PVP-23

Electromagnetic Waves & Transmission Lines

Course Code	23EC3401	Year	II	Semester	II
Course Category	Program core	Branch	ECE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Pre requisites	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		BL
CO1	Understand the basic mathematical concepts related to electromagnetic fields, transmission lines, 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 parameters and characteristics of transmission lines	L4

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

COs	PO1	PO2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PSO 2
CO1	2									2		2		
CO2	3	3								2		2	3	
CO3	3	3			3					2		2	3	
CO4	2	3			2					2		2	2	
Avg.	3	3			3					2		2	3	

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. Continuity Equation and Relaxation Time.	CO1, CO2
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,CO2

3	**Time-varying Fields and Maxwell's Equations:** Time varying fields, Faraday's law of electromagnetic induction, Displacement current, Maxwell's equations in point form and integral form, boundary conditions of electromagnetic fields, Polarization.	CO1, CO3
4	**Uniform Plane Wave:** Wave equation, Wave propagation in free space, wave propagation in conductor and dielectrics, Poynting Theorem, skin effect, wave polarization.	CO1,CO3
5	**Transmission Lines :** Introduction, Types, Primary & Secondary Constants, Transmission Line Equation, Characteristic Impedance, Propagation Constant, Lossless line, Distortion less line, Input Impedance, Reflection Coefficient, VSWR.	CO1,CO4

Learning Resources
Text Books
1. Matthew N.O. Sadiku, Elements of Electromagnetics, Oxford University Press, 7th Ed., 2018. 2. Nathan Ida, Engineering Electromagnetics, Springer Publications, 4th Ed., 2021 3. G.S.N Raju, Electromagnetic Field Theory and Transmission Lines. Pearson Education, 2013
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 3. William H. Hayt, Engineering Electromagnetics, Tata Mc-Graw Hill Publications, 6th Ed.,
e- Resources & other digital material
1. https://ocw.mit.edu/courses/res-6-001-electromagnetic-fields-and-energy- spring-2008/ 2. https://nptel.ac.in/courses/117/103/117103065/