Course Type	Course Code	Name of Course	L	T	P	Credit
DC	EEC 203	Electromagnetic Theory and Applications	3	0	0	9

Course Objective

The course will give a brief overview about various aspects of Electromagnetic Field Theory. Apart from gaining knowledge about different methods available for obtaining electromagnetic field generated by complex geometries, the students will learn about the significance of bound charge present in multi-dielectric interface. The course will also help in understanding the significance and application of multi-dielectric system in electrical industry.

Learning Outcomes

Upon successful completion of this course, students will:

- understand the fundamentals as well as to have an insight of Electromagnetic Field Theory.
- find application of Field Theory to solve practical problems related to design of Insulators, cables.
- Understand the fundamentals required for better understanding advanced courses like Electric Machines, High Voltage Engineering.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Physical interpretation of gradient, divergence and curl. Laplacian operator, vector relationship in different co-ordinate systems. Electric vector field and scalar potential field, Relation between electric field intensity and potential,	5	Understanding of basic related to Field Theory
2	Gauss's integral law for electric displacement field, Gauss's law in differential form, Stokes theorem, Green's theorem, Poisson's and Laplace's equations - in cartesian, cylindrical and spherical coordinates, Helmholtz theorem	4	Knowledge about different essential theorems in Field Theory
3	electric dipole fields, Electric polarization, and its relation to the permittivity of dielectric media,	5	In depth knowledge about dipoles, electric polarization phenomenon
4	Boundary conditions at interface of different dielectric media, Electric stress and mechanical force in charged conductors, Energy stored in electric field, Capacitance of coaxial cables and two wire transmission lines and related electric fields,	5	Understanding the basics of dielectric-dielectric interface, energy stored in electrostatic field and other applications of electrostatic fields
5	Solution of Laplace's equation by separation of variables method, Numerical analysis of electric fields by solving Laplace's equation, Iterative methods, Finite elements – practical problems. Uniqueness theorem, Method of Images for the solution of electric fields.	5	Knowledge about different methods available for solving electric potential and field intensity.
6	Magnetic field intensity, Scalar and Vector magnetic potential, Lorentz force, Motoring and generating principles, Faraday's Law, Ampere's law in both integral and differential forms, Biot-Savart's law, Boundary conditions, Inductance of coaxial cable and two wire transmission lines, Energy in magnetic field, Force due to magnetic field in magnetic medium.	9	Knowledge about Magnetic field, different basic theorems required for studying magnetic field and other applications of magnetostatic field.
7	Maxwell's field equations, Displacement current density and continuity equation, Electromagnetic wave equation in loss-free and lossy media, Plane and polarized waves and their propagation as solutions of wave equation, Poynting's vector, Power flow through electromagnetic media. Diffusion equation for eddy currents and skin effect.	9	In depth knowledge about time varying fields and associated

Text Books

1. Engineering Electromagnetics, W.H.Hayt, McGraw Hill
2. Electric Field Analysis, S. Chakravorti, CRC Press

Reference Books

1. Electromagnetics, Kraus & Carver, McGraw Hill