LECTURE SCHEDULE FOR ELECTROMAGNETIC FIELDS

NAME OF THE FACULTY:

DESIGNATION: **ASSISTANT PROFESSOR**

BRANCH: **EEE**

DEPARTMENT: **ELECTRICAL AND ELECTRONICS ENGINEERING**

YEAR/SEM: **II/I**

ACADEMIC YEAR: **2023-24**

REGULATION: **R-20**

SUBJECT CODE:

Course Outcomes:

CO1:*Compute electric fields and potentials using Gauss law or solve Laplace's or Poisson's equations for various electric charge distributions.*

CO2:*Calculate the capacitance and energy stored in dielectrics.*

CO3:*Calculate the magnetic field intensity due to current carrying conductor and understanding the application of Ampere's law, Maxwell's second and third law.*

CO4:*Estimate self and mutual inductances and the energy stored in the magnetic field.*

CO5:*Understand the concepts of displacement current and Poynting theorem and Poynting vector*

Unit No	Corse outcomes	Name of the Topic	Text books/ Reference books	No. of classes required	Mode of teaching
Electrostatics					
I	**CO1:**Compute electric fields and potentials using Gauss law or solve Laplace's or Poisson's equations for various electric charge distributions.	**INTRODUCTION**	T1/R4	1	**CHALK AND TALK**
		Electrostatic Fields – Coulomb's Law		1	
		Electric Field Intensity (EFI)		1	
		EFI due to a line and a surface charge		2	
		Work done in moving a point charge in an electrostatic field		2	
		Electric Potential – Properties of potential function		2	
		Potential gradient – Guass's law		1	
		Maxwell's first law, div (D)=ρv		1	
		Laplace's and Poison's equations		1	
		Solution of Laplace's equation in one variable		1	
TOTAL				**13**	
Conductors – Dielectrics and Capacitance					
II	**CO2:**Calculate the capacitance and energy stored in dielectrics.	**INTRODUCTION**	T1/R4	1	
		Electric dipole – Dipole moment		1	
		Potential and EFI due to an electric dipole		1	
		Torque on an Electric dipole in an electric field		1	

		Behaviour of conductors in an electric field		1	**CHALK AND TALK**
		Conductors and Insulators		1	
		Polarization		1	
		Boundary conditions between conduction to Dielectric and dielectric to dielectrics capacitance		1	
		Capacitance of parallel plates, spherical and coaxial cables with composite dielectrics		1	
		Energy stored and energy density in a static electric field		1	
		Current density,Conduction and Convection current densities		1	
		Ohm's law in point form – Equation of continuity		1	
TOTAL				**12**	
Magneto statics and Ampere's Law,Force in Magnetic fields					
III	**CO3:**Calculate the magnetic field intensity due to current carrying conductor and understanding the application of Ampere's law, Maxwell's second and third law.	**INTRODUCTION**	**T1/R4**	1	**CHALK AND TALK**
		Static magnetic fields		1	
		Biot-Savart's law,Oesterd's experiment		1	
		Magnetic field intensity (MFI) – MFI due to a straight current carrying filament		1	
		MFI due to circular, square and solenoid current		1	
		Carrying wire ,Relation between magnetic flux		1	
		magnetic flux density and MFI		1	
		Maxwell's second Equation, div(B)=0		1	
		Ampere's circuital law and its applications		1	
		MFI due to an infinite sheet of current and a long filament carrying conductor		1	
		Point form of Ampere's circuital law		1	
		Field due to a circular loop, rectangular and square loops		1	
		Maxwell's third equation, Curl (H)=J		1	
		Magnetic force		1	
		Moving charges in a Magnetic field		1	
		Lorentz force equation – force on a current element in a magnetic field		1	
		Force on a straight and a long current carrying conductor in a magnetic field		1	
		Force between two straight long and parallel current carrying conductors		1	
		Magnetic dipole and dipole moment		1	
		A differential current loop as a magnetic dipole		1	
		Torque on a current loop placed in a magnetic field		1	

TOTAL				**21**	
Self and Mutual inductance					
IV	**CO4:**Estimate self and mutual inductances and the energy stored in the magnetic field.	**INTRODUCTION**	**T1/R4**	1	**CHALK AND TALK**
		Self and Mutual inductance		2	
		Determination of self-inductance of a solenoid		1	
		Determination of self-inductance of a toroid		1	
		Mutual inductance between a straight long wire		1	
		Mutual inductance between a square loop wire in the same plane		1	
		Energy stored in a magnetic field		1	
		Density in a magnetic field		1	
		REVISION		1	
		TEST		1	
TOTAL				**11**	
Time Varying Fields					
V	**CO5:**Understand the concepts of displacement current and Poynting theorem and Poynting vector.	**INTRODUCTION**	**T1/R4**	1	**CHALK AND TALK**
		Time varying fields – Faraday's laws of electromagnetic induction – Its integral and point forms		2	
		Maxwell's fourth equation, Curl (E)=-∂B/∂t		1	
		Statically and Dynamically induced EMFs		2	
		Simple problems		2	
		Modification of Maxwell's equations for time varying fields		1	
		Displacement current		1	
		Poynting Theorem and Poynting vector.		1	
		REVISION		1	
		TEST		1	
TOTAL				**13**	
GRAND TOTAL				**70**	

Course-PO Attainment for Electro Magnetic Fields												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	3	2	2	3		3		3	3
CO2	3	3		3	2	2	2		3		3	3
CO3	3	3	3	3	2	3	3		3		3	2
CO4	3	3	3	3	2	3	2		2		2	3
CO5	3	3		2	2	2	3		3		3	2

K1: REMEMBERING **K2:** UNDERSTANDING **K3:** APPLYING **K4:** ANALYZING
K5: EVALUATING **K6:** CREATING.

S.NO	GRADUATE ATTRIBUTION	ACTION VERBS	LEVEL
1	ENGINEERING KNOWLEDGE	APPLY	K3
2	PROBLEM ANALYSIS	ANALYZING	K4
3	DESIGN DEVELOPMENT OF SOLUTIONS	UNDERSTANDING	K2
4	INVESTIGATION OF COMPLEX PROBLEMS	APPLY	K3
5	MODERN TOOL USAGE	UNDERSTANDING	K2
6	ENGINEER AND SOCIETY	UNDERSTANDING	K2
7	ENVIRONMENT AND SUSTAINABILITY	UNDERSTANDING	K2
8	ETHICS		
9	INDIVIDUALS AND TEAM WORK	APPLY	K3
10	COMMUNICATION		
11	PROJECT MANAGEMENT AND FINANCE	APPLY	K3
12	LIFE LONG LEARNING	APPLY	K3

Text Books:

1. "Engineering Electromagnetics" by William H. Hayt & John. A. Buck Mc. Graw-Hill,7th Editon.2006.

2. "Principles of Electro Magnetics" by Sadiku, Oxford Publications, 6th edition, 2015.

Reference Books:

1. Introduction to Electro Dynamics by D J Griffiths, Prentice-Hall of India Pvt. Ltd,2nd edition

2. Electromagnetic Field Theory by Yaduvir Singh, Pearson India, 1st edition, 2011.

3. Fundamentals of Engineering Electro magnetics by Sunil Bhooshan, Oxford University Press,2012

4. Electro magnetics by Joseph A. Edminister, Schaum's Outline,4th Edition,2014.

		Name	Signature with Date
i.	Faculty	Mr. VARAPRASAD K S B	
ii.	Course Coordinator		

HOD **PRINCIPAL**