

PAPER II- ELECTROMAGNETICS

UNIT-I

Electrostatics

Coulomb's law, Electric Field and potentials, Field due to a uniform charged sphere, Derivations of Poisson and Laplace Equations, Gauss Law and its application: The Field of a conductor. Electric dipole, Field and potential due to an electric dipole, Dipole approximation for an arbitrary charge distribution, Electric quadrupole, Field due to a quadrupole, Electrostatic Energy of a charged uniform sphere, Energy of a condenser.

Magnetostatics

Magnetic field, Magnetic force of a current, Magnetic Induction and Biot-Savart Law, Lorentz Force, Vector and Scalar Magnetic potentials, Magnetic Dipole, Magnetomotive force and Ampere's Circuital theorem and its applications to calculate magnetic field due to wire carrying current and solenoid.

UNIT-II

Electromagnetic Induction

Laws of Induction, Faraday's laws and Lenz's Law. Mutual and Self Induction, Vector potential in varying Magnetic field, Induction of current in continuous media, Skin effect, Motion of electron in changing magnetic field, Betatron, Magnetic energy in field, Induced magnetic field (Time varying electric field), Displacement current, Maxwell's equations, Theory and working of moving coil ballistic galvanometer.

UNIT-III

Dielectrics

Dielectric constant, polarization, Electronic polarization, Atomic or ionic Polarization Polarization charges, Electrostatic equation with dielectrics, Field, force and energy in Dielectrics.

Magnetic Properties of Matter

Intensity of magnetization and magnetic susceptibility, Properties of Dia, Para and Ferromagnetic materials, Curie temperature, Hysteresis and its experimental determination.

UNIT -IV

Electromagnetic Waves

The wave', equation satisfied .by E and B, plane electromagnetic waves in vacuum, Poynting's vector, reflection at, a plane boundary of dielectrics, polarization by reflection and total internal reflection, Faraday effect; waves in a conducting medium, reflection and refraction by the ionosphere

Text and Reference Books

1. Berkeley Physics Course; Electricity and Magnetism, Ed. E.M. Purcell (Mc GrawHill). Halliday and Resnik; "Physics", Vol 2.
2. D J Griffith; "Introduction to Electrodynamics" (Prentice-Hall of India). Reitz and Milford; "Electricity and Magnetism (Addison-Wesley).
3. A S Mahajan and A A Rangwala; "Electricity and Magnetism" (Tata McGraw-Hill). A M Portis; "Electromagnetic Fields".
4. Pugh and Pugh; "Principles of Electricity and Magnetism" (Addison-Wesley).
5. Panofsky and Phillips; "Classical Electricity and Magnetism" (India Book House). S S Atwood; "Electricity and Magnetism" (Dover).

Some Other Books

1. J.P.Agarwal , *Electromagnetics* , Pragati Prakashan, Meerut, UP, India
2. Manoj Kumar Tiwari, Sameer Sinha, S.P.Singh, Sujit Kumar Verma, *Electromagnetics*, Krishna Prakashan, Meerut, UP, India
3. R.B.Singh and D.N.Tripathi, *Electromagnetics*, Kedar Nath Ram Nath Publishers
4. B.S.Agarwal, Vinod Goel, *Electromagnetics*, Kedar Nath Ram Nath Publishers
5. Satyaprakash, *Electromagnetic Theory and electrodynamics*, Kedar Nath Ram Nath Publishers
6. K.K.Tiwari, *Electricity and Magnetism*, S Chand publishers.