

TRANSMISSION LINES AND WAVEGUIDES

Course Code	20EC4501C	Year	III	Semester	I
Course Category	Program Elective	Branch	ECE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes	
CO1	Interpret various parameters of transmission lines, waveguides and resonators. (L2)
CO2	Solve various parameters like load reflection coefficient, Standing Wave Ratio, Line impedance and Cut-off frequency for transmission lines, waveguides and resonators (L3)
CO3	Apply smith chart for line parameters and impedance calculations. (L3)
CO4	Analyze the field components and characteristics of a transmission lines, waveguides and resonators. (L4)
CO5	Submit a report on transmission lines ,waveguides and resonators (L5)

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)														
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation														
* - Average value indicates course correlation strength with mapped PO														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2					1								
CO2	3					2							3	
CO3	3				3	2							3	
CO4		3				2							3	
CO5									3	3				
Average* (Rounded to nearest integer)	3	3			3	2			3	3			3	

Syllabus		
Unit No.	Contents	Mapped CO
I	Basics of Transmission Lines: Concept and definition, Different kinds of transmission lines, Applications, Equivalent circuit, Primary constants- R, L, C and G, Secondary constants – Propagation constant and Characteristic Impedance, General transmission line equations. Attenuation and phase constant. Wavelength, phase velocity and group velocity. The lossless transmission line, The infinite long transmission line, The distortion less transmission line and condition for distortionlessness and minimum attenuation.	CO1 , CO2,CO5
II	Finite Transmission Lines: The load reflection coefficient, Standing Wave Ratio, Line impedance, Generalized reflection coefficient, The lossless terminated transmission line, The lossless matched transmission line, The lossless shorted transmission line, The lossless open transmission line.	CO1 , CO2,CO5
III	UHF Lines: UHF lines as circuit elements: $\lambda/4$, $\lambda/2$, $\lambda/8$ lines, Smith Chart: Construction of smith chart, Smith chart as impedance chart, smith chart as admittance chart, Problems using smith chart. Impedance matching, Quarter wave transmission line, Single stub and introduction to double stub matching.	CO1,CO3, CO4,CO5
IV	Waveguides: Introduction, Rectangular Waveguides-Transverse Electric (TE) and Transverse Magnetic (TM) mode analysis – Field expressions, Characteristic equation, Cut-off frequency, Phase velocity, Group velocity, Attenuation and Phase constants, Wavelength and Impedance. Dominant and degenerate modes	CO1,CO2, CO4, CO5
V	Cavities: Rectangular Cavity Resonators-Dominant modes and Resonant Frequencies, Q factor, Types of coupling and Coupling coefficients. Planar transmission lines: Introduction, Strip Lines, Micro strip Lines-characteristic impedance, Losses and Quality factor. Parallel Strip Lines-distributed parameters, characteristic impedance and attenuation losses.	CO1, CO2,CO4 , CO5

Learning Resources
Text Books
1. Nathan Ida, Engineering Electromagnetics, Springer International, 2 nd Ed., 2008. 2. Samuel Y. Liao, Microwave Devices and Circuits –Pearson Education, 3 rd Ed., 2003.
Reference Books
1. E.C. Jordan and K.G. Balmain Electromagnetic Waves and Radiating Systems, PHI, 2 nd Ed., 2009 2. Annapurna Das, Sisir K Das, “Microwave Engineering”, 2 nd Ed., 2006, Tata McGraw Hill
e- Resources & other digital material
1. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/em/index.htm 2. http://nptel.iitm.ac.in/video.php?subjectId=117101056 3. http://www.cdeep.iitb.ac.in/nptel/Electrical%20&%20Comm%20Engg/Transmission%20Lines%20and%20EM%20Waves/TOC.htm 4. http://www.mike-willis.com/Tutorial/PF2.htm
