

SYLLABUS :-

Review of Maxwells equations. Potential formulation, gauge transformations, Lorentz and Coulomb gauge, wave equation, electromagnetic waves. Retarded potentials, field of a uniformly moving charge, Lienard-Wiechert potentials; Radiation from oscillating electric and magnetic dipoles and antennas. Optical dispersion in materials, resonant absorption, anomalous dispersion; frequency dispersion characteristics of dielectrics, conductors and plasmas; causality in the connection between D and E, Kramers-Kronig relations. Maxwell field as a classical 4-vector field; electromagnetic field tensor; homogeneous Maxwell equations; Lorentz invariants; Wigner rotation and Thomas precession. Lagrangian formulation of the free Maxwell field; stress-energy-momentum tensor; field angular momentum; conserved quantities; inhomogeneous Maxwell equations; 4-dimensional Greens function of the wave equation for the 4-potential in the Lorentz gauge. Radiation from accelerated charges in the comoving frame; Larmor formula; polar plots and polarization charts; radiation from relativistic charges; linear accelerator and synchrotron radiation; multipole expansion of electromagnetic fields; Cherenkov radiation; transition radiation; radiation reaction.