| II Year B.Tech. EEE I - Semester | L | T | P | TO | C |
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# EE 213 ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

***Objective of the Course***

*To expose the students to the fundamentals of electromagnetic fields and their applications in Electrical Engineering. To impart knowledge on Concepts of electrostatics, electrical potential, energy density and their applications, Concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications.*

**UNIT – I Co-ordinate systems and Vector Calculus**

Coordinate systems and transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.

**UNIT 2 Electrostatics**

Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gauss's Law, Electric dipole and flux lines, energy density in electrostatic fields. Polarization in dielectrics, dielectric constants, continuity equation and relaxation time. Boundary conditions: Electrostatic boundary value problems. Poission's and Laplace's equations, general procedures for soling Poission's or Laplace's equations, capacitors -capacitance.

**UNIT 3 Magneto statics**

Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, application of ampere's law, magnetic flux density, magnetic scalar and vector potential. Magnetic forces: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.

**UNIT 4**

**Maxwell's Equations & Faraday's Law:** Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form.

**Waves and applications :** Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plane waves in good conductors, power and the pointing vector, reflection of a plane wave in a normal incidence.

**UNIT 5 Transmission lines**

Transmission line parameters, Transmission line equations, input impedance, standing wave ratio and power, The Smith chart, some applications of transmission lines.

**OUTCOMES:**

The Purpose of this Course is to enable the students to have a fair knowledge about the Theory and Problems in Electromagnetic Fields.

**TEXT BOOKS:**


1. William H. Hayt & John. A. Buck, "Engineering Electromagnetics", 7th ed., Mc. Graw- Hill Companies, 2005.
2. Sadiku, 'Elements of Electromagnetics', 2nd ed., Oxford University Press, 1995.


**REFERENCE BOOKS:**


1. John.D.Kraus, "Electromagnetics", 4 th ed., McGraw Hill book Co., New York, 1991
2. Joseph. A. Edminister, "Theory and Problems of Electromagnetics", 2 nd ed., Schaum Series, Tata McGraw Hill, 1993.
3. S. Kamakshaiah, "Electromagnetic Fields", 1st ed., Right publishers, 2007.