

Module Code: MATH-411
Module Title: **Electromagnetic Theory - I**
Module Rating: 3 Cr. Hours

Electrostatic Fields

- Coulomb's law, the electric field intensity and potential
- Gauss's law and deductions, Poisson and Laplace equations
- Conductors and condensers
- Dipoles, the linear quadrupole
- Potential energy of a charge distribution, Dielectrics
- The polarization and the displacement vectors
- General solutions of Laplace's equation
- Solutions of Laplace's equation in spherical coordinates
- Legendre's equation, Legendre's polynomials

Magnetostatic Fields


- The Magnetostatic law of force
- The magnetic induction
- The Lorentz force on a point charge moving in a magnetic field
- The divergence of the magnetic field
- The vector potential
- The conservation of charge and the equation of continuity
- The Lorentz condition
- The curl of the magnetic field
- Ampere's law and the scalar potential

Steady and Slowly Varying Currents

- Electric current, linear conductors
- Conductivity, resistance
- Kirchhoff's laws
- Current density vector
- Magnetic field of straight and circular current
- Magnetic flux, vector potential
- Forces on a circuit in magnetic field

Recommended Books

1. G. E. Owen, *Introduction to Electromagnetic Theory* (Dover, 2003).
2. D. Corrison and P. Lorrison, *Introduction to Electromagnetic Fields and Waves* (W.H. Freeman and Company, London, 1962).
3. J. R. Reitz, F. J. Milford and R. W. Christy, *Foundations of Electromagnetic Theory* (Addison-Wesley Publishing Co., 1993).
4. J. D. Jackson, *Classical Electrodynamics* (Wiley, 1999).
5. D. J. Griffiths, *Introduction to Electrodynamics* (Prentice-Hall, 1999).


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