

Unit-I

Electromagnetic induction and transient current: Motional emf and flux rule, Faraday's law of electromagnetic induction, Faraday's law in integral and differential forms, Calculation of induced electric field due to an infinite long wire carrying a slowly varying current, Self inductance and mutual inductance, Self inductance of a solenoid and of a straight conductor, energy stored in an inductor in the electromagnetic field, Transient currents, Growth and Decay of current in series R-L, R-C and RLC circuits.

Unit-II

Coulomb's law, electric field, field at a point due to (electric dipole), discrete charge distribution and continuous charge distribution, flux of electric field, Gauss' law of electrostatics, field due to linear, spherical and cylindrical charge distribution curl of electrostatic field, Electrostatic potential, Gauss law in magnetism, Ampere's circuital law and its modification.

Unit-III

Alternating currents, Power in ac circuits, Wattless current, Series and Parallel resonant circuits, Sharpness of resonance, Q-factor.

Maxwell's equations, Displacement current and their physical significance, Maxwell's equations inside matter, Boundary conditions, Scalar and Vector potentials, Gauge transformation, Coulomb gauge and Lorentz Gauge, Lorentz force law in potential form, Electromagnetic waves, Poynting's theorem.

Electromagnetic waves: Electromagnetic waves in non conducting media, the wave equation, Monochromatic waves in vacuum, Energy and momentum of electromagnetic waves, Propagation through linear media, Reflection and transmission at normal incidence, and at oblique incidence, Plane electromagnetic waves in conductors, The modified wave equation, Monochromatic plane waves in conducting media, Reflection and transmission at conducting surface (normal incidence).

Books:

1. Introduction to Electrodynamics- D. J Griffiths (PHI)
2. Foundation of electromagnetic theory- Ritz and Milford (Narosa)
3. Electricity and magnetism- E. Purcell (Berkeley Physics Course) TMH
4. Electronics- Chattopadhyay & Rakshit (New Age)
5. Electronics- B. B Swain
6. Electricity and magnetism- D. C Tayal
7. Electricity and magnetism- Satyaprakash