

ECE207:ELECTROMAGNETIC FIELD THEORY

L:3 T:1 P:0 Credits:4

Course Outcomes: Through this course students should be able to

CO1 :: recall the basic the basic Electro and Magneto static theorems and laws

CO2 :: describe the concepts of electrodynamics & to derive and discuss the Maxwell's equations.

CO3 :: interpret Maxwell's equations to electromagnetic waves propagation and transmission line

CO4 :: explore solutions of problems relating to transmission lines and uniform plane wave propagation.

CO5 :: apply the characteristics of electromagnetic wave and its propagation in free space and different medium

CO6 :: deduce the knowledge of electromagnetic fields in practice

Unit I

Introduction to Vector Analysis : Introduction to Coordinate systems and Transformation, Differential Length, Area and Volume, Line, Surface and Volume Integrals, Del Operator, Gradient, Divergence and Curl, Stoke's Theorem, Divergence Theorem, Laplacian of a Scalar

Unit II

Electrostatics : Coulomb Law, Permittivity and Electric flux density, Electric potential, Gauss Law, Applications of Gauss's Law, Continuity Equation, Relaxation time and boundary conditions, Poisson's and Laplace's Equations

Unit III

Magnetostatics : Permeability and Magnetic flux Density, Biot Savart Law, Ampere's circuit law and its application, Magnetic flux and magnetic flux density, Derivation of the steady magnetic field laws

Unit IV

Waves and Applications : **Faraday's** law, Displacement current, Maxwell's equations in point form and integral form for steady fields, Phasor form of Maxwell's equation

Unit V

Electromagnetic Wave Propagation : **Wave Propagation in Lossy Dielectrics**, Plane Waves, Power and Poynting Vector, Reflection at boundaries

Unit VI

Transmission Line : Transmission line parameters, Transmission line equation and reflection coefficients of voltage and current, SWR and Power, Input Impedance, Smith Chart, Application of electromagnetic field in modern wireless communication

Text Books:

1. PRINCIPLES OF ELECTROMAGNETICS by MATTHEW N.O. SADIKU, KULKARNI, OXFORD UNIVERSITY PRESS

References:

1. ENGINEERING ELECTROMAGNETICS by WILLIAM H. HAYT, JR AND JOHN A. BUCK, Tata McGraw Hill, India