

Program : <b>Diploma in Electronics and Communication Engineering</b>	
Course Code : <b>6201A</b>	Course Title: <b>Antenna and Wave Propagation</b>
Semester : <b>6</b>	Credits: <b>4</b>
Course Category: <b>Program Elective</b>	
Periods per week: <b>4 (L:4, T:0, P:0)</b>	Periods per semester: <b>60</b>

### Course Objectives:

- To familiarize radio wave propagation.
- To explain ground wave, sky wave and space wave propagation.
- To provide knowledge on basic antenna parameters.
- To familiarize different types of antenna.

### Course Prerequisites:

Topic	Course code	Course name	Semester
Signal modulation schemes, transmission & reception		Principles of Electronic Communication	3

### Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive level
CO1	Explain different types of radio wave propagation methods	15	Understanding
CO2	Illustrate sky wave propagation	14	Understanding
CO3	Summarize antenna and antenna parameters	15	Understanding
CO4	Outline different types of antennas	14	Understanding
	Series Test	2	

### CO – PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2						
CO2	2						
CO3	2						
CO4	2						

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

### Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	<b>Explain different types of radio wave propagation methods</b>		
M1.01	Explain the different modes of propagation.	5	Understanding
M1.02	Illustrate ground wave propagation	5	Understanding
M1.03	Illustrate space wave propagation.	5	Understanding

### Contents:

- **Radio wave propagation:** Introduction, definition, categorization and general classification, different modes of wave propagation. Ray/Mode concept.
- **Ground wave propagation:** introduction, plane earth reflection, space and surface waves, wave tilt, curved earth reflection, LOS distance, effective earth radius.
- **Space wave propagation:** Introduction, field strength of space wave with distance and height, effect of earth's curvature, absorption, super refraction, duct propagation, scattering phenomenon, tropospheric propagation.

CO2	<b>Illustrate sky wave propagation</b>		
M2.01	Explain the structure of ionosphere	4	Understanding.
M2.02	Outline the different terms used in sky wave propagation	5	Understanding.
M2.03	Explain the different fading and diversity techniques	5	Understanding.
	Series Test – I	1	

### Contents:

- **Sky wave propagation** - Introduction, structure of ionosphere, refraction and reflection of sky wave by ionosphere, ionosphere absorption and abnormalities.

- Definition of ray path, critical frequency, skip distance, maximum usable frequency (MUF), virtual height, vertical and oblique incidence, relation between MUF and skip distance.
- Definition of fading, types of fading, different diversity techniques, multi-hop propagation.

<b>CO3 Summarize antenna and antenna parameters</b>			
M3.01	Illustrate the radiation mechanism of antenna	4	Understanding
M3.02	Explain antenna and functions of antenna	2	Understanding.
M3.03	Summarize antenna parameters	6	Understanding
M3.04	Explain the principles of reciprocity and duality of antennas	3	Understanding.

#### **Contents:**

- Radiation mechanism, potential function, retarded potential, short dipole, short current element - near and far field
- Definition and functions of antenna.
- Antenna parameters - beam area, beam width, half power bandwidth, gain, directivity, effective aperture, effective height, wave polarisation, antenna temperature, signal to noise ratio, radiation resistance, radiation efficiency.
- Principle of reciprocity and duality of antenna.

<b>CO4 Outline different types of antennas</b>			
M4.01	Explain the classification of wire antenna	3	Understanding
M4.02	Compare aperture antenna and microstrip antenna	3	Understanding
M4.03	Explain reflector antennas and travelling wave antenna	4	Understanding
M4.04	Summarize the properties of antenna arrays	4	Understanding
	Series Test – II	1	

#### **Contents:**

- Wire antenna - Short dipole antenna, dipole antenna, loop antenna, mono pole antenna
- Aperture antenna - slot antenna, horn antenna
- Microstrip antenna and lens antenna
- Travelling wave antenna - long wire antenna, Yagi-Uda antenna, helical wire antenna, spiral antenna
- Antenna arrays - linear and planar antenna arrays

**Text/Reference:**

<b>T/R</b>	<b>Book Title/Author</b>
T1	John D. Krauss : Antennas for all application, Tata McGraw Hill 3/e
T2	Balanis : Antenna Theory and design, Wiley Publication, 3/e
T3	K. D. Prasad: Antenna and wave propagation, Satya Prakashan, New Delhi
R1	Collin R.E. : Antenna and Radio wave propagation, Tata McGraw Hill, 2005
R2	G. S. N. Raju : Antennas and wave propagation, Pearson education, 2004

**Online Resources:**

<b>Sl.No</b>	<b>Website Link</b>
1	<a href="https://nptel.ac.in/courses/117/107/117107035/">https://nptel.ac.in/courses/117/107/117107035/</a>