GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: V

Electronics Engineering/Electronics & Communication Engineering/Electronics & Telecommunication

Subject Name: Engineering Electromagnetics

Subject Code: **151002**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
3	0	0	3	70	30	50

Sr. No	Course Content
1.	**Review of Vector Analysis and Vector Calculus:** Scalars & Vectors, Dot and cross products, Co-ordinate systems and conversions, Review of line, Surface and volume integrals – Definition of curl, divergence and gradient – Meaning of Divergence theorem and Stokes' theorem
2.	**Electrostatics:** 1. **Coulomb's law and electrical field intensity**: Coulomb's law, Field due to different charge distributions. 2. **Electric flux density, Gauss's law and divergence**: Concept of electric flux density, Gauss's law and its applications, Differential volume element, Divergence, Maxwell's first eqn. and divergence theorem for electric flux density. 3. **Energy and potential** : Energy expanded in moving a point charge in electrical field, Line integral, Definition of potential difference and potential, Potential field of a point charge and system of charges, Potential gradient, Dipole, Energy density in electrostatic field.
3.	**Static Magnetic Field:** 1. **Steady Magnetic Field:** Biot-Savart's law, Ampere's circuital law, applications of this law for an infinitely long coaxial transmission line, solenoid and toroid, point form of Ampere's circuital law ,concept of flux density, scalar and vector magnetic potential. Stoke's theorem for magnetic field. Point and integral forms of Maxwell's equations for steady electric and magnetic fields.
4.	**Electric and Magnetic Fields in Materials:** 1. **Conductors, dielectrics and capacitance** : Definition of currents and current density, Continuity equation, Metallic conductors and their properties, Semiconductors, Dielectric materials, Characteristics, Boundary conditions, Capacitance of a parallel plate capacitor, Coaxial cable and spherical capacitors.

	2. **Poisson's and Laplace equations:** Poisson's and Laplace equation, Uniqueness theorem, Examples of solution of Laplace and Poisson's equations. 3. **Magnetic forces, materials and inductance :** Force on a moving charge, Force on a differential current element, Force and torque on a close circuit, magnetization and permeability, Magnetic boundary conditions, Magnetic circuit, Self inductance and Mutual inductance.
5.	**Time Varying Fields and Maxwell's Equations:** Faraday's law, Displacement current, Maxwell's equations in point and integral forms for time varying fields .
6.	**Electromagnetic Waves:** 1. **The uniform plane waves:** Wave motion in free space, Perfect dielectric, Dielectric, Poynting vector, Power consideration, Propagation in good conductor, Phenomena of skin effect, Reflection of uniform plane waves, Plane waves at normal incidence, and at oblique incidence, Standing wave ratio.

Reference Books:

1. W H.Hayt & J A Buck : "Engineering Electromagnetics" TATA McGraw-Hill, 7thEdition 2007
2. Elements of Electromagnetics by Matthew Sadiku, 4th Edition,Oxford University Press.
3. Electromagnetics Joseph Edminister-Schaum's Outline Series, TMH
4. Electromagnetics with applications by J.D.Krauss and Daniel Fleisch fifth edition, Mcgraw Hill