SCHEME OF COURSE WORK

Course Details:

Course Title	**:Engineering Electromagnetics**		
Course Code	**:22EE1102**	**L T P C**	**:3 0 0 3**
Program:	**: B.Tech.**		
Semester	**:III**		
Prerequisites	**:Physics**		
Courses to which it is a prerequisite	**: - All courses in B.Tech Syllabus except Humanities**		

Course Outcomes (COs):

1	Explain the laws concerning static electric fields
2	Evaluate the boundary conditions in conductors and dielectrics
3	Examine the equations concerned with static magnetic fields
4	Evaluate the energy stored and energy density in electromagnetic fields
5	Summarize Maxwell's equations

Program Outcomes (POs):

A graduate of B.Techwill be able to

PO1	Apply the knowledge of basic sciences and electrical and electronics engineering fundamentals to solve the problems of power systems and drives.
PO 2	Analyze power systems that efficiently generate, transmit and distribute electrical power in the context of present Information and Communications Technology.
PO 3	Design and develop electrical machines and associated controls with due considerations to societal and environmental issues.
PO 4	Design and conduct experiments, analyze and interpret experimental data for performance analysis.
PO 5	Apply appropriate simulation tools for modeling and evaluation of electrical systems.
PO 6	Apply the electrical engineering knowledge to assess the health and safety issues and their consequences.
PO 7	Demonstrate electrical engineering principles for creating solutions for sustainable development.
PO 8	Develop a techno ethical personality that help to serve the people in general and Electrical and Electronics Engineering in particular.
PO 9	Develop leadership skills and work effectively in a team to achieve project objectives.
PO10	Communicate effectively in both verbal and written form.
PO11	Understand the principles of management and finance to manage project in multi-disciplinary environments.
PO12	Pursue life-long learning as a means of enhancing the knowledge and skills.

Course OutcomeVersusProgram Outcomes:

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO-1	3	2	3	-	-	-	-	-	-	-	-	-
CO-2	3	3	3	-	2	-	-	-	-	-	-	-
CO-3	3	2	2	-	2	-	-	-	-	-	2	-
CO-4	3	3	3	-	2	-	2	-	-	-	2	-
CO-5	3	3	2	-	-	-	2	-	-	-	1	2

3 - Strongly correlated, *2* - *Moderately* correlated, 1- Weakly Correlated *Blank* - *No correlation*

AssessmentMethods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

SCHEME OF COURSE WORK

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Electrostatic Fields - Coulomb's Law - Electric Field Intensity(EFI) due to Line, Surface and Volume charges- Work Done in Moving a Point Charge in Electrostatic Field	CO-1	1. State and explain Coulomb's law in vector form. 2. Determine Electric Field Intensity due to a finite line charge.	Lecture/Discussion	Assignment-1 Week 1-4
2	Electric Potentialdue to point charges, line charges and Volume Charges - Potential Gradient - Gauss's Law- Application of Gauss's Law- Maxwell's First Law – Numerical Problems.	CO-1	3.What is electrical potential. What are its properties.	Lecture/Discussion	Assignment-1 Week 1-4
3	Laplace's Equation and Poisson's Equations - Solution of Laplace's Equation in one Variable.	CO-1	4.State Laplace and Poison's equation.	Lecture/Discussion	Assignment-1 Week 1-4
4	Electric Dipole - Dipole Moment - Potential and EFI due to Electric Dipole - Torque on an Electric Dipole in an Electric Field – Numerical Problems.	CO-1	5. Determine potential and Electric Field Intensity due to an electric dipole	Lecture/Discussion	Assignment-1 Week 1-4
5	Behavior of Conductors in an Electric Field-Conductors and Insulators – Electric Field Inside a Dielectric Material – Polarization – Dielectric Conductors and Dielectric Boundary Conditions.	CO-2	6.Estimate Dielectric-conductor boundary condition	Lecture/Discussion	Assignment-1 Week 5-7
6	Capacitance- Capacitance of Parallel Plate, Spherical & Co-axial capacitors – Energy Stored and Energy Density in a Static Electric Field	CO-2	7. Calculate the capacitance of a coaxial cable.	Lecture/Discussion	Assignment-1 Week 5-7
7	Current Density – Conduction and Convection Current Densities – Ohm's Law in Point Form – Equation of Continuity – Numerical Problems.	CO-2	8.Deduce expressions for point form of ohm's law.	Lecture/Discussion	Assignment-1 Week 5-7
8	Static Magnetic Fields – Biot-Savart Law – Oersted's experiment –	CO-3	9.State and explain Biot-	Lecture/Disc	Quiz-1

SCHEME OF COURSE WORK

	Magnetic Field Intensity(MFI) due to a Straight, Circular &Solenoid Current Carrying Wire		savart's Law	ussion	
9	MID EXAMINATIONS				
10	Maxwell's Second Equation. Ampere's Circuital Law and its Applications Viz., MFI Due to an Infinite Sheet of Current and a Long Current Carrying Filament	CO-3	10. State Ampere's circuit law. Derive an expression for magnetic field at any point because of infinitely long current carrying conductor?	Lecture/Disc ussion	Assignment-2 Week 10-13
11	Point Form of Ampere's Circuital Law – Maxwell's Third Equation – Numerical Problems.	CO-3	11. Elaborate Maxwell's third equation	Lecture/ Discussion	Assignment-2 Week 10-13
12	Magnetic Force — Lorentz Force Equation – Force on Current Element in a Magnetic Field - Force on a Straight and Long Current Carrying Conductor in a Magnetic Field - Force Between two Straight and Parallel Current Carrying Conductors	CO-3	12. What is Lorentz force equation and explain how to determine the force on a current element in a magnetic field	Lecture/ Discussion	Assignment-2 Week 10-13
13	Magnetic Dipole and Dipole moment – A Differential Current Loop as a Magnetic Dipole – Torque on a Current Loop Placed in a Magnetic Field – Numerical Problems.	CO-3	13. What is Magnetic Dipole and define Dipole moment	Lecture/ Discussion	Assignment-2 Week 10-13
14	Scalar Magnetic Potential and Vector Magnetic Potential and its Properties - Vector Magnetic Potential due to Simple Configuration – Vector Poisson's Equations	CO-4	14.What is the difference between vector magnetic potential and scalar magnetic potential	Lecture/ Discussion	Assignment-2 Week 14-15
15	Self and Mutual Inductances – Neumann's Formulae – Determination of Self Inductance of a Solenoid and Toroid and Mutual Inductance Between a Straight, Long Wire and a Square Loop Wire in the Same Plane – Energy Stored and Intensity in a Magnetic Field – Numerical Problems.	CO-4	15.How is the self inductance of a solenoid determined, explain?	Lecture/ Discussion	Assignment-2 Week 14-15
16	Faraday's Law of Electromagnetic Induction – It's Integral and Point Forms – Maxwell's Fourth Equation. Statically and Dynamically Induced E.M.F's – Simple Problems –	CO-5	16. What are the applications of Faraday's Law	Lecture/ Discussion	Assignment-2 Week 15-17

SCHEME OF COURSE WORK

	Modified Maxwell's Equations for Time Varying Fields – Displacement Current.				
17	Wave Equations – Uniform Plane Wave Motion in Free Space– Poynting Theorem – Poynting Vector and its Significance.	CO-5	17. What is the significance of Poynting vector	Lecture/ Discussion	Assignment-2 Week 15-17
18	Revision	-	Problems: 18.The vector from the origin to point A is given as (6,-2,-4), and the unit vector directed from the origin toward point B is (2,-2,1)/3. If points A and B are ten units apart, find the coordinates of point B.		Quiz-2
19	MID EXAMINATIONS				