MPYC-303 (CLASSICAL ELECTRODYNAMICS)

Marks-100

Unit-I

Electrostatics and magnetostatics,Boundary value problems and conservation laws.
Maxwell's Equations:

Maxwells equations in free space; Magnetic charge; Maxwells equations inside matter; Dis-placement current; Vector and scalars potentials; Wave equation for potentials; Lorentz and Coulomb gauge conditions; Wave equation for Electric and Magenticfields in absence of sources.

Covariant Formulation of Maxwells Equation:

Lorentz transformation; Scalars, vectors and Tensors; Maxwells equations and equations of continuity in terms of A and J ; Electromagnetic field tensor and its dual; Covariant form of Maxwells equations; Lagrangian for a charged particle in presence of external electromagnetic eld and Maxwells equation as Euler-Lagrange equations.(15)

Unit-II

Plane Waves in Non-Conducting Media:

Plane waves in non-conducting media;velocity of wave propagation and energy flow;linear,circular and elliptic polarization; Reflection and refraction of electromagnetic waves at a plane inter-face between dielectrics; normal and oblique incidence;total internal reflection and polarization by reflection; waves in dispersive media,Kramer-Kronig relation.
Plane Waves in Conduction Media:

Plane waves in conduction media; Reflection and transmission at a conducting surface; Cylindrical cavities and wave guides; Modes in rectangular wave guide and resonant cavities.(15)
Diffraction:
Kirchoff 's formulation of diffraction by a circular aperature.(12)

Unit-III

Green's Function Solution for Retarded Potential

Green's function solution of potential form of Maxwell's equations, Retarded and advanced Green's Functions.
Multipole Radiation:

Potential,Fields and radiation due to an oscillating electric dipole; radiation due to a centre -fed linear antenna; angular distribution of power radiated; Rayleigh Scattering. Magnetic dipole and Electric Quadrupole radiation.

Radiation by Point Charge:

Lienard-Weichert potential, Field due to a point charge, Angular distribution of radiation and total power radiated by an accelerated charge, Larmor's formula, Thomson's scattering.(13)

Books:

1. Classical Electrodynamics - J. D. Jackson
2. Classical Theory of Fields - L.LandauLifsitz
3. Introduction to Electrodynamics - D.J.Griths.
4. Principles of Optics-M.Born and E. Wolf