

# AMEC22 ANTENNA AND MICROWAVE ENGINEERING

## UNIT-1 ANTENNA PRINCIPLES

- 1.1 The Alternating Current Element,
- 1.2 Electric and Magnetic Fields due to Alternating current element,
- 1.3 Application to short antennas,
- 1.4 Radiation from Monopole and Half-wave Dipole,
- 1.5 Assumed current distribution.

## UNIT-2 ANTENNA FUNDAMENTALS

- 2.1 Application of Network Theorems to antennas,
- 2.2 Equivalence of Directional Patterns,
- 2.3 Equivalence of Transmitting and Receiving antenna impedances,
- 2.4 Equality of effective lengths using Reciprocity Theorem,
- 2.5 Directional properties of Dipole Antennas, Antenna Gain,
- 2.6 Directivity, Effective Area,
- 2.7 Antenna Terminal Impedance, Antenna as an Opened Out Transmission Line,
- 2.8 Practical Antennas and Methods of Excitation,
- 2.9 Transmission loss between antennas,
- 2.10 Antenna Temperature and Signal to Noise Ratio.

## UNIT-3 ANTENNA ARRAYS

- 3.1 Two-Element Array, Horizontal Patterns in Broadcast Arrays,
- 3.2 Linear Arrays, Broad-side and End-fire,
- 3.3 Multiplication of Patterns,
- 3.4 Effect of Earth on Vertical Patterns, Binomial array,
- 3.5 Tchebycheff Distribution Array.

## UNIT-4 WAVE PROPAGATION

- 4.1 Modes of Propagation, Plane Earth Reflection, Surface Wave, Field strength,
- 4.2 Elevated Dipole Antennas above a Plane Earth,
- 4.3 Wave tilt of the Surface Wave,
- 4.4 Spherical Earth Propagation, Tropospheric Wave.
- 4.5 Ionosphere Propagation,
- 4.6 Sky Wave Transmission Calculations,
- 4.7 Effect of the Earth's Magnetic Field,
- 4.8 Virtual Height, MUF/LUF, Skip distance,
- 4.9 Ionospheric Variations and Fading.
- 4.10 Space Waves: Radio Horizon, Microwave space wave Propagation, Duct Propagation.

## UNIT-5 WAVE GUIDES

- 5.1 Guided waves between parallel plates,
- 5.2 Dielectric slab Waveguide, Rectangular,

- 5.3 Circular waveguides,
- 5.4 Transmission Line Analogy for waveguides.

### **UNIT-6 MICROWAVE COMPONENTS**

- 6.1 Waveguide couplings, bends and twists, tees, transitions, matched load,
- 6.2 Attenuators and phase shifters, wave guide discontinuities,
- 6.3 Windows Irises and tuning screws,
- 6.4 Two-hole directional coupler, Isolators and circulators.

### **UNIT-7 MICROWAVE GENERATION**

- 7.1 Limitations of Conventional Vacuum Tubes,
- 7.2 Klystron(Reflex and Multi-cavity), TWT,
- 7.3 Magnetrons, and BWO,
- 7.4 Negative conductance Microwave devices: Tunnel diode, Gunn diode, IMPATT diode

#### **Reference Books:**

1. Reich, "Microwave principles", CBS, 1996.
2. Collin, "Foundation of Microwave Engineering", 2nd ed. McGraw Hill, 1992.
3. Watson, "Microwave Semiconductor Devices and Their Circuit Applications", McGraw Hill.
4. J.D.Krauss, 'Antennas', TMH

