Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Third Year Bachelor of Engineering (All Branches)

With effect from: Academic Year 2019-20

Subject Code: EE501-N	Subject Title: Engineering Electromagnetics
Pre-requisite	

Course Objective:

- To identify and solve the problems regarding mathematical operations related to the field distributed in the three dimensional space.
- To understand concepts of vectors for engineering electromagnetic.

Teaching scheme				Total Credit	Evaluation Scheme					Total Marks
L	T	P	Total		Theory		IE Marks	CIA Marks	Pract. Marks	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks				
03	00	00	03	03	03	70	30	20	00	120

Outline of the Course:

Sr. No	Title of the Unit	Minimum Hours
1	Vector Algebra	6
2	Electrostatic Fields In Free Space	8
3	Energy and Potential:	4
4	Conductors and Dielectrics	4
5	Steady Magnetic Field	8
6	Magnetic Forces and Materials	6
7	Time Varying Fields and Maxwell's Equations	6
8	Analytical and Numerical techniques	3

Total Hours (Theory): 45
Total Hours (Lab): 00
Total Hours: 45

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Detailed Syllabus

Sr. No	Topic	Lecture Hours	Weightage(%)
1	**Vector Algebra:-** Scalars and vectors- Vector algebra, The coordinate systems (Cartesian, cylindrical and spherical), Position and distance vectors, Differential length, area and volume, Dot product and cross product, Transformation of vectors, Line, surface and volume integrals, examples.	**6**	**15**
2	**Electrostatic Fields In Free Space:** Coulomb's law, Electric field intensity, Types of charge distribution, Electric field intensity due to various charge distribution, Electrical Field due to infinite line charge, Electrical Field due to charged circular ring, Electrical Field due to infinite sheet of a charge, Electric flux, Electric flux density, Relationship between Electric flux density and Electric field intensity, Electric flux density for various charge distribution, Gauss's law, Application of Gauss's law, Gauss's law applied to differential volume element, Divergence Theorem, Maxwell's first equation, examples.	**8**	**25**
3	**Energy and Potential:** Work done, Electric potential and potential difference, Potential due to point charge, line charge, surface charge, volume charge, Potential Gradient, relation between field intensity and electric potential, conservative field, An electric dipole and flux lines.	**4**	**10**
4	**Conductors and Dielectrics:** Convection and conduction current densities, Continuity Equation, Conductor properties, Relaxation Time, Dielectric materials, Boundary conditions, Polarization and dielectric constant-Boundary conditions between conductor and free space, Poisson's and Laplace's equations, Uniqueness theorem, examples.	**4**	**10**
5	**Steady Magnetic Field:** Magnetic field and its properties, Biot-Savart's law, Magnetic field intensity due to infinite long straight conductor, Ampere's circuital law, application of ampere's circuital law, Curl, Stokes' theorem, Magnetic flux and magnetic flux density, Magnetic field intensity due to various current configurations, Maxwell's equations for static EM fields.	**8**	**15**
6	**Magnetic Forces and Materials:** Force on a moving point charge, Lorentz force equation, Magnetic forces and torques, A magnetic dipole, magnetization and permeability, Classification of magnetic materials, Magnetic boundary conditions, Neuman's formula, Inductance and mutual inductance, Magnetic energy, magnetic circuits.	**6**	**10**

7	**Time Varying Fields and Maxwell's Equations:** Faraday's law, Displacement current and current density, Maxwell's equation in point form and integral form, Boundary condition for time varying field, Magnetic Brake, Magnetic Levitation, Magneto-hydrodynamic generator	**6**	**10**
8	**Analytical and Numerical techniques:** Advantages of numerical techniques Separation of variable method, Method of images, Finite difference method (FDM), Finite Element method (FEM), Application of numerical techniques.	**3**	**5**
	Total	**45**	**100**

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- One internal exam of 30 marks is conducted as a part of mid semester evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carries a weight age of five marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar /Tutorial may be conducted and having share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

Learning Outcome

On successful completion of the course

- The student can learn about various co-ordinate system and vectors.
- The student can learn about different type of magnetic material and its properties.
- The student can learn about various electrical quantities in vector form.

Text Book & Reference Books:

- William Hart Hayt and John A. Buck. Engineering Electromagnetics , McGraw-Hill.
- Engineering Electromagnetics Umran S. Inan, Pearson Education.
- Engineering Electromagnetics Robert Stratman Elliott Tata Mcgraw Hill.
- Elements of engineering electromagnetics, Nannapaneni Narayana Rao Prentice Hall-India.