Content for e-class

M.Sc.PHYSICS (II Semester): ELECTRODYNAMICS & PLASMA PHYSICS

Teacher

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Unit 1. Electrostatics: Electrostatic fields in matter; Dielectrics, Polarization, Field inside a dielectric, Electric displacement, Linear dielectrics. Laplace's and Poisson Equations, Methods of images, point charge near an infinite conducting plane, Point charge in the presence of grounded conducting sphere, Point charge in presence of charged insulated sphere.

Unit 2. Magneticstatics: Magnetic vector potential, Magnetostatic fields in Matter: Magnetization, field of a magnetized object, magnetic field inside matter, linear and non linear magnetic media.

Unit 3. Time-Varying Fields: Maxwell's displacement current, Maxwell's equations, Maxwell's equations in terms of vector and scalar potentials, Poynting theorem, Lienard- Wiechert potentials due to a point charge, Fields of a point charge in motion, Power radiated by an accelerated charge, Larmor's formula and its relativistic generalization.

Unit 4. Plane Electromagnetic Wave: Reflection, Refraction of electromagnetic waves at an interface between dielectrics, Fresnel's relation polarization by reflection and total internal reflection, Plain electromagnetic waves in free space, dielectrics and conducting media.

Unit 5. Plasma: Definition of plasma ,Concept of temperature, Debye shielding, Criteria for plasma, Single-particle motions in E and B fields, Magnetic mirrors and plasma confinement, Plasma as fluid, the fluid equation of motion, Equation of continuity and equation of state, Waves in plasmas, Plasma oscillations, Plasma frequency ωp, Electron plasma waves, ion waves, Electron and ion oscillations perpendicular to **B** and parallel to **B,** Cutoffs and resonances.

Text and Reference Books;

Classical Electrodynamics by J.D. Jackson
Foundations of Electromagnetic theory by J.R. Reitz, F.J.Milford and R.W.Christy
Introduction to Electromagnetics by David J. Griffiths
Intriduction to Plasma Physics and Controlled Fusion, Vol-1: Plasma Physics by Francis F. Chen
Plasma Physics by S.N. Sen.**)**