ELECTROMAGNETIC THEORY (THEORY) EE-240

Pre-requisite: Engineering Physics and Applied Calculus.
Credit Hours 03
Contact Hours 48

RECOMMENDED BOOKS

"Engineering Electromagnetics" by William Hayt and John A. Buck , Eighth Edition, McGraw-Hill

REFERENCE BOOKS

"Elements of Electromagnetic" Sadiku, Matthew N , Fourth Edition, Oxford University

OBJECTIVE OF COURSE

Importance of Electromagnetics study has been undoubtly enormous. Its scope penetrate into the boundary of Electrical / Electronics / Communication / Computer Engineering especially in the area of circuit theory, transmission line, microwave and antenna design. In this course we will begin with electrostatics and cover the major parts of electrostatics. After it, we will focus on detail study of magnetostatics and eventually we will able to explore important features of electrodynamics related to electromagnet wave and its propagation. After the completion of this course, students must be ready to understand the various phenomenon of wave propagation, microwaves systems and antenna theory and design.

S.NO	CLO/PLOs MAPPING	DOMAIN	PLO
01	**Describe** the fundamentals of Electrostatics and magnetostatics.	C2	01
02	**Identify** the characteristics of materials and relate them to electric and magnetic fields.	C1	02
03	**Demonstrate** the theoretical background of Maxwell's equations and electromagnetic wave concepts, regarding propagation characteristics.	C3	03

COURSE CONTENTS

Review of Vectors and Coordinate Systems

- Cartesian, Cylindrical, Spherical System
- Dot and Cross product
- Differential length, area, and volume
- Gradient, Divergence and Curl

Static Electric Field

- Coulomb's law and Electric Field
- Gauss' law and Divergence of Electric Flux Density
- Work, Potential, Potential Gradient and Energy in Electrostatic Field
- Current and Current Density, Conductor, Dielectrics, Boundary Conditions, Capacitance

Steady state magnetic Field

- Steady Magnetic Field
- Biot-Savart Law
- Ampere's Law
- Stoke's Theorem
- Magnetic Boundary Conditions
- Magnetic Material and Boundary Conditions
- Magnetic Flux Density
- Vector Magnetic Potential
- Inductance

Time varying fields

- Faraday's Law
- Displacement Current Density
- Maxwell's Equations in Differential and Integral Form
- Retarded Potential
- Smith chart

EM Wave Propagation

- Plane Wave in Free Space
- Perfect Dielectric
- Lossy Dielectrics
- Good Conductors
- Skin Effect
- Poynting Theorem
- Power Density