EE 305: ELECTROMAGNETIC THEORY (3-0-0: 3)

Introduction

Co-ordinate systems and transformation, Cartesian coordinates, Circular cylindrical coordinates, Spherical coordinates & their transformation. Differential length, area and volume in different coordinate systems.

Introduction to Vector Calculus

DEL operator, Gradient of a scalar, Divergence of a vector & Divergence theorem, Curl of a vector & Strokes theorem, Laplacian of a scalar, Classification of vector fields, Helmholtz's theorem.

Electrostatic Field

Coulomb's law, field intensity, Gauss's law, Electric potential and Potential gradient, Relation between E and V, an Electric dipole and flux lines. Energy density in electrostatic field. Boundary conditions: Dielectric-dielectric, Conductor –dielectric, Conductor-free space. Poisson's and Laplace's equation, General procedure for solving Poisson's and Laplace's equation.

Magnetostatic Fields

Biot- savart law, Ampere's circuit law, Magnetic flux density, Magnetic static and Vector potential, Forces due to magnetic field, Magnetic torque and moments, Magnetisation in material, Magnetic boundary condition, Inductor and Inductances, Magnetic energy, Force on magnetic material.

Electromagnetic Fields

Faraday's law, Transformer and motional emf, Displacement current, Maxwell's equations, Time varying Potential, Time harmonic fields.

Electromagnetic Wave Propagation

Wave equation, Wave propagation in lossy dielectric, Plane waves in loss less dielectric, Plane wave in free space, Plane wave in good conductor, Skin effect, Skin depth, Power & Poynting vector.

Transmission Line

Concept of lump & distributed parameters, Line parameters, Transmission line equation & solutions, Physical significance of solutions, Propagation constants, Characteristic impedance, Wavelength, Velocity of propagation.

Text Books

1. W.H. Hyat & J.A. Buck, "Engineering Electromagnetic", TMH.
2. Mathew N.O. Sadiku, "Elements of Electromagnetic", Oxford University Press.

References

1. Edminister, "Theory and problems of Electromagnetic", TMH.
2. A Pramanik, "Electromagnetism", PHI.
3. N.N. Rao, "Elements of Engineering Electromagnetic", Pearson Education.