

Core5 - ELE5B07 - Electro Magnetic Theory

Module 1: Fundamental of Vector Analysis

Fundamental vector operations, Coordinate systems-unit length, area and volume, Integrals of vector functions, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stokes's theorem, Physical Interpretation of Gradient, divergent and curl, coordinate transformations.

Module 2: Electrostatics

Static Electric Fields; Postulates of electrostatics, Coulomb's law, Gauss's law and applications, Electric potential, dielectrics, flux, boundary conditions, capacitance, capacitors, Electrostatic energy and forces, Solution of Electrostatic Problems- Poisson's and Laplace's equations-Method of images, Boundary conditions and Boundary value problems.

Module 3: Magnetostatics

Steady Electric Currents; current density, Ohm's law, Boundary condition for current density, Equation of continuity and Kirchhoff's law, Biot-Savart Law, Postulates of Magnetostatics, Vector Magnetic Potential, Force between two current wires, Ampere's Circuit Theorem, Magnetic dipole, Boundary conditions for magnetostatic fields, Magnetic energy, Magnetic forces and torques.

Module 4: Time varying Electromagnetic fields and waves

Faraday's law of electromagnetic induction, Inconsistency of Amperes law, Maxwell's equations, Integral and differential forms, conduction current and displacement current- Uniform Plane waves- Poynting theorem and Poynting vector- Solution for free space condition-Intrinsic impedance- wave equation for conducting medium- Wave polarization, Reflection and transmission, TE, TM and TEM waves, fundamentals of antennas and parameters.

Text Books

1. Engineering Electromagnetics – Haytt (McGraw-Hill Education)
2. Elements of Electromagnetics--Matthew N. O. Sadiku (Oxford University Press)
3. Electromagnetic Field Theory and Transmission Lines--G. S. N. Raju (Pearson Education)