

3EC08: ANTENNA AND WAVE PROPAGATION
CREDITS - 3 (LTP: 3,0,0)

Course Objective:

Knowledge of Electromagnetics wave propagation in different medium is essential for the Communication Engineers. As antenna is vital part of any communication system and its knowledge is equally important as well.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE	CE	ESE	CE	100	
3	0	0	3	60	40	00		00

Course Content:

Unit No.	Topics	Teaching Hrs.
1.	Antenna basics : Physical concept of radiation, retarded potentials, Hertzian dipole, Definition and functions of an antenna, Antenna parameters: Radiation pattern, gain, directivity, antenna apertures, reciprocity; Radiation from dipoles of arbitrary length, Power density, radiation resistance, input impedance, beam width, bandwidth, beam efficiency and polarization, Friss transmission formula. Retarded potential, Radiation from a current element and monopole – Radiation of half-wave and center-fed dipole – Near and far fields, current distribution of dipole antennas.	07
2.	Wire antennas : Short electric dipole radiation of short dipole, Long wire antennas, V-antennas, Rhombic Antennas, small loop antenna, Helical antennas, location methods of Feeding antennas, folded dipole antennas.	08
3.	Antenna Arrays : Arrays: electric fields from two, three and N element arrays, linear arrays: Dolph-Tchebysheff distribution. Broad-side array and End-Fire array - Method of pattern multiplication, practical design consideration.	07
4.	Microwave antennas : Reflector Antennas: Yagi-Uda antenna, corner reflectors, Parabola, paraboloid reflector, reflectors, cassegrain feed of other reflector antennas, Slot antenna - Babinet's principle, Microstrip antennas, Lens antennas, Introduction to 5G antennas	10
5.	Antenna measurements : Measurement of far-field radiation pattern, gain, phase, directivity, efficiency and polarization. Anechoic Chamber	05

Unit No.	Topics	Teaching Hrs.
6.	Wave propagation : Factors involved in the propagation of radio waves - Ground wave, reflection of radio waves by the surface of the earth - Space wave propagation, considerations in space wave propagation, atmospheric effect in space wave propagation - Ionosphere and its effect on radio waves, Mechanism of ionosphere propagation - Ray paths – Skip distance - Critical frequency-Maximum usable frequency - Fading of signal - Types of fading- Diversity reception.	08
Total		45

List of References:

1. J.D. Krauss, “*Antennas for all applications*”, Fourth Edition, MH publication, 2010
2. C. A. Balanis, “*Antenna Theory: Analysis and design*”, Third Edition, Wiley India, 2005.
3. Jordan & Balmain, “*Electromagnetic wave & radiating systems*”, Second edition, Prentice-Hall, 2000.

Course Outcomes (COs):

By learning this course student will be able to ...

1. Identify the importance of EM waves in Antenna.
2. Understand and measure the basic antenna parameters.
3. Analyze the characteristic of dipole and loop antennas
4. Comprehend Microwave antennas and their design.
5. Analyze matching and feeding networks for antennas.
6. Compare various modes of radio wave propagation and understand the significant role of atmosphere.