

## Electromagnetic Waves & Transmission Lines

<b>Course Code</b>	23 EC3401	<b>Year</b>	II	<b>Semester</b>	II
<b>Course Category</b>	BS	<b>Branch</b>	ECE	<b>Course Type</b>	Theory
<b>Credits</b>	3	<b>L-T-P</b>	3-0-0	<b>Pre requisites</b>	Engineering Physics, Differential Equations and Vector Calculus
<b>Continuous Internal Evaluation</b>	30	<b>Semester End Evaluation</b>	70	<b>Total Marks</b>	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		BL
<b>CO1</b>	Understand the basic mathematical concepts related to electromagnetic fields, transmission lines, uniform plane waves , and its boundaries.	L2
<b>CO2</b>	Apply the Electrostatic and Magneto static Fields to various applications	L3
<b>CO3</b>	Apply Maxwell's equations for static and time-varying fields to solve vector wave equations, power and polarization for waves propagation.	L3
<b>CO4</b>	Analyze the parameters and characteristics of transmission lines	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
<b>CO1</b>	2									2		2		
<b>CO2</b>	3									2		2	3	
<b>CO3</b>	3				3					2		2	3	
<b>CO4</b>	2				2					2		2	2	
<b>Avg.</b>	3				3					2		2	3	

Syllabus		
Unit No.	Contents	Mapped CO
1	<b>Transmission Lines:</b> Introduction, types, Primary & Secondary Constants, Transmission Line Equation, Characteristic Impedance, Propagation Constant, Lossless line, Distortion less line Input Impedance, Reflection Coefficient, VSWR.	CO1,CO2
2	<b>Review of coordinate systems; Electrostatics:</b> 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, CO3
3	<b>Magnetostatics:</b> 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,CO3

4	<b>Time-varying Fields and Maxwell's Equations:</b> Timevarying fields, Faraday's law of electromagnetic induction, Displacement current, Maxwell's equations in point form and integral form, boundary conditions of electromagnetic fields, Polarization, Magnetization.	CO1, CO4
5	<b>Uniform Plane Wave:</b> Wave equation, Wave propagation in free space, wave propagation in conductor and dielectrics, Poynting Theorem, skin effect, wave polarization.	CO1,CO4

### Learning Resources

#### Text Books

1. Matthew N.O. Sadiku, Elements of Electromagnetics, Oxford University Press, 7<sup>th</sup> Ed., 2018.
2. William H. Hayt, Engineering Electromagnetics, Tata Mc-Graw Hill Publications, 6<sup>th</sup> Ed.,
3. Nathan Ida, Engineering Electromagnetics, Springer Publications, 4<sup>th</sup> Ed., 2021

#### Reference Books

1. R Shevgaonkar, Electromagnetic Waves, Tata Mc-Graw Hill Publications
2. E. C. Jordan, EM Waves and Radiating Systems, PHI, 2<sup>nd</sup> Ed.,2007

#### 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/>