistance, capacitor and inductor.
5. Learn to present observations, results, analysis and different concepts related to experiments of Electricity and Magnetism.

LESSON PLAN (OPTICS) Semester 4th Session 2025-26

Week / Date	Unit	Topics to be Covered
9–10 Jan 2026	—	Introduction to course and syllabus, Nature of light, Wave concept, Superposition principle
12–17 Jan	**Unit I: Interference**	Interference by division of wavefront, Young's Double Slit Experiment, Coherence, Conditions of interference
19–24 Jan		Fresnel's Biprism, Determination of wavelength of sodium light, Thickness of mica sheet
26–31 Jan		Interference by division of amplitude, Phase change on reflection, Plane parallel thin film
2–7 Feb		Colours in thin films, Classification of fringes, Interference due to reflected and transmitted light
9–14 Feb		Wedge shaped film, Newton's Rings, Applications, Numericals, **Revision**
16–21 Feb	**Unit II: Diffraction**	Huygens–Fresnel theory, Fresnel's assumptions, Rectilinear propagation of light
23–28 Feb		Diffraction at straight edge, Rectangular slit, Circular aperture
1–8 Mar		**HOLI Break**
		Diffraction due to narrow slit, Diffraction due to narrow wire
9–14 Mar		Fraunhofer diffraction, Single slit diffraction, Double slit diffraction
16–21 Mar		Plane transmission grating, Grating spectrum, Dispersive power of grating
23–28 Mar		Rayleigh's criterion, Resolving power of telescope and grating, **Revision**
1–4 Apr	**Unit III: Polarization**	Polarization by reflection, refraction and scattering, Malus Law
6–11 Apr		Double refraction, Huygens' theory of double refraction
13–18 Apr		Nicol prism, Quarter wave plate, Half wave plate
20–25 Apr		Plane, circular and elliptical polarized light
27 Apr – 2 May		Optical activity, Fresnel's theory, Specific rotation, Polarimeters, **Revision**
4–9 May	**Unit IV: Lasers**	Absorption & emission of radiation, Population inversion, Components & properties of laser
11–15 May		He–Ne and Ruby lasers, Applications of lasers, Optical fibres, Numerical aperture, Types & applications, Fibre optic sensors, **Overall revision**

Course Learning Outcomes (CLO):

After completing this course, the learner will be able to:

1. Have understanding of Interference - by Division of Wave front, by Division of Amplitude and Interference due to transmitted light & reflected light.
2. Learn about Huygens-Fresnel‟s theory, diffraction at a straight edge and at a circular aperture, diffraction due to a narrow Slit and due to a narrow wire. Understand and explain the Fraunhoffer diffraction, dispersive power of grating, Rayleigh's criterion and resolving power of telescope & grating.
3. Understand the theories and laws of polarization along with understanding of the production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii) Elliptically polarized light.
4. Understand and appreciate the applications of Lasers in developing LED, Holography, in materials processing, in Medicine, Industry and Military. Have the idea of optical fibres, their properties and principle of propagation of electromagnetic waves through optical fibres.
5. Understand various optical phenomena, principles, workings and applications optical instruments through Experiments.

Lesson Plan- Physics, Semester 6th, ATOMIC MOLECULAR AND LASER PHYSICS

Week	Dates	Topics / Subtopics
1.	09–10 Jan	**Unit-III:** Main features of a laser: Directionality, high intensity, high degree of coherence
2.	13–18 Jan	Spatial and temporal coherence, Einstein's coefficients and possibility of amplification
3.	20–25 Jan	Momentum transfer, Lifetime of a level, Kinetics of optical absorption
4.	27 Jan – 01 Feb	Threshold condition for laser emission, Laser pumping
5.	03–08 Feb	He-Ne laser (Principle, Construction, Working)
6.	10–15 Feb	Ruby laser (Principle, Construction, Working)
7.	17–22 Feb	Applications of lasers in Medicine and Industry
8.	24 Feb – 28 Feb	**Unit-I:** Introduction to Vector Atom Model, Quantum numbers associated with vector atom model
9.	01–08 Mar	**Holi Break**
10.	09–14 Mar	Penetrating and Non-penetrating orbits (qualitative description), Spectral lines in different series of alkali spectra
11.	16–21 Mar	Spin orbit interaction and doublet term separation LS coupling
12.	23–28 Mar	Russell-Saunder Coupling jj coupling, Expressions for interaction energies for LS and jj coupling
13.	30 Mar – 04 Apr	**Unit-II:** Zeeman effect (normal and anomalous), Zeeman pattern of D_1 and D_2 lines of Na atom
14.	06–11 Apr	Paschen-Back effect of a single valence electron system
15.	13–18 Apr	Weak field Stark effect of Hydrogen atom
16.	20–25 Apr	Discrete set of electronic energies of molecules, Quantisation of vibrational and rotational energies
17.	27 Apr – 02 May	Raman effect (quantitative description), Stokes and anti-Stokes lines
18.	04–09 May	Revision
19.	11–15 May	Revision