|  |  |  |
| --- | --- | --- |
| **EC6502** | **Antenna and Wave Propagation** | **L-T-P: 3-0-0; Total 42 lectures** |

***Prerequisites*:** i) Electromagnetic Field Theory

***Objective****:* This course is intended to provide students with a good understanding of the general characteristics of different antennas, the principles and theory behind their operation, and modelling techniques for different antenna systems. In addition, the principles and characteristics of radio waves propagating in various environments and wireless channels are dealt with.

***Topics Covered :***

**Unit I: Introduction:** Introduction to Antennas; Coordinate System, Solid Angle; Fundamental Parameters of Antennas; Equivalent Circuit of Transmitting and Receiving Antennas. (4 Lectures)

**Unit II: Wire Antenna and Radiation :** Radiation: Potential Functions and electromagnetic-field, alternating current element, power radiated by the alternating current element and radiation resistance, application to short antennas, radiation from a quarter wave mono pole and Half wave dipole. Antenna terminologies, Terminal impedances, Mutual impedance of antennas. 11 Lectures

**Unit III: Different types of Antennas and Arrays :** Yagi-Uda, Log-periodic, Rhombic, Travelling wave antenna, Horn, parabolic reflector and its fading techniques. Slot antenna, loops, Helical, lens, Micro strip antenna. Directional properties of dipole antenna, Two element array, three element array, linear arrays, multiplication of patterns, Binomial array, (15 Lectures)

**Unit IV: Propagation of electromagnetic waves :** Various paths of propagation, Space wave and surface wave, wave tilt of surface wave, spherical earth propagation. Tropospheric wave propagation, Duct and super refraction. Ionospheric wave propagation& mechanism of reflection and refraction, critical frequency, MUF, virtual height, skip distance, OWF. Effect of earth magnetic field. Friis Transmission Formula and Path Loss, Fading (12 Lectures)

***Book List***

1. E. C. Jordan and K. G. Balmain, Electromagnetic Waves and Radiating Systems, 2nd Edition. Prentice Hall India, India, 2000.
2. John D. Kraus and Ronald J. Marhefka, Antennas for All Applications, 3rd Ed. Tata McGraw Hill, New Delhi, India, 2003.
3. C. A. Balanis, Antenna Theory - Analysis and Design. John Wiley and Sons, Inc, India, 2005. (Textbook for Antenna)
4. R.E. Collin, Antennas and Radiowave Propagation. McGraw-Hill, 1985.

***Course Outcome****:* Upon successful completion of this course, students should be able to:

1. Describe and analyze some simple radiating systems.
2. Analyze basic antenna arrays.
3. Describe and analyze the general characteristics of different types of wire antennas and aperture antennas.
4. Analyze and model the ionospheric, tropospheric, surface wave, and ground wave propagation.
5. Analyze and model the propagation mechanism of modern mobile communication.