Course Type	Course Code	Name of Course	L	T	P	Credit
DC	ECC207	Electromagnetic Theory	3	0	0	9

Course Objective

To acquire the knowledge of Electromagnetic field theory that allows the student to have a solid theoretical foundation to be able in the future to design emission, propagation and reception of electro- magnetic wave systems. To identify, formulate and solve fields and electromagnetic waves propagation problems in a multidisciplinary frame individually or as a member of a group.

Learning Outcomes

Upon successful completion of this course, students will able to:

- Apply the concepts of electric and magnetic fields to practical engineering problems
- Apply elementary solution techniques for electrostatics and magnetostatics equations
- Interpret Maxwell's equations for time dependent electromagnetic fields.
- Determine parameters such as frequency, phase constant, velocity, skin depth and associated intrinsic impedance for different media.
- Calculate reflection and transmission coefficients and fields for uniform plane waves normally- incident and obliquely- incident on planar interfaces

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Fundamental Concepts:** Scalar and vector fields; Physical interpretation of gradient, divergence and curl; Coordinate systems; Review of static fields; Amperes', Faraday's and Gauss's Law, Current continuity equation.	10	Apply different techniques of vector calculus to understand different concepts of electromagnetic field theory. Explain fundamental laws governing electromagnetic fields and evaluate the physical quantities of electromagnetic fields in different media using the fundamental laws.
2	**Maxwell's equations & Plane Waves:** Displacement current; Maxwell's equations, Wave equation in an lossless and lossy medium and its solution, phasor notation, polarization of waves, reflection and refraction of plane waves at plane boundaries, Poynting vector and power flow in EM fields.	12	Study time varying Maxwell's equations and their applications in electromagnetic problems. Use Maxwell's equations to describe the propagation of electromagnetic waves in free space and lossy media.
3	**Transmission Lines:** Transmission line equation and its solution, Characteristics impedance, Propagation constant, Reflection and Transmission coefficient, Standing waves and Input impedance;	8	Generalize the concepts of guided structures like transmission line, means of transporting energy or information, commonly used in power distribution and communication.
4	**Waveguides:** Electromagnetic fields in parallel-plate, and rectangular waveguides, TE and TM modes, wave impedance, wave velocities, attenuation and power in waveguides.	8	Generalize the concepts of guided structures and their analysis
5	**Radiation of EM waves:** Basic Theory of Antennas and Radiation Characteristics, Hertzian dipole.	4	Understand the radiation mechanism of the antennas

Textbook:

1. Electromagnetic Fields and wave, Magdy F. Iskander, Waveland Pr Inc (2000).
2. Electromagnetic waves and Radiating system, Jordon and Balmain, Prentice Hall Publications.

Reference Books:

1. David J. Griffiths, Introduction to Electrodynamics, Pearson Education Indian Learning Private Limited
2. David K. Cheng, Field and Wave Electromagnetics, Pearson Education Indian Learning Private Limited
3. W H Hayt, Engineering Electromegnetics, Tata Mcgraw Hill Publications.