SWARNANDHRA COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous)
Narsapur, West Godavari District, A.P. 534280
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Code	Course Title	Sem	Branch	Contact Hrs/Week	Academic Year	Date of Commencement of Semester
23EC5T03	Antennas and Wave Propagation	V	ECE	5	2026-27	22-06-2026

TEACHING PLAN

COURSE OUTCOMES:

After completion of the Course (Antennas and Wave Propagation) students are able to

CO1: Distinguish between various antenna parameters. ***(K4)***

CO2: Compute the radiated fields of different types of antennas. ***(K3)***

CO3: Classify different types of antenna arrays and analyze the characteristics of broadband and microwave antennas. ***(K4)***

CO4: Demonstrate the characteristics of radio wave propagation through antenna measurements. ***(K3)***

Unit. No	Out Comes & Blooms Level		Topics/Activity	Text / Ref Book	Contact Hours	Delivery Method
1	**CO 1:** Distinguish between various antenna parameters. ***(K4)***		**1. ANTENNA FUNDAMENTALS**			Chalk & Talk, PPT and Tutorial, LMS.
		1.1	Introduction,	T1,T2	1	
		1.2	Radiation Mechanism-single wire, two wire dipoles	T1, R1	1	
		1.3	Current Distribution on a thin wire antenna,	T1, R2	1	
		1.4	Antenna Parameters-Radiation Patterns,	T1, R1	1	
		1.5	Patterns in Principle planes Main Lobe and Side Lobes	T1, R1	1	
		1.6	Beam Widths, Beam Area, Radiation Intensity	T1, T2	1	
		1.7	Beam Efficiency, Directivity,	T1, R1	1	
		1.8	Gain and Resolution	T1, R2	1	
		1.9	Antenna Apertures, Aperture Efficiency	T2, R1	1	
		1.10	Effective Height	T1, T2	1	
		1.11	Antenna Efficiency, Band width, Input impedance	T2, R1	1	
		1.12	Related Problems	T1, T2	1	
			Total		**12**	
			II. THIN LINEAR WIRE ANTENNAS			
		2.1	Retarded Potentials	T1, R1	1	
		2.2	Radiation from Small Electric Dipole	T2, R1	1	

2	**CO2**: Compute the radiated fields of different types of antennas. ***(K3)***	2.3	Half Wave Dipole	T1, R2	1	Chalk & Talk, PPT and Tutorial, LMS.
		2.4	Quarter wave Monopole		1	
		2.5	Evaluation of field components: Power Radiated,	T1, R1	1	
		2.6	Evaluation of field components: Power Radiated,	T1, R1	1	
		2.7	Radiation Resistance	T1, R1	1	
		2.8	Beam Widths, Directivity,	T1, R1	1	
		2.9	Radiation Efficiency		1	
		2.10	Effective Area, Effective Height	T1, R1	1	
		2.11	Natural current distributions, fields and patterns of thin linear center fed antennas of different lengths	T2, R1	1	
		2.12	Reciprocity theorem	T1, R1	1	
		2.13	Loop Antennas: small loops field components	T1, R1	1	
		2.14	Comparison of far fields of small loop and short dipole	T1, R1	1	
		2.15	Concept of short magnetic dipole, D and R_r relations for small loops	T2, R1	1	
		2.16	Related Problems	T1, T2	1	
			Total		**16**	
3	**CO3**: Classify different types of antenna arrays and analyze the characteristics of broadband and microwave antennas. ***(K4)***		**III. ANTENNA ARRAYS**			
		3.1	2 element arrays –different cases,	T1, R1	1	Chalk & Talk, PPT and Tutorial, LMS.
		3.2	Principle of Pattern Multiplication	T1, R1	1	
		3.3	N-element Uniform Linear Arrays-	T2, R1	1	
		3.4	Broadside Array	T1, R2	1	
		3.5	End fire Array	T1, R1	1	
		3.6	EFA With Increased Directivity	T2, R1	1	
		3.7	Derivation of their characteristics and comparison	T1, R1	1	
		3.8	Concept of Scanning Arrays, Binomial Arrays, Directivity relations (no derivations)	T1, R1	1	
		3.9	Yagi-Uda Arrays	T2, R1	1	

		3.10	Folded dipole and their characteristics	T1, R1	1	
		3.11	Related problems	T1, T2, R2	1	
			Total		**11**	
		IV. BROADBAND ANTENNAS, UHF AND MICROWAVE ANTENNAS				
4	**CO4:** Demonstrate the characteristics of radio wave propagation through antenna measurements ***(K3).***	4.1	Log periodic antenna	T2, R1	1	Chalk & Talk, PPT and Tutorial, LMS
		4.2	Helical Antennas – Geometry, in Axial Mode and Normal Modes	T2, R1	1	
		4.3	Horn Antennas – Types, Optimum Horns,	T2, R1	1	
		4.4	Design Characteristics of Pyramidal Horns	T2, R2	1	
		4.5	Paraboloidal Reflectors: – Geometry, characteristics	T2, R1	1	
		4.6	types of feeds: Off-set Feeds, Case grain Feeds	T2, R2	1	
		4.7	F/D Ratio, Spill Over, Back Lobes, Aperture Blocking	T2, R1	1	
		4.8	Microstrip Antennas- Introduction, Features, Advantages and Limitations,	T2, R1	1	
		4.9	Impact of different parameters on characteristics	T2, R2	1	
		4.10	Related problems	T2, R1	1	
	Content beyond Syllabus	4.11	Lens antenna with Zoning applications	T1, R1, R2	1	
			Total		**11**	
5	**CO4:** Demonstrate the characteristics of radio wave propagation through antenna measurements ***(K3)***		**V: ANTENNA MEASUREMENTS, WAVE PROPAGATION**			
		5.1	FRIIS Transmission Equation	T1, R1	1	Chalk & Talk, PPT and Tutorial, LMS
		5.2	Patterns Required, Set Up,	T2, R1	1	
		5.3	Distance Criterion, Directivity	T2, R1	1	
		5.4	Gain Measurements (Comparison, Absolute and 3-Antenna Methods).	T1, R1	1	
		5.5	Types of propagations. Sky Wave Propagation - Formation of Ionosphere layers and their Characteristics	T1, R1	1	
		5.6	Mechanism of Reflection and Refraction, Critical Frequency	T2, R1	1	
		5.7	MUF & SKIP Distance-calculations,	T2, R1	1	

		5.8	Space Wave Propagation-Mechanism, LOS and Radio Horizon	T1, R1	1	
		5.9	Field strength equation	T2, R1	1	
		5.10	Related problems	T2, R1	1	
			Total		**10**	
		TOTAL NO. OF CLASSES PROPOSED PER PERIODs			**60**	

Text Books:	
S.No.	**AUTHORS/BOOK TITLE/EDITION (latest)/PUBLISHER/YEAR OF PUBLICATION**
T1	Constantine A. Balanis "Antenna Theory and Applications", Wiley 3rd edition, A.John Wiley & Sons. Inc., Publication 2021.
T2	John D.Kraus and Ronald J.Marhefka Ahmad S Khan, "Antennas for All Applications", 3rd edition, McGraw Hill Education private limited, 2018.
Reference Books:	
S.No.	**AUTHORS/BOOK TITLE/EDITION (latest)/PUBLISHER/YEAR OF PUBLICATION**
R1	G.S.N.Raju, "Antennas and wave propagation ", 5th edition, Pearson Education, South Asia 2012.
R2	K.D.Prasad, Satya Prakashan, "Antennas and wave propagation", 2019-20 edition, Satya Prakashan Publications, New Delhi,2019
Web Details	
1	Antennas https://onlinecourses.nptel.ac.in/noc20ee20/preview
2	Antenna Arrays www.nrao.edu (https://public.nrao.edu/telescopes/vla/)
3	Analysis and design Principles of Microwave Antennas NPTEL IIT Kharagpur https://nptel.ac.in/courses/108/105/108105114/

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