ANDHRA LOYOLA INSTITUTE OF ENGINEERING AND TECHNOLOGY

DEPARTEMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

WIRED & WIRELESS TRANSMISSION DEVICES (WWTD)

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Semester/Year: II/III **A.Y:** 2021-22

Course Outcomes:

1	Factual	**CO1:** Describes about the operation of waveguides and its parameters. Explains the operation of Microstrip Lines. **CO2**: Describe how antenna converts the electrical energy to electromagnetic wave and vice versa and able to define basic antenna parameters
2	Conceptual	**CO5:** Apply the concepts of resonant and non resonant antennas for practical applications in terms of their operating frequencies like VHF and UHF. **CO 6**: Describe the concepts various types of propagation and terrestrial effects on radio wave and influence of ionosphere on propagation.
3	Procedural	**CO4:** Demonstrate the types of arrays and capable to characterize simple arrays based on their applications.
4	Applied	**CO3:** Define the concept of retarded potential, near field and far field and able to calculate the radiation of wired antennas.

Textbook:

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition,2000.
2. Antennas and wave propagation- Sisir K Das, Annapurna Das, TMH,2013.

REFERENCES:

1. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition,1988.
2. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5, Standard Publishers Distributors,Delhi,2009.
3. Antennas and wave propagation by Prof G S N Raju, Pearsion Publications, First impression,2016

Contents/Activities:

1	Factual	1.NPTEL Videos 2. Discussions on Wave Guides and their parameters during microwave propagation. 2.Discussions on types of antennas
2	Conceptual	1.Laborartry Exercises 2.NPTEL Videos 3. Discussions on radiation in antennas
3	Procedural	1. NPTEL Videos 2. analysis with some parameters with different parameters 3.observe the wave propagation between transmitter and receiver
4	Applied	1. NPTEL Videos 2. Analysis of some wire antennas

Session /week	Objectives	Topic	Before Class - Videos, e-Books, Case studies	In-Class – Activities, Quiz	Post Class - Assignment, Discussion Forum

1	To understand the concept of Microwaves	Introduction, Microwave Spectrum and Bands.	https://www.youtube.com/watch?v=_SNwJknISXA https://www.youtube.com/watch?v=1nYJS9Ld6lk	1.Defining the objective of course**(10 min)** 2. Explaining the introduction to microwaves**(15 min)** 3. Explanation of Microwave Spectrum and Bands **(20 min)**	Explain the Microwave Spectrum and Bands in detail?
2	To analyze the behaviour of Rectangular waveguides for TE/TM modes.	Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields,	https://www.youtube.com/watch?v=78YmiNQuBuQ https://www.youtube.com/watch?v=fKH1ICAWLKI	1. Analysis of Rectangular waveguide for TE mode propagation **(2Hrs)** 2. Analysis of Rectangular waveguide for TM mode propagation **(2Hrs)**	1.What is meant by TE mode and TM mode? 2. Obtain the expressions for Electric and Magnetic fields for Microwave travelling in rectangular waveguide.
3	To understand the various parameters of Waveguides w.r.t TE/TM modes	Cut-off Frequencies, Phase and Group Velocities, Wavelengths, Impedance Relations, Power Transmission and Power Losses	https://www.youtube.com/watch?v=vBz_3yhKK5M https://www.youtube.com/watch?v=w7-_y4H6FzU	1. Discussion on waveguide parameters **(2Hrs)** 2. Power calculation and determination of losses **(1Hr)**	Definitions and expressions of Cut-off Frequencies, Phase and Group Velocities.
4	To understand the various Excitation techniques for feeding the waveguides	Excitation techniques-waveguides	https://www.youtube.com/watch?v=YjTiyAnxBuI	Excitation techniques-waveguides **(1Hr)**	Define various Excitation techniques used for waveguides

5	To study the operation of Microstrip Lines	Microstrip Lines – operation, relations and losses.	https://www.youtube.com/watch?v=pf4A6alSxd0	Microstrip Lines – operation, relations and losses **(2Hrs)**	Comparison between Strip lines and Microstrip lines.
6	Aims to understand antenna functionality	Introduction to antennas, Radiation mechanism-single wire, 2 wire	https://nptel.ac.in/courses/108/101/108101092/	2.Explanation of antenna introduction **(20 min)** 3.functionality of antenna**(15 min)** 4.Conclusion of session**(5 min**	Explain radiation mechanism of a single wire and two wire configurations?
7	To understand radiation in antenna	Radiation mechanism in dipole	https://nptel.ac.in/courses/108/101/108101092/	1.Defining the objective of course**(10 min)** 2.radiation of antenna**(35 min)** 3.Conclusion of session**(5 min**	Explain radiation mechanism of a dipole?
8	To understand plotting of distribution in antenna	Current distribution on a thin wire antenna	https://nptel.ac.in/courses/108/101/108101092/	Explanation of dipole at different lengths**(50 min)**	Explain current distribution on lossless two wire transmission line, flared transmission line and linear dipole
9	About to understand about performance of antenna	Antenna parameters – Radiation pattern, Pattern lobes	https://nptel.ac.in/courses/117/107/117107035/	Describing the parameters of antenna**(50min)**	Define and explain the following terms: (i) Directivity (ii) Power Gain (iii)

					Radiation Intensity (iv) HPBW & FNBW
10	To understand how we calculate the antenna potentials	Thin linear wire antennas-introduction	https://nptel.ac.in/courses/117/107/117107035/	Analysis of antenna types**(2hrs)**	Derive an expression for magnetic field component of an alternating current element.
11	Describe the parameters of Small loop ,monopole ,dipole antennas	Retarded potentials-heuristic approach Radiation from a short dipole Radiation mechanism of monopole	https://nptel.ac.in/courses/117/107/117107035/	Calculation of parameters of dipole(**1.30mins**) Small loop**(1hr**) Monopole **(1hr)**	Prove that radiation resistance of an half-wave dipole is 73 ohms
12	To understand how we apply theorems to antennas	Antenna theorems	https://nptel.ac.in/courses/117/107/117107035/	Applicability and Proofs of theorems **(2hrs)**	Define Reciprocity Theorem and prove it for equivalence of directional patterns
13	About to understand how group of elements of consider as single antenna	Types of Antenna arrays	https://nptel.ac.in/courses/117/107/117107035/	2 ,N-element array BSA,EFA**(5HRS)**	Explain the effects of uniform and non-uniform amplitude distributions in array.
14	About to understand types of arrays	Binomial Array, Non uniform Array:Tchebysheff Array	https://nptel.ac.in/courses/117/107/117107035/#	Phased, binomial arrays **(2hrs**)	Explain binomial array

15	About to understand types of arrays with parasitic elements	Arrays with parasitic elements, yagi-uda arrays	https://nptel.ac.in/content/storage2/courses/108101092/Week-11-Yagi-Uda-and-Log-Periodic-Antennas.pdf	Parasitic element arrays**(3hrs)**	What is Yagi-Uda antenna? Explain its construction and properties with special reference to the directivity, bandwidth and impedance.
16	About to understand types of non resonant radiators	Travelling wave antennas – introduction, Long wire antenna, Long wire antenna, V-Antenna, Rhombic antenna	https://www.youtube.com/watch?v=FhirfLrqTGE	Types of antennas **(3hrs)**	Write the characteristics of travelling wave antennas. Discuss the geometry and radiation characteristics of long wire antenna.
17	To understand about patch antenna design ,simulation synthesis	Micro strip antennas – introduction, Rectangular patch antenna, Feed techniques	https://www.youtube.com/watch?v=4RbVqpSWk4c	Design equations and types **(3hrs)**	What are Micro-strip antennas and explain its characteristics
18	To study the operation of various Travelling antenna	Broadband Antenna: Helical antennas – introduction, geometry	https://en.wikipedia.org/wiki/Helical_antenna	Helical antenna and modes of helical antenna **(3hrs)**	Explain the construction and operation of helical antenna in axial mode.

19	To study and understand the different HF,VHF,UHF Antennas	Reflector antennas- flat and corner reflectors, Paraboloid reflectors	http://www.infocobuild.com/education/audio-video-courses/electronics/Antennas-IIT-Bombay/lecture-58.html	Reflector antennas and their types**(3hrs)**	Give the comparison between horn antenna and paraboloidal reflector antenna
20	Estimate the performance of reflectors	Types of feeds, F/D ratio, Spillover, Aperture blocking	http://www.infocobuild.com/education/audio-video-courses/electronics/Antennas-IIT-Bombay/lecture-56.html	Calculating the performance of reflectors**(50min)**	https://nptel.ac.in/content/storage2/courses/downloads/108101092/noc19_ee19_Assignment13.pdf
21	UHF antennas	Horn antennas – types, optimum horn , Pyramidal horn, lens antennas,– geometry, Dielectric lens and zoning, Applications	https://nptel.ac.in/content/storage2/courses/108101092/Week-10-Horn-Antennas-Part-1.pdf https://en.wikipedia.org/wiki/Lens_antenna	Horn antenna and types (2**hrs**), Lens antennas**(1hr)**	Explain the important design parameters of optimum horn antennas
22	To understand the various Antenna measurement techniques	Antenna measurements – patterns, distance criterion Directivity measurement, Gain – comparision method (Absolute and 3-antennas method)	https://www.keysight.com/upload/cmc_upload/All/ORFR-Theory.pdf	Different antenna Measurements **(2hrs)**	Explain the procedure for measuring the gain of antenna.
23	Understand about the radiowave propagation	Concepts of Propagation – Ground Wave Propagation,	https://www.youtube.com/watch?v=gdgvt5gGb_c	Basic wave propagation (**2hrs)**	)Briefly explain about ground wave propagation with neat sketch

24	abnormalities	Wave Tilt, Flat and Spherical Earth Considerations	https://buzztech.in/ground-wave-propagation-angle-of-tilt/#:~:text=Wave%20tilt%20is%20defined%20as,and%20are%20not%20in%20phase.	Wave tilt in ground wave propagation(**1hr)**	Explain the term wave tilt of surface waves.
25	Types of wave propagation	Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics	http://spot.pcc.edu/~wlara/eet223/slides/Chapter13.pdf https://www.researchgate.net/publication/331902651_HF_Sky_wave_hop-propagation_on_earth's_surfaces_in_different_conditions	Ionospheric Propagation and layers (**3hrs)**	Write short notes on i) Critical frequency ii) Skip distance iii) Skip zone Draw the atmospheric layers and discuss about each layer in the ionosphere region.
26	Types of wave propagation	Space Wave Propagation – Mechanism, LOS and Radio Horizon	http://spot.pcc.edu/~wlara/eet223/slides/Chapter13.pdf	Space wave propagation with refractive index, radio horizon, los distance(**4hrs)**	Derive the field strength in space wave propagation.
27	Refractive index calculation ,	M-curves and Duct Propagation, Tropospheric Scattering	https://www.youtube.com/watch?v=ngbEgc_TfGE	M-curves and Duct Propagation(**3HRS)**	Explain the Duct propagation and its characteristics with M-curves.

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