RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		E	0	3	5	0	2	1	1	

COURSE NAME	**Antenna and wave propagation**
CO Description	Compare various modes of wave propagation.
LO Description	Define various parameters and laws related to EM Wave.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-01	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.	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	8	-	Text Books, PPT, Handouts, chalk board, charts, Numerical Problems Workbook	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal

LO-01	End Semester Theory Exam	**Student will be asked to**(and/or): 1. Explain EM wave and its properties. 2. Compare different methods of wireless wave propagation. 3. Describe Angle of tilt and radio horizon.	10	Question paper, Rating scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	**SCHEME FOR LEARNING OUTCOME**	**Branch Code**			**Course Code**			**CO Code**	**LO Code**	Format No. **4**
		E	*0*	*3*	*5*	*0*	*2*	*1*	*2*	

COURSE NAME	**Antenna and wave propagation**
CO Description	Compare various modes of wave propagation.
LO Description	Illustrate the sky wave propagation.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-02	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	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial.	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	7	-	Text Books, PPT, Handouts, chalk board, charts, Numerical Problems workbook.	

SCHEME OF ASSESSMENT					
S. No.	**Method of Assessment**	**Description of Assessment**	**Maximum Marks**	**Resources Required**	**External / Internal**
LO-02	End Semester Theory Exam	**Student will be asked to**(and/or): 1. List the various layers of ionosphere. 2. Explain the given parameter for sky wave propagation. 3. Simple numerical on critical frequency, maximum working frequency, optimum working frequency.	10	Question paper, Rating scale	External
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)					

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		E	0	3	5	0	2	2	3	

COURSE NAME	**Antenna and wave propagation**
CO Description	Explain the working of transmission line.
LO Description	Define the fundamental of parallel wire transmission lines.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-03	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,	Interactive classroom lecture, PPT, demonstration, quiz, assignments	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/ assignments/ tutorial.	7	-	Text Books, PPT, Handouts, chalk board, charts.Videos lectures- NPTEL& others	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-03	Mid-Semester Theory Exam/ Assignment	**Student will be asked to** 1. Explain and draw the equivalent circuit of transmission line. 2. Describe various parameters of transmission line. 3. Drive the expression for Loss less and Distortion less transmission line,	10	Rubrics/Rating scale	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		E	0	3	5	0	2	2	4	

COURSE NAME	**Antenna and wave propagation**
CO Description	Explain the working of transmission line.
LO Description	Describe various parameters of transmission line.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-04	Transmission line Parameters :- Characteristics impedance Incident wave, reflected wave and standing wave. Reflection co-efficient. Standing wave ratio (SWR),VSWR. Impedance matching its type (λ/4,Single stub matching) and its need.	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	8	-	Text Books, PPT, Handouts, chalk board, charts.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal

LO-04	End Semester Theory Exam	**Student will be asked to**(and/or): 1. Explain various parameters for transmission line. 2. Calculate Reflection coefficient and SWR for given line parameters. 3. Describe types of matching. 4. What is matching and why it is needed.	10	Question paper, Rating scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	**SCHEME FOR LEARNING OUTCOME**	**Branch Code**			**Course Code**			**CO Code**	**LO Code**	Format No. **4**
		E	*0*	*3*	*5*	*0*	*2*	*2*	*5*	

COURSE NAME	**Antenna and wave propagation**
CO Description	Explain the working of transmission line.
LO Description	Verify various parameters of transmission line.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-05	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.	Lab demonstration, hands on practice, lab assignments, V-Lab.	• Teacher with support from lab staff will demonstrate the procedure of lab experiments. • Student will conduct lab assignment based on these experiments.	--	7	Lab manual, charts, experimental trainer instruments/kit with measuring instruments,	

						computer with relevant simulation software and high speed internet.	

SCHEME OF ASSESSMENT					
S. No.	**Method of Assessment**	**Description of Assessment**	**Maximum Marks**	**Resources Required**	**External / Internal**
LO-05	Practical test in laboratory	**Student will be asked to**(and/or): 1. Demonstrate the smith chart for transmission line. 2. Calculate input impedance of given transmission line and verify it using smith chart. 3. Simulate and verify transmission line parameters in laboratory using software.	15	Rubric, Rating scale.	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		E	0	3	5	0	2	3	6	

COURSE NAME	**Antenna and wave propagation**
CO Description	Explain wave propagation through metallic waveguide.
LO Description	Describe various propagation parameters and modes in rectangular waveguide.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-06	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)	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	8	-	Text Books, PPT, Handouts, chalk board, charts, Numerical Problems Workbook	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-06	End Semester Theory Exam	**Student will be asked to** 1Explain various modes exist in waveguide. 2Describe the concept of dominant mode for TE and TM mode. 3 Calculate wave parameters for given waveguide.	10	Question paper , Rating scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		E	*0*	*3*	*5*	*0*	*2*	*3*	*7*	

COURSE NAME	**Antenna and wave propagation**
CO Description	Explain wave propagation of microwave through metallic waveguide.
LO Description	Calculate various parameters of TE and TM modes.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-07	Measurement of cutoff wavelength, cutoff frequency and Phase velocity, Group velocity, Guide wavelength for a given wave and verification using trainer kit.	Lab demonstration, hands on practice, lab assignments, V-Lab.	Teacher with support from lab staff will demonstrate the procedure of lab experiments. Student will conduct lab assignment based on these experiments.	--	7	Lab manual, charts, experimental trainer instruments/kit with measuring instruments.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
Lo-07	Practical test in laboratory	**Student will be asked to**(and/or): 1. Verify various parameters (cutoff wavelength, cutoff frequency and Phase velocity, Group velocity, Guide wavelength) of rectangular waveguide .	10	Rubrics, Rating scale	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		E	*0*	*3*	*5*	*0*	*2*	*4*	*8*	

COURSE NAME	**Antenna and wave propagation**
CO Description	Categorize various kind of antenna.
LO Description	Define various parameters of antenna.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-08	Antenna and its working principle. Basic Antenna parameter 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 formula.	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	8	-	Text Books, PPT, Handouts, chalk board, charts, Numerical Problems Workbook	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal

LO-08	End Semester Theory Exam	**Student will be asked to** (and/or): 1. What is antenna and Explain its working. 2. Define various parameters of antenna. 3. Draw the radiation pattern of antenna and explain various lobs present in it. 4. Solve Simple numerals on calculation of antenna parameters. 5. Calculate the received power using friis formula.	10	Question paper , Rating scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	**SCHEME FOR LEARNING OUTCOME**	**Branch Code**			**Course Code**			**CO Code**	**LO Code**	Format No. **4**
		E	*0*	*3*	*5*	*0*	*2*	*4*	*9*	

COURSE NAME	**Antenna and wave propagation**
CO Description	Categorize various kind of antenna.
LO Description	Explain the structure of basic antenna and antenna array.

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-09	Introduction of basic antenna. Hertizian 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)	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	8	-	Text Books, PPT, Handouts, chalk board, charts, Numerical Problems Workbook	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-09	End Semester Theory Exam	**Student will be asked to** **1.** Explain the working of dipole antenna **2.** Compare different dipole antenna. **3.** What is antenna array and how it is made? **4.** Draw the radiation pattern of different antenna array.	10	Question paper , Rating scale	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	**SCHEME FOR LEARNING OUTCOME**	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		E	*0*	*3*	*5*	*0*	*2*	*4*	*10*	

COURSE NAME	**Antenna and wave propagation**
CO Description	Categorize various kind of antenna.
LO Description	Verify the field pattern of basic antenna and calculate HPBW using it.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-10	Distribution of voltage & current for half wave dipole, full wave dipole antenna. Radiation pattern of dipole antenna (half wave, full wave, folded).	Lab demonstration, hands on practice, lab assignments, V-Lab.	Teacher with support from lab staff will demonstrate the procedure of lab experiments. Student will conduct lab assignment based on these	--	7	Lab manual, charts, experimental trainer instruments/kit with	

	Calculate half power beam width for dipole antenna (half-wave, full-wave, folded)		experiments.			measuring instruments, computer with relevant simulation software and high speed internet.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-10	Practical test in laboratory	**Student will be asked to** (and/or): 1. Draw voltage and current distribution for basic antenna. 2. Draw and verify the radiation pattern of basic antenna in laboratory.	10	Rubrics, Rating scale.	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	**SCHEME FOR LEARNING OUTCOME**	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		E	*0*	*3*	*5*	*0*	*2*	*4*	*11*	

COURSE NAME	**Antenna and wave propagation**
CO Description	Categorize various kind of antenna.
LO Description	Describe the working of given antenna.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks

LO-11	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	Interactive classroom lecture, PPT, demonstration, quiz, assignments, tutorial	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/assignments/ tutorial to make students practice their knowledge.	8	-	Text Books, PPT, Handouts, chalk board, charts, Numerical Problems Workbook	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-11	End Semester Theory Exam	**Student will be asked to**(and/or): 1. Explain Physical structure of given antenna. 2. Compare different antenna based on their application 3. Draw the radiation pattern of given antenna.	10	Question paper, Rating scale.	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		E	0	3	5	0	2		12	

COURSE NAME	**Antenna and wave propagation**
CO Description	Categorize various kind of antenna.
LO Description	Verify the radiation pattern of different antennas.

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-12	Study of radiation pattern of different antenna. Yagi-Uda Antenna Parabolic reflector antenna Horn antenna Loop & helical antenna Log periodic antenna Turnstile antenna Sector antenna	Lab demonstration, hands on practice, lab assignments, V-Lab.	Teacher with support from lab staff will demonstrate the procedure of lab experiments. Student will conduct lab assignment based on these experiments.	--	7	Lab manual, charts, experimental trainer instruments/kit with measuring instruments, computer with relevant simulation software and high speed internet.	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
LO-12	Practical test in laboratory	**Student will be asked to** (and/or): 1. Draw and verify the radiation pattern of given antenna in laboratory.	15	Question paper, Rating scale.	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. **4**
		E	*0*	*3*	*5*	*0*	*2*	*5*	*13*	

COURSE NAME	**Antenna and wave propagation**
CO Description	Select advance antenna as per application requirement.
LO Description	Describe the working of micro-strip antenna.

SCHEME OF STUDY							
S. No.	**Learning Content**	**Teaching – Learning Method**	**Description of T-L Process**	**Teach Hrs.**	**Pract. /Tut Hrs.**	**LRs Required**	**Remarks**
LO-13	Rectangular Micro-strip Antennas – Introduction, Features, Advantages and Limitations. Rectangular Patch Antennas – Geometry and Parameters, Types of Feeding (Coaxial feed and micro-strip feed) Characteristics of rectangular micro-strip Antennas. Impact of dielectric constant and thickness of substrate on characteristics of rectangular micro-strip antenna.	Interactive classroom lecture, PPT, demonstration, quiz, assignments	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/ assignments/ tutorial.	8	-	Text Books, PPT, Handouts, chalk board, charts. Videos lectures-NPTEL& others	

SCHEME OF ASSESSMENT					
S. No.	**Method of Assessment**	**Description of Assessment**	**Maximum Marks**	**Resources Required**	**External / Internal**
LO-13	Mid-Semester Theory Exam/ Assignment	**Student will be asked to** 1. What is micro-strip antenna and what are its advantages. 2. List and explain various feeding methods of micro-strip antenna. 3. Identify the impact of dielectric and thickness on characteristic of micro-strip antenna.	10	Rubrics, Rating scale	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		E	0	3	5	0	2	5	14	

COURSE NAME	**Antenna and wave propagation**
CO Description	Select advance antenna as per application requirement.
LO Description	Illustrate the structure of smart antenna.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
LO-14	Smart Antenna:- Introduction, Structure of smart antenna and it's 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, Types of smart antenna Switched - beam array Fully adaptive array Introduction to MIMO technology	Interactive classroom lecture, PPT, demonstration, quiz, assignments	Teacher will explain the contents and provide handouts to students. Teacher will conduct quiz/ assignments/ tutorial.	7	-	Text Books, PPT, Handouts, chalk board, charts. Videos lectures-NPTEL& others	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal

LO-14	Mid-Semester Theory Exam / Assignment	**Student will be asked to**(and/or): 1. Draw the structure of smart antenna and explain its working. 2. Compare and list the advantages of smart antenna with basic antenna. 3. Describe different types of smart antenna. 4. Explain MIMO technology.	10	Rubrics, Rating scale	Internal
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)					