Curriculum plan of Prof. Rachana Kumar

For Odd Session 2024-25
B.Sc. (H) III Year, Sem V
Paper-Electromagnetic Theory

3 periods per week

Content	Allocation of Lectures	Schedule to be followed
Unit - I: Review of Maxwell's equations; Coulomb gauge and Lorentz gauge; Poynting's theorem and Poynting's vector; electromagnetic (em) energy density; physical concept of electromagnetic field energy density	6 lectures	August-September Syllabus Reference books Derivations and Numericals
Unit – II: EM wave propagation in unbounded media: Plane em waves through vacuum and isotropic dielectric medium: transverse nature, refractive index, dielectric constant, wave impedance. Plane em waves through conducting medium: relaxation time, skin depth, attenuation constant; Wave propagation through dilute plasma: electrical conductivity of ionized gases, plasma frequency, refractive index, skin depth.	10 lectures	
Unit – III: EM waves in bounded media: Boundary conditions at a plane interface between two media; reflection and refraction of plane em waves at plane interface between two dielectric media - Laws of reflection and refraction; Fresnel's formulae for perpendicular and parallel polarization, Brewster's law; reflection and transmission coefficients; total internal reflection, evanescent waves; metallic reflection (normal incidence)	9 lectures	September-October Derivations and Numericals Problem Set and Model paper pattern discussion. Class test on unit end Discussion of Important questions

Unit – IV: Polarization of EM waves: Propagation of em waves in an anisotropic media; symmetric nature of dielectric tensor; Fresnel's formula; uniaxial and biaxial crystals; light propagation in uniaxial crystal; double refraction; polarization by double refraction; Nicol prism; ordinary and extraordinary refractive indices; production and detection of plane, circular and elliptically polarized light; phase retardation plates: quarter wave and half wave plates Optical rotation; Biot's laws for rotatory polarization; Fresnel's theory of optical rotation; specific rotation	13 Lectures	October – November Assignment for IA Derivations and Numerical ICT presentations
Unit – V: Wave guides: Planar optical wave guides; planar dielectric wave guide ($-d/2 < x < d/2$); condition of continuity at interface; phase shift on total reflection; Eigenvalue equations; phase and group velocity of guided waves; field energy and power transmission (TE mode only)	7 lectures	Till end November (dispersal of classes) Derivations and Numericals Doubts solving for students Course completion