Central University of Jammu

Rahya-Suchani (Bagla) District Samba – 181143, Jammu (J&K)

Department of Electronics and Communication Engineering

Electromagnetic Field Theory

Course Code: BEECE2C304, BEECA2C304

Course Title: Electromagnetic Field Theory

Semester: III

Credits:03

Rationale

The course enables to understand the basic knowledge of Electromagnetic field theory that allows the student to have a solid theoretical foundation for future applications. Also, students able to identify, formulate and solve the electromagnetic fields and waves propagation-based problems, further it provides the students with a solid foundation in engineering fundamentals required to solve problems and also to pursue higher studies

Course Outlines

Contents	No. of Lectures
Unit-I **VECTOR ANALYSIS**: General Treatment on Cartesian, cylindrical, spherical co-ordinate systems with reference to vectors, operation of gradient, divergence, curl, Laplacian., Gauss's Divergence theorem, Stoke's theorem.	**08**
Unit-II **ELECTROSTATICS**: Review of electric field quantities and their definitions. Gauss's flux theorem, Poisson's Equation and Laplace Equation, uniqueness theorem, Green's theorem, Coulomb's law, dipole moment. Electrostatic Field in Dielectric: Polarization, electric flux density, boundary conditions, capacitor and capacitance, electrostatic shielding, energy stored in electric fields.	**08**
Unit-III **MAGNETOSTATICS**: Magnetic flux and flux density, static currents in conducting media, Ampere's law, Biot-Savart law, boundary between magnetic media, forces between currents, magnetic potentials, magnetic torque and moment, Dipole, Energy stored in magnetic field. Faraday's law of induction (transformer and motion), Inductor and Inductances (self and mutual).	**08**
Unit-IV **ELECTROMAGNETIC WAVES**: Faraday's low, Maxwell's equations - Equation of continuity - Displacement current - Maxwell's equation in point and integral forms,Time-varying potentials, wave equations, plane waves in Lossy Dielectrics, Free space & Good conductors, Skin effect, Poynting vector and Theorem, Reflection of plane waves, SWR.	**08**

Unit-V	08
TRANSMISSION LINES: Line equations, input impedance, Stub Matching, SWR and power, smith chart, some applications of Transmission lines. Electromagnetic Wave in Conductors, Rectangular and Circular Wave Guide, Cutoff and guided wavelength, Wave and Characteristic impedance, Dominant Mode, TE and TM Modes.	

Course Outcomes

Up on successful completion of this course, candidates will be able to:

- Describe various theorems related to vector analysis Scheme
- Differentiate different types of coordinate systems and use them for solving the problems of electromagnetic field theory
- Explain concepts, theories and laws of electrostatics, magnetics, electromagnetics, electromagnetic wave propagation and transmission lines
- Apply theories and laws of electrostatics, magnetics and electromagnetics to solve electrical engineering problems
- Deduce the electromagnetic wave propagation from Maxwell's equations

Books Recommended:

1. W. H. Hayt, J. A. Buck, and M. Jaleel Akhtar, "Engineering Electromagnetics", 8th Edition, McGraw Hill Publication.
2. David J. Griffiths, Introduction to Electrodynamics, 4th Edition, PHI, 2013.
3. S. P. Seth, Elements of Electromagnetic Fields, Dhanpat Rai & Co., 4th Edition, 2012.
4. C. L. Wadhwa, Engineering Electromagnetics, New Age International Publishers, 3rd Edition, 2012. 5. Fawwaz T. Ulaby, Electromagnetics for engineers, Pearson education, first Indian reprint, 2005.
5. Elements of Electromagnetic by Mathew N.O. Sadiku, Oxford University Press.