Course Syllabi: UEE507: Engineering Electromagnetics (L : T : P :: 3 : 1 : 0)

1. **Course number and name**: UEE507: Engineering Electromagnetics

2. **Credits and contact hours**: 3.5 and 4

3. **Text book, title, author, and year**

   Text Books / Reference Books
   - *Hayt, W.H., Engineering Electromagnetics, Tata McGraw–Hill (2008).*
   - *Kraus, J.D., Electromagnetics, McGraw–Hill (2006).*
   - *Sadiku, M.N.O, Elements of Electromagnetics, Oxford University Press (2009).*
   - *Jordan, E.C. and Balmain K.G., Electromagnetic Waves and Radiating Systems, Prentice Hall of India (2008).*
   - *Paramanik, A, Electromagnetism: Theory and Applications, Prentice–Hall of India (2006).*

   a. Other supplemental materials
      - Nil

4. **Specific course information**

   a. Brief description of the content of the course (catalog description)

   Vector Analysis: Review of vector algebra, Review of cartesian, Cylindrical and spherical coordinate systems, Introduction to del ∇ (operator, Use of del operator as gradient, divergence,curl).

   Electrostatic fields: Introduction to coulomb's law, Gaussian law and its applications in determination of field of spherical and cylindrical geometries, Laplace's and poission's equation in various coordinate systems. Effect of dielectric on capacitance, Boundary conditions at electric interfaces, Method of images and its applications.

   Magnetostatics: Introduction to ampere's law, Magnetic vector potential, Magnetic forces, Boundary conditions at magnetic interfaces.

   Time Varying Fields andMaxwell's Equations: Continuity of charge, Concept of displacement current, Maxwell's equation in integral and differential form: for static fields, for time varying fields, for free space, for good conductors, for harmonically varying fields, Poynting theorem: Energy stored and radiated power, Complex poynting vector, Properties of conductor and dielectrics, Wave equations for free space, Wave equations for conductors.

   Uniform Plane Waves: Introduction, Uniform plane wave propagation: Wave equations, Transverse nature of uniform plane waves, Perpendicular relation between $\vec{E}$ and $\vec{H}$, EM waves in charge free, Current free dielectric, Reflection by ideal conductor: Normal incidence, reflection and transmission with normal incidence at another dielectric, Plane wave in lossy dielectric, Wave impedance and propagation constant, Depth of penetration, Surface impedance and surface resistance, Application of EM propagation through Transmission Lines and Rectangular Waveguides

5. **Specific goals for the course**

   After the completion of the course, the students will be able to:
   - Appraise need analysis for different coordinate systems in electromagnetics and their interrelations.
   - Apply vector calculus to solve field theory problems.

- Calculate electric and magnetic fields in different coordinates for various charge and current configurations.
- Exhibit the concept of time varying fields.
- Demonstrate different aspects of plane wave in dielectric and conducting media.
- Realize the analogy of wave with transmission line and determine the transmission line performance.

6. Brief list of topics to be covered

- Vector Analysis
- Electrostatic fields
- Magnetostatics
- Time Varying Fields and Maxwell's Equations
- Uniform Plane Waves