



Code	Subject Title	Cr. Hrs	Semester
MATH-411	Electromagnetic Theory - I	3	VII
Year	Discipline		
4	Mathematics		

Objectives:

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:

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