SREENIVASA INSTITUTE of TECHNOLOGY and MANAGEMENT STUDIES (AUTONOMOUS): CHITTOOR
DEPARTMENT 0f ELECTRONICS and COMMUNICATION ENGINEERING

II Year B.Tech. II semester	**L**	**T**	**P**	**C**
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16ECE224 ELECTROMAGNETIC THEORY

Educational course objectives:

- Understanding and the ability to use vector algebra, and vector calculus.
- Proficiency in the use of vector identities, and various Coordinate systems & transformations.

UNIT -1:

Electrostatics: Review of Vector algebra, Co-ordinate systems & transformation, Vector calculus, Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Electric dipole, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors.

UNIT -2:

Magnetostatics: Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields.

UNIT-3:

Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Magnetic torque and moment, Magnetic dipole, Inductances and Magnetic Energy. Forces Due to Magnetic field, Magnetic Torque and Moment,Magnetic Dipole,Magnetization in materials,Magnetic Boundary condition, Inductors and Inductance, Magnetic Energy, Magnetic Circuits.

UNIT -4:

Maxwell's Equations (for Time Varying Fields): Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Boundary Conditions of Electromagnetic fields: DielectricDielectric and Dielectric-Conductor Interfaces

UNIT -5:

EM Wave Propagation: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor.

Educational Outcomes:

This course provides the foundational education in static electromagnetic fields, and time varying electromagnetic waves.

- ✓ Analyze and solve the problems of electric and magnetic fields that vary with three dimensional spatial co-ordinates as well as with time.
- ✓ Become proficient with analytical skills for understanding propagation of electromagnetic waves in different media.
- ✓ Understand the concept of transmission lines & their applications.
- ✓ Develop technical & writing skills important for effective communication.

Text Books:

1. Matthew N.O. Sadiku, “Elements of Electromagnetics,” Oxford Univ. Press, 4th ed., 2008.
2. William H. Hayt Jr. and John A. Buck, “Engineering Electromagnetics,” TMH, 7th ed., 2006.

Reference Books:

1. E.C. Jordan and K.G. Balmain, EM Waves and Radiating Sys. PHI, 2nd, 2000.
2. John D. Krauss, “Electromagnetics”, McGraw- Hill publications, 3rd ed., 1988.
3. Schaum"s out – lines, “Electromagnetics,”, TMH publications, Second Edition ,2006.