

RGPV (DIPLOMA WING)BHOPAL		OBE CURRICULUM FOR THE COURSE		FORMAT-3	Sheet No. 1/5
Branch	Electronics & Tele-communication			Semester	V
Course Code		Course Name	Antenna and wave propagation		
Course Outcome1	Compare various modes of wave propagation.			Teach Hrs	Marks
Learning Outcome 1	Define various parameters and laws related to EM Wave. (Cognitive)			8	10
Contents	<ul style="list-style-type: none"> - Introduction of EM waves and their properties. - Transverse and longitudinal wave. - Time period, frequency, wavelength of a sinusoidal wave. - frequency-wavelength relation - Ranges of Electromagnetic waves for Communication - Review of Snell's Law, Reflection, refraction, interference, diffraction, Scattering and Polarization of EM waves. - Ground wave propagation: angle of tilt. - Space wave propagation: radio horizon - Free space path loss calculation for received power. 				
Method of Assessment	External Theory				
Learning Outcome 2	Illustrate sky wave propagation. (Cognitive)			7	10
Contents	Sky wave propagation: Ionosphere layers (day and night effect) Reflection & refraction of radio waves in ionosphere. Critical frequency and Maximum usable frequency Optimum working frequency. Skip distance Single hop and multi hop transmission. Tropospheric scattering and Duct propagation				
Method of Assessment	External Theory				

RGPV (DIPLOMA WING)BHOPAL		OBECURRICULUMFOR THE COURSE		FORMAT-3	Sheet No. 2/5
Branch	Electronics & Tele-communication			Semester	V
Course Code		Course Name	Antenna and wave propagation		
Course Outcome 2	Explain the working of transmission line.			Teach Hrs	Marks
Learning Outcome 3	Define the fundamental of parallel wire transmission lines. (Cognitive)			7	10
Contents	Transmission lines:- Introduction, its types and Need. Parallel wire transmission line equivalent circuit. Current/voltage distribution in parallel wire transmission line. Primary and secondary constants of parallel wire transmission line. Condition for Loss less and Distortion less transmission line,				
Method of Assessment	Internal theory				
Learning Outcome4	Describe various parameters of transmission line. (Cognitive)			8	10
Contents	Transmission line Parameters :- Characteristics impedance Incident wave, reflected wave and standing wave. Reflection co-efficient. Standing wave ratio (SWR), VSWR. Impedance matching its type ($\lambda/4$, Single stub matching) and its need.				
Method of Assessment	External theory				
Learning Outcome 5	Verify various parameters of transmission line. (Psychomotor)			7	15
Contents	Measurement of Characteristic impedance, Reflection co-efficient, VSWR of transmission line for Open circuit, short circuit and Z_L load (at $\lambda/2$, $\lambda/4$ $\lambda/8$) and its verification using Smith chart and/or simulation software.				
Method of Assessment	External Practical				

RGPV (DIPLOMA WING)BHOPAL		OBECURRICULUMFOR THE COURSE		FORMAT-3	Sheet No. 3/5
Branch	Electronics & Tele-communication			Semester	V
Course Code		Course Name	Antenna and wave propagation		
Course Outcome 3	Explain wave propagation through metallic waveguide.			Teach Hrs	Marks
Learning Outcome 6	Describe various propagation parameters and modes in rectangular waveguide. (Cognitive)			8	10
Contents	<p>Waveguides: - Introduction and its Comparison with transmission lines. Transverse Magnetic Waves, Transverse Electric Waves, Cutoff wavelength and frequency in Rectangular waveguide Modes in Rectangular waveguide, Concept of Dominant Mode. Propagation parameters in waveguide: - Phase velocity, Group velocity, Guide wavelength (Simple numerical)</p>				
Method of Assessment	External Theory				
Learning Outcome 7	Calculate various parameters of TE and TM modes. (Psychomotor)			7	10
Contents	Measurement of cutoff wavelength, cutoff frequency and Phase velocity, Group velocity, Guide wavelength for a given wave and verification using trainer kit.				
Method of Assessment	Internal Practical				

RGPV (DIPLOMA WING)BHOPAL		OBECURRICULUMFOR THE COURSE		FORMAT-3	Sheet No. 4/5
Branch	Electronics & Tele-communication			Semester	V
Course Code		Course Name	Antenna and wave propagation		
Course Outcome 4	Categorize various kind of antenna.			Teach Hrs	Marks
Learning Outcome 8	Define various parameters of antenna. (Cognitive)			8	10
Contents	Antenna and its working principle. Basic Antenna parameter <ul style="list-style-type: none"> - Reciprocity theorem for antenna. - Radiation resistance - Isotropic radiator - Gain & Directivity (with Concept of dB, dBm, dBi) - Radiation pattern of an antenna (Field and power pattern using polar plot). - Beamwidth of an antenna. - Bandwidth of an antenna - Concept of Effective height and effective aperture. - Friis transmission equation. 				
Method of Assessment	External Theory				
Learning Outcome9	Explain the structure of basic antenna and antenna array. (Cognitive)			8	10
Contents	Introduction of basic antenna. Hertzian antenna, Dipole antenna, half wave antenna and folded dipole, antenna and marconi antenna. Introduction of Antenna arrays and its need. Point Sources - Definition, Pattern, arrays of two Isotropic Sources Types of antenna array (Broad side array, end fire array, collinear array)				
Method of Assessment	External Theory				

Learning Outcome 10	Verify the field pattern of basic antenna and calculate HPBW using it. (Psychomotor)	7	10
Contents	Distribution of voltage & current for half wave dipole, full wave dipole antenna and marconi antenna. Radiation pattern of omi-directional antenna, dipole antenna (half, full, folded) and marconi antenna. Calculate half power beam width for dipole antenna using radiation pattern (half, full, folded)		
Method of Assessment	Internal Practical		
Learning Outcome 11	Describe the working of given antenna. (Cognitive)	8	10
Contents	Physical structure, working, radiation pattern and applications of the following Antennas:- Yagi-Uda Antenna with concept of parasitic array. Parabolic reflector antenna Horn antenna Loop & helical antenna Log periodic antenna Turnstile antenna Sector Antenna		
Method of Assessment	External Theory		
Learning Outcome12	Verify the radiation pattern of different antennas.	7	15
Contents	Study of radiation pattern of different antenna. Marconi antenna Yagi-Uda Antenna Parabolic reflector antenna Horn antenna Loop & helical antenna Log periodic antenna Turnstile antenna		
Method of Assessment	External Practical		

RGPV (DIPLOMA WING)BHOPAL		OBECURRICULUMFOR THE COURSE		FORMAT-3	Sheet No. 5/5
Branch	Electronics & Tele-communication		Semester	5	
Course Code		Course Name	Antenna and wave propagation		
Course Outcome 5	Select advance antenna as per application requirement.		Teach Hrs	Marks	
Learning Outcome 13	Describe the working of micro-strip antenna. (Cognitive)		8	10	
Contents	<p>Rectangular Micro-strip Antennas – Introduction, Features, Advantages and Limitations.</p> <p>Rectangular Patch Antennas – Geometry and Parameters,</p> <p>Types of Feeding (Coaxial feed and micro-strip feed) Characteristics of rectangular micro-strip Antennas.</p> <p>Impact of dielectric constant and thickness of substrate on characteristics of rectangular micro-strip antenna.</p>				
Method of Assessment	Internal Theory				
Learning Outcome 14	Illustrate the structure of smart antenna. (Cognitive)		7	10	
Contents	<p>Smart Antenna:- Introduction, Structure of smart antenna and its working. Benefits of Smart Antennas, Structures for Beam forming Systems, Comparison of switch beam system in smart antenna. Strategies for the coverage and Capacity Improvement, Smart Antenna Algorithms. Types of smart antenna Switched - beam array Fully adaptive array Introduction to mimo technology</p>				
Method of Assessment	Internal Theory				

Suggested List of Experiments*:

S.N.	Experiment	CO
1.	Measurement of Various line parameters of transmission line using trainer kit.	CO502.2
2.	Verification of line parameters using smith chart.	CO502.2
3.	Measurement of guided power in Transmission lines.	CO502.2
4.	Study of VSWR meter.	CO502.2
5.	Study of Smith chart.	CO502.2
6.	Measurement of standing wave ratio (VSWR) and Reflection coefficient.	CO502.3
7.	Measurement of Cutoff frequency of waveguide.	CO502.3
8.	Measurement of cutoff wavelength, Phase velocity, Group velocity of waveguide.	CO502.3
9.	Measurement of cutoff wavelength (TE 10 mode)	CO502.3
10.	To study the variation of radiated field with distance from transmitting antenna.	CO502.4
11.	To study and plot the radiation pattern of the dipole/Folded dipole antennas.	CO502.4
12.	To study and plot the radiation pattern different antenna.	CO502.5

Ten experiments in a semester as per the discretion of the subject teacher.

Major Equipment/Materials:

1.	Antenna trainer kit.
2.	Transmission line trainer kit.
3.	Wave guide trainer kit.
4.	Cathode Ray Oscilloscope(CRO)/Digital Storage Oscilloscope(DSO)
5.	Dual Power Supply.
6.	Function generator.
7.	Spectrum analyser.
8.	Breadboard, discrete components, wires.
9.	Multimeter /Ammeter/Voltmeter

Suggestions for Practical:

Experiments are expected to be performed

1. Using trainer kit and verification using smith chart.
2. on simulation software
3. on virtual lab platforms available online

Reference Books/Web Portals:.

S.N.	Title	Author
1	Antennas and Wave Propagation	K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.
2	Transmission Lines & Waveguides	Late Ajay V. Bakshi, Uday A. Bakshi ,Technical Publication
3	Antennas for All Applications	John D. Kraus and R. J. Marhefka, and Ahmad S. Khan TMH, New Delhi, 4th ed., (Special Indian Edition) 2010.
4	Advanced Electronic Communication System	Tomasi,Pearson Publication.
5	Electronic Communication system	Kannedy , TMH Publication
6	Stutzman, .L. and Thiele, H.A., “Antenna Theory and esign”,	2nd Ed., John Wiley & Sons (1998).
7	Garg, R., Bhartia, P., Bahl, I. and Ittipiboon,	“Microstrip Antenna Design Handbook ”, Artech House (2001)