Curriculum plan of Prof. Rachana Kumar

For Even Session 2021-22
B.Sc. (H) III Year
Paper-Electromagnetic Theory

4 periods per week

Content	Allocation of Lectures	Schedule followed
Maxwell's Equations Review of Maxwell Equations. Displacement Current. Vector and Scalar Potentials. Gauge Transformations: Lorentz and Coulomb Gauge. Boundary Conditions at Interface between Different Media. Wave Equations. Plane Waves in Dielectric Media. Poynting Theorem and Poynting Vector. Electromagnetic Energy Density. Physical Concept of Electromagnetic Field Energy Density, Momentum Density and Angular Momentum Density.	12 lectures	3 Jan-19 Jan Syllabus Reference books Question pattern discussion Derivations and Numericals
EM Wave Propagation in Unbounded Media: Plane EM waves through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive index and dielectric constant, wave impedance. Propagation through conducting media, relaxation time, skin depth. Wave propagation through dilute plasma, electrical conductivity of ionized gases, plasma frequency, refractive index, skin depth, application to propagation through ionosphere.	10 lectures	21 Jan-1 Feb Derivations and Numericals Problem Set and Model paper pattern discussion Class test on unit end Discussion of Important questions

EM Wave in Bounded Media: Boundary conditions at a plane interface between two media. Reflection & Refraction of plane waves at plane interface between two dielectric media-Laws of Reflection & Refraction. Fresnel's Formulae for perpendicular & parallel polarization cases, Brewster's law. Reflection & Transmission coefficients.Total internal reflection, evanescent waves. Metallic reflection (normal Incidence)	10 Lectures	4 Feb – 1 9 Feb Assignment for IA Derivations and Numerical
Polarization of Electromagnetic Waves Description of Linear, Circular and Elliptical Polarization. Propagation of e.m. Waves in 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, Circularly and Elliptically Polarized Light. Phase Retardation Plates: Quarter-Wave and Half-Wave Plates. Babinet Compensator and its Uses. Analysis of Polarized Light.	12 lectures	20 Feb- 8th march Derivations and Numericals Based on problem set and model paper
Rotatory Polarization:- Optical Rotation. Biot's Laws for Rotatory Polarization. Fresnel's Theory of Optical Rotation. Calculation of Angle of Rotation. Experimental Verification of Fresnel's Theory. Specific Rotation. Laurent's Half-Shade Polarimeter.	5 lectures	11 th march- 15th March Derivations, Class Work Discussion of previous years papers prior to HY
Wave Guides Planar Optical Wave Guides. Planar Dielectric Wave Guide. Condition of Continuity at Interface. Phase Shift on Total Reflection. Eigenvalue Equations. Phase and Group Velocity of the Guided Waves. Field Energy and Power Transmission.	8 lectures	1 April-12 April Derivations and Concepts ICT presentations

Optical Fibres :- Numerical Aperture. Step and Graded Indices (Definitions Only). Single and Multiple Mode Fibres (Concept and Definition Only).	3 lectures	17th April-23th April Expected course completion 24April-25th April Mock test