**20EC3102- ANTENNA AND WAVE PROPAGATION**

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| **Course category:** | Program Core | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture - Tutorial - Practical:** | 2 - 1 – 0 |
| **Prerequisite:** | Vector Calculus, Basics of Electromagnetic Fields and Waves | **Sessional Evaluation :****External Evaluation:****Total Marks:** | 4060100 |
| **Course****Objectives** | Students undergoing this course are expected to: |
| 1. Study the propagation of signals; calculate various line parameters.
2. Study the concept of polarization and its significance in wireless communications.
3. Learn antenna basics, antenna parameters and calculation of radiation resistances of various antennas.
4. Learn the methods to measure antenna parameters.
5. Understand the basic working principle of VHF and UHF antennas.
6. Understand different kinds of Wave Propagation.
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| **Course Outcomes** | Upon successful completion of the course, the students will be able to: |
| CO1 | Understand the fundamentals of Transmission Line Theory. |
| CO2 | Learn antenna basics, Antenna Parameters and calculation of Radiation Resistances. |
| CO3 | Describe various Antennas, Arrays And Draw Radiation Patterns. |
| CO4 | Measure the antenna’s fundamental parameter. |
| CO5 | Learn different types of Antennas to be employed in V.H.F. and U.H.F.  |
| CO6 | Classify Radio Wave Propagation in the Atmosphere. |
| **Course****Content****Course****Content** | **UNIT-I****TRANSMISSION LINES:** Primary and Secondary Constants of the Line, Transmission Line Equations, Propagation Constant, Characteristic Impedance, Distortion less Line, Input Impedance of Open and Short-Circuited Lines, Standing Waves, Reflection Coefficient, Smith Chart.**UNIT II****RADIATION FUNDAMENTALS:** Definition of antenna, Retarded Potentials, Far Field Approximation, Radiation from a current Element, Half Wave Dipole and Monopole Antennas.**ANTENNA PARAMETERS:** Radiation Pattern, Radiation Intensity, Directivity, Gain, H.P.B.W., Effective Aperture, Relation between Directivity and Maximum Effective Aperture.**UNIT III****LINEAR WIRE ANTENNAS:** Current Distribution on Thin Linear Wire Antennas, Array of Two Point Sources, Principle of Pattern Multiplication, Uniform Linear Arrays: Broad Side and End fire Array and Binomial Arrays.**V.H.F AND U.H.F ANTENNAS:** Long Wire and Rhombic Antennas, Yagi-Uda Antenna, Folded Dipole Antennas (Without Analysis) **UNIT IV****ANTENNA MEASUREMENTS:**Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods)**UNIT V****SURFACE AND SPACE WAVE PROPAGATION:** Friis Transmission Equation, Salient Features of Somerfield Theory, Ground Wave Field Strength Calculation, Effect of Curvature of Earth, Refraction of Radio Waves in Troposphere, Effective Radius of Earth, Radio Horizon and Maximum Radio Range.**UNIT VI****SKY WAVE PROPAGATION:** Structure of Ionosphere, Mechanism of Wave Refraction in Ionosphere, Critical Frequency, M.U.F., Virtual Height, Skip Distance, Effect of Earth’s Magnetic Field, Faraday’s rotation. |
| **Text Books and Reference Books** | **TEXT BOOKS:**1. “Antennas”, by John D Krauss, McGraw-Hill Education (ISE), 3rd edition 2001.
2. “Antenna and Wave Propagation”, by K.D. Prasad - satya prakashan pvt.ltd, 2020.

**REFERENCE BOOKS:** 1. “Transmission Lines and Networks” by Umesh Sinha , Sathya Prakashan pvt.ltd, 2010.
2. “Electromagnetic Waves and Radiating Systems”, by Jordan E.C. and Balmain H. G.-pearson education, 2nd edition, 2015.
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| **E-Resources** | 1. http://www.nptel.ac.in.
2. http:/www.ebookee.com/antennaandwavepropagation.
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| **Contribution of Course Outcomes towards achievement of Program Outcomes** |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 2 | 2 | 1 | - | - | 1 | - | 2 | - | 2 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 1 | - | - | 1 | - | 2 | - | 2 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 1 | 1 |  - |  - | 1 |  - | 2 |  - |  2 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 2 | 1 | - | - | 1 | - | 2 | - | 2 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 1 | - | - | 1 | - | 2 | - | 2 | 3 | 3 |
| CO6 | 3 | 3 | 2 | 2 | 1 | - | - | 1 | - | 2 | - | 2 | 2 | 2 |