ENGINEERING ELECTROMAGNETICS
SEMESTER – III (EC/TC)
[As per Choice Based Credit System (CBCS) Scheme]

Course Code	**17EC36**	**CIE Marks**	**40**
Number of Lecture Hours/Week	**04**	**SEE Marks**	**60**
Total Number of Lecture Hours	**50 (10 Hours per Module)**	**Exam Hours**	**03**

CREDITS – 04

Course objectives: This course will enable students to:

- Study the different coordinate systems, Physical signifiance of Divergence, Curl and Gradient.
- Understand the applications of Coulomb's law and Gauss law to different charge distributions and the applications of Laplace's and Poisson's Equations to solve real time problems on capacitance of different charge distributions.
- Understand the physical significance of Biot-Savart's, Amperes's Law and Stokes' theorem for different current distributions.
- Infer the effects of magnetic forces, materials and inductance.
- Know the physical interpretation of Maxwell' equations and applications for Plane waves for their behaviour in different media
- Acquire knowledge of Poynting theorem and its application of power flow.

Module - 1

Coulomb's Law, Electric Field Intensity and Flux density
Experimental law of Coulomb, Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge, Electric flux density. **L1, L2, L3**

Module -2

Gauss's law and Divergence
Gauss' law, Divergence. Maxwell's First equation (Electrostatics), Vector Operator ▼ and divergence theorem.
Energy, Potential and Conductors
Energy expended in moving a point charge in an electric field, The line integral, Definition of potential difference and potential, The potential field of point charge, Current and Current density, Continuity of current. **L1, L2, L3**

Module -3

Poisson's and Laplace's Equations
Derivation of Poisson's and Laplace's Equations, Uniqueness theorem, Examples of the solution of Laplace's equation.
Steady Magnetic Field
Biot-Savart Law, Ampere's circuital law, Curl, Stokes' theorem, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic Potentials. **L1, L2, L3**

Module -4

Magnetic Forces Force on a moving charge, differential current elements, Force between differential current elements. **Magnetic Materials** Magnetisation and permeability, Magnetic boundary conditions, Magnetic circuit, Potential Energy and forces on magnetic materials. **L1, L2, L3**
Module -5
Time-varying fields and Maxwell's equations Faraday's law, displacement current, Maxwell's equations in point form, Maxwell's equations in integral form. **Uniform Plane Wave** Wave propagation in free space and good conductors. Poynting's theorem and wave power, Skin Effect. **L1, L2, L3**
Course Outcomes: After studying this course, students will be able to: • Evaluate problems on electric field due to point, linear, volume charges by applying conventional methods or by Gauss law. • Determine potential and energy with respect to point charge and capacitance using Laplace equation. • Calculate magnetic field, force, and potential energy with respect to magnetic materials. • Apply Maxwell's equation for time varying fields, EM waves in free space and conductors. • Evaluate power associated with EM waves using Poynting theorem.
Text Book: W.H. Hayt and J.A. Buck, "Engineering Electromagnetics", 7th Edition, Tata McGraw-Hill, 2009, ISBN-978-0-07-061223-5.
Reference Books: 1. John Krauss and Daniel A Fleisch, "Electromagnetics with applications", McGraw- Hill. 2. N. Narayana Rao, "Fundamentals of Electromagnetics for Engineering", Pearson.

D.V.T

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