Semester IV

Electromagnetic Fields & Waves

Course Code	20BS1402	**Year**	II	**Semester**	II
Course Category	Basic Sciences	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Engineering Physics, Differential Equations and Vector Calculus
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Understand the basic mathematical concepts related to electromagnetic fields, uniform plane waves and its boundaries. (L2)
CO2	Apply the Electrostatic and Magneto static Fields to various applications(L3)
CO3	Apply Maxwell's equations for static and time-varying fields to solve vector wave equations, power and polarization for waves propagation. (L3).
CO4	Analyze the uniform plane wave characteristics for wave incidence in different mediums(L4)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3-High, 2: Medium, 1:Low)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2									2		2		
CO2	3									2		2	3	
CO3	3				3					2		2	3	
CO4	2				2					2		2	2	

Syllabus		
Unit No.	**Contents**	**Mapped CO**
1	**Review of coordinate systems; Electrostatics:** Coulomb's Law, Electric Field Intensity, Field due to a line charge, Electric Flux Density, Guass's law, Electric Potential, Potential gradient, energy stored, Laplace's and Poison's equations.	CO1
2	**Magnetostatics:** Steady current, Biot-Savart's law, Static magnetic field due to line current, Magnetic flux Density, Ampere's circuital law, Lorentz force equation, Magnetic Vector Potential, energy stored.	CO1
3	**Time-varying Fields and Maxwell's Equations:** Time varying fields, Faraday's law of electromagnetic induction, Displacement	CO2, CO3

	current, Maxwell's equations in point form and integral form, boundary conditions of electromagnetic fields, Polarization, Magnetization.	
4	**Uniform Plane Wave:** Wave equation, Wave propagation in free space, wave propagation in conductor and dielectrics, Poynting Theorem, skin effect, wave polarization, Direction cosines.	CO4
5	**Plane Waves at Boundaries and in Dispersive Media:** Reflection of uniform plane waves by perfect conductor – normaland oblique incidence, standing wave ratio, Reflection and transmission of uniform plane waves by perfect dielectric – normal and oblique incidence.	CO4

Learning Resources
Text Books
1. Matthew N.O.Sadiku, Principles of Electromagnetics, Oxford University Press 2. William H. Hayt, Engineering Electromagnetics, Tata Mc-Graw Hill Publications
Reference Books
1. R Shevgaonkar, Electromagnetic Waves, Tata Mc-Graw Hill Publications 2. E. C. Jordan, EM Waves and Radiating Systems, PHI, 2nd Ed.,2007
e- Resources & other digital material
1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-013-electromagnetics-and-applications-spring-2009/ 2. https://nptel.ac.in/courses/117/103/117103065/