Course Objectives:

The main objectives are:

- Understand basic terminology and concepts of Antennas.
- To attain knowledge on the basic parameters those are considered in the antenna design process and the analysis while designing that.
- Analyze the electric and magnetic field emission from various basic antennas and mathematical formulation of the analysis.
- To have knowledge on antenna operation and types as well as their usage in real time field.
- Aware of the wave spectrum and respective band antenna usage and also to know the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure.

UNIT - I:

**Antenna Basics:** Introduction, Basic Antenna Parameters - Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height. Related Problems.

**Thin Linear Wire Antennas:** Radiation from Small Electric Dipole, Quarterwave Monopole and Halfwave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beamwidths, Directivity, Effective Area and Effective Height. Natural current distributions, fields and patterns of Thin Linear Center-fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small and Large Loops (Qualitative Treatment).

UNIT - II:


UNIT - III:


UNIT - IV:

Antenna Arrays: Point Sources - Definition, Pattern, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays - Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparision, BSAs with Non-uniform Amplitude Distributions - General Considerations and Binomial Arrays, Illustrative Problems.

Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by Comparision, Absolute and 3-Antenna Methods)

UNIT - V:


Wave Propagation - II: Sky Wave Propagation - Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and skip Distance, Multi-hop Propagation.

TEXT BOOKS:


REFERENCE BOOKS:


Course Outcomes:

Student will be:
- Aware of parameter considerations viz. antenna efficiency, beam efficiency, radiation resistance etc. in the design of an antenna.
- Capable to analyze the designed antenna and field evaluation under various conditions and formulate the electric as well as the magnetic fields Equation set for Far field and near field conditions.
- Understand the Array system of different antennas and field analysis under application of different currents to the individual antenna elements.
- Understand the design issues, operation of fundamental antennas like Yagi-Uda, Horn antennas and helical structure and also their operation methodology in practice.
- Design a lens structure and also the bench step for antenna parameter measurement of testing for their effectiveness.
- Knowledge about the means of propagation of Electromagnetic wave i.e. free space propagation and also about frequency dependent layer selection, its respective issues for an effective transmission of information in the form of EM wave to a remote location and related issues.