PPH204 ELECTRODYNAMICS

L	T	P	Cr
3	1	0	3.5

Course Objectives: To apprise the students regarding the concepts of electrodynamics and Maxwell equations and use them various situations

Boundary Value Problems: Uniqueness Theorem, Dirichlet or Neumann Boundary conditions, Formal solution of Electrostatic &Magnetostatic Boundary value problems.

Time Varying Fields and Maxwell Equations: Faraday's Law of induction, Displacement current, Maxwell equations, scalar and vector potentials, Gauge transformation, Lorentz and Coulomb gauges, Hertz potential, Conservation of energy, Complex Poynting's Theorem.

Electromagnetic Waves: Wave equation, Plane waves in free space and isotropic dielectrics, Polarization, Energy transmitted by a plane wave, Waves in conducting media, Skin depth. Reflection and Refraction of electromagnetic waves at plane interface, Fresnel's amplitude relations. Reflection and transmission coefficients, Polarization by reflection. Brewster's angle, Total internal reflection, EM wave guides, TE, TM and TEM waves, Rectangular wave guides. Energy flow and attenuation in wave guides, Cavity resonators.

Radiation from Localized Time Varying Sources: Solution of the inhomogeneous wave equation in the absence of boundaries. Fields and Radiation of a localized oscillating source, Electric dipole and electric quadrupole fields, Centre fed linear antenna.

Charged Particle Dynamics: Non-relativistic motion in uniform constant fields and in a slowly varying magnetic field. Adiabatic invariance of flux through an orbit, Relativistic motion of a charged particle.

Course learning outcomes: Students will have achieved the ability to:

1. use Maxwell equations in analysing the electromagnetic field due to time varying charge and current distribution.
2. describe the nature of electromagnetic wave and its propagation through different media and interfaces.
3. explain charged particle dynamics and radiation from localized time varying electromagnetic sources.

Recommended Books:

1. *Griffiths, D.J., Introduction to Electrodynamics, Dorling Kingsley, (1998).*
2. *Jackson, J.D., Classical Electrodynamics, Wiley Eastern, (1999).*
3. *Puri, S.P., Classical Electrodynamics, Tata McGraw Hill, (1999).*
4. *Jordan, E.C. and Balmain, K.G., Electromagnetic Wave and radiating systems, Prentice Hall of India, (2007).*

Evaluation Scheme:

Sr. No.	Evaluation Elements	Weightage (%)
1	MST	30
2	EST	45
3	Sessionals (May include assignments/quizzes)	25