GUJARAT TECHNOLOGICAL UNIVERSITY

M.E

Communication Engineering

Subject Name: **Antenna Engineering and Design**

Sr.No	Course content
1	INTRODUCTION TO ANTENNAS Review the fundamental theory of antennas: Reciprocity theorem, Antenna equivalent circuit, Classification of antennas, Brief understanding of special types of Antennas.
2	Gain a thorough understanding of the important concepts: Radiation Impedance, Radiation Pattern, Antenna Impedance, Bandwidth, Directivity, Gain, Antenna efficiency, Radiation Efficiency, Antenna Polarization, Antenna Apertures, Antenna temperature, near-field and far-field concepts, and radiation mechanism.
3	ANTENNA SYNTHESIS, ANALYSIS and OPTIMIZATION TECHNIQUES Introduction to various methods of antenna synthesis such as Schelkunoff Polynomial, Fourier transform, Woodward Lawson.
4	Introduction to antenna analysis methods: Integral equation method, Moment method, Finite Difference Time Domain methods; Applications of these methods to the practical antennas such as dipole, loop, helical, microstrip patch, and PIFA.
5	Various optimization techniques (OT) such as Genetic algorithm, Artificial Intelligence, Fuzzy logic. Comparative analysis of the OT's for particular application and antenna type.
6	ANTENNA DESIGN Various impedance matching techniques such as Quarter wavelength transformer, T-match, Gamma Match, Omega match, Baluns and Transformers.
7	Analytical comparative study of wire type and aperture type, narrow band and wide band, element and antenna array antennas.
8	Designing an antenna with a set of given specifications using standard software.
9	Material selection for antenna to be designed, understanding the specifications – errors responses – corrections methods.
10	Concepts of antenna coupling, coupling methods, interferences and effects on performance of the antenna system.
11	SPECIAL TOPICS FOR ANTENNA DESIGN and MEASUREMENT Techniques to miniaturize an antenna for wireless LAN and Blue tooth applications, Wide-band and multi-band antennas, Mobile antennas and antenna diversity, Reconfigurable antennas, Practical consideration in designing antennas for wireless communications (such as the interaction between mobile antenna and human body).
12	Measurement of various antenna parameters necessarily needed for practical antennas.
13	Understanding the working and design of anechoic chamber, practical difficulties, types and applications.

Reference Books:

1. Balanis C A, Antenna Theory: design and applications, Wiley
2. Hohnson R C and H Jasik, Antenna Engineering Handbooks, McGraw Hill
3. Sadiku N O Mathew, Elements of Electromagnetics, Oxford Univ Press
4. Harrington R F, Time harmonic Electromagnetic Fields, McGraw Hill