M.Sc. Physics Semester III Paper XVII
Electrodynamics and Wave propagation 23PHY23C2

Theory Marks:80

Internal Assessment Marks:20

Time: 3 Hours   .

COURSE OUTCOMES

CO1   Student would be able to formulate and solve electrodynamic problems in relativistic covariant form in four dimensional space.

CO2   Student would gain the knowledge about electrostatic and magnetic fields produced by static and moving charges in a variety of simple configurations.

CO3   Would be able to analyze the basics of theory of transmission lines and waveguides.

Unit I

Review of four-vector and Lorentz transformation in four dimensional space; Conservation of charge and four current density; Electromagnetic field tensor in four dimensions and Maxwell's equations; Lorentz invariants of electromagnetic fields; Dual field tensor; Transformation of electric and magnetic field vectors; Covariance of force equation.

Unit II

Radiating systems: Field and radiation of a localized source; Oscillating electric dipole; Centre fed linear antenna; Lienard-Wiechertpotential ; Electric and magnetic fields due to a uniformly moving charge and accelerated charge; Linear and circular acceleration and angular distribution of power radiated.

Unit III

Radiative reaction force; Scattering and absorption of radiation; Thompson scattering and Rayleigh scattering; Normal and anomalous dispersion; Ionoshere; Propagation of electromagnetic wave through ionosphere; Reflection of electromagnetic waves by ionosphere; Motion of charged particles in uniform $\mathbf{E}$ and $\mathbf{B}$ fields; Time varying fields.

Unit IV

Fields at the surface of and within a conductor; Wave guides; Modes in a rectangular wave guide; Attenuation in wave guides; Dielectric wave guides; Circuit representation of parallel plate transmission lines; Transmission line equations and their solutions; Characteristic impedance and propagation coefficient; Low loss radio frequency and UHF transmission lines.

Note: The syllabus is divided into four units. Nine questions will be set in all. Question No.1 will be compulsory having four to eight parts covering the whole syllabus. In addition there will be two questions from each unit and the student is to answer one question from each unit. A student has to attempt five questions in all.

Text and Reference Books

[1] Classical Electrodynamics by J.D. Jackson
[2] Introduction to Electrodynamics by D.J. Griffiths
[3] Electromagnetic by B.B. Laud
[4] Classical Electricity and Magnetism by Panofsky and Phillips
[5] Fundamentals of Electromagnetics by M.A. WazedMiah