

ANTENNAS AND PROPAGATION

Course Code	20EC3602	Year	III	Semester	II
Course Category	Program Core	Branch	ECE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Electro Magnetic Fields & Waves
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	Interpret the fundamental parameters of antennas and wave propagation in the construction of a wireless communication link. L2
CO2	Analyse various wire antennas, antenna arrays and establish their mathematical relations. L4
CO3	Develop antennas for different frequency ranges and analyse their radiation properties L3
CO4	Analyse the wave propagation through different layers of atmosphere L4

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	1		1	1	1
CO2		3							2	2		2	2	2
CO3	2								2	2		2	2	2
CO4		1							1	2		1	1	1
Average* (Rounded to nearest integer)	2	2							2	2		2	2	2

Syllabus		
Unit No.	Contents	Mapped CO
I	Antenna Fundamentals: Introduction, Types of Antennas, radiation mechanism – single wire, two- wire, dipoles, current distribution on a thin wire antenna, antenna parameters - radiation pattern, radiation power density, radiation intensity, beam width, directivity, antenna efficiency, gain, realized gain, beam efficiency, bandwidth, Polarization, input impedance antenna radiation efficiency, antenna vector effective length, equivalent areas and Friis transmission equation.	CO1, CO2
II	Linear Wire Antennas: Retarded potentials, radiation from small electric dipole, quarter wave monopole and half wave dipole – current distribution, evaluation of field components, power radiated, radiation	CO2, CO3

	resistance, antenna theorems. Loop antennas: field components, comparison of far fields of small loop and short dipole. Helical antenna- monofilar, axial mode and normal mode operations,	
III	Antenna Arrays: Introduction, 2-element arrays – different cases, principle of pattern multiplication, N-element uniform linear arrays – broadside, end fire arrays, EFA with increased directivity, concept of scanning arrays, directivity relations, Binomial arrays.	CO2, CO3
IV	Broadband & Microwave Antennas: Broadband Antennas: Introduction, folded dipole, Yagi-Uda antenna, reflector antennas- plane reflector, corner reflector, parabolic reflector, feed methods for parabolic reflectors, F/D ratio, aperture blocking. Microstrip Antennas –Introduction, Features, Advantages and Limitations, Rectangular Microstrip Antenna – Geometry, Feeding Methods, Characteristics of Microstrip Antennas. Circular Microstrip Antenna – Geometry & Design Parameters	CO2, CO3
V	Wave Propagation: Ground wave propagation–characteristics, parameters, wave tilt, flat and spherical earth considerations. Sky wave propagation – structural details of ionosphere, refraction and reflection, ray path, critical frequency, MUF, LUF, OF, skip distance, virtual height, Ionospheric abnormalities, Space wave propagation – mechanism, LOS and radio horizon. Tropospheric wave propagation – radius of curvature of path, effective earth’s radius.	CO1, CO4

Learning Resources	
Text Books	
1. Constantine A. Balanis - Antenna Theory and Applications – John Wiley & Sons, 4 th Ed., 2021	
2. John D Kraus, Ronald J Marhefka & Ahmad S Khan - Antennas and Wave Propagation – TMH, 4 th Ed., 2010.	
Reference Books	
1. E.C. Jordan and K.G. Balmain - Electromagnetic Waves and Radiating Systems – PHI, 2 nd Ed., 2009.	
2. K.D. Prasad, Satya Prakashan - Antennas and Wave Propagation – Tech India Publications, New Delhi, 2001	
3. E.V.D. Glazier and H.R.L. Lamont - Transmission and propagation-, vol.5 Standard Publishers Distributors- New Delhi	
e- Resources & other digital material	
1. http://www.antenna-theory.com/	
2. http://www.antenna-theory.com/basics/main.html	
3. https://nptel.ac.in/courses/108/105/108105114/#	
