GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. SEMESTER: VI
Electronics Engineering/Electronics &Communication Engineering/Electronics &Telecommunication

Subject Name: **Digital Communication**
Subject Code: **161001**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
4	0	2	6	70	30	50

Sr. No	Course Content	Total Hrs.
1.	**Probability Theory & Random Variables :** Information, Probability, Conditional Probability of independent events, Relation between probability and probability Density , Releigh Probability Density , CDF, PDF, Random Variables, Variance of a Random Variable, ,correlation between Random Variables, Statistical Averages(Means),Mean and Variance of sum of Random variables, Linear mean square Estimation, Central limit theorem, Error function and Complementary error function Discrete and Continuous Variable, Gaussian PDF, Threshold Detection, Statistical Average,Chebyshev In Equality, Auto correction.	8
2.	**Information Theory :** Concept & Measure of information, Source Coding, Error Free Communication Over a noisy channel, Shannon Theorem, The channel capacity of a Discrete Memory less Channel, Optimum System, The channel capacity of a Continuous Channel, Practical Communication System In Light of Shannon's Equation.	7
3.	**Formatting a Base Band Modulation :** Base band system, The Sampling Theorem, Sampling and interpolation functions,Spectra,Nyquist Theorem, Under sampling, Applications ,Aliasing, PCM, DPCM, ADPCM, Uniform and Non-uniform Quantization, Quantization Error in PCM,Delta Modulation, Adaptive Delta Modulations ,SNR Calculation,Non-uniform Quantization, Phase Modulation..	5

4.	**Digital communication system :** Digital multiplexing ,line coding, PSD on /off signaling, Bipolar signaling, Duo binary signal, pulse shapping, Nyquist first and second criterion for zero ISI,Regenerative repeaters,Detection error Probability, M-ary System, Scrambling,Digital Carrier System	6
5.	**Error Correcting Codes :** Introduction, Linear block code, cyclic code, convolution code, Burst Error Correcting and detecting code, Interlaced code for burst and random error Generation, Comparison of coded and un-coded system.	6
6.	**Digital Modulation Techniques :** QAM, BPSK, QPSK, DEPSK, DPSK, MSK, M-ary-FSK, M-ary-PSK, BFSK of various digital modulation techniques.	8
7.	**Digital Communication Systems in the Presence of Noise :** Noise Figure, Signal to noise Ratio, performance of communication system with channel noise, Optimum Binary Receiver.	5
8.	**Digital Carrier Demodulation Techniques :** Coherent and non-coherent detection of ASK, FSK, PSK, QPSK,DPSK.	3
9.	**Spread Spectrum Communications :** Introduction to Frequency hopping, Introduction to direct sequence Spread Spectrum, Introduction to CDMA, Overview of latest trends in digital communication.	4

Text Books:
1. Digital and analog communication system by B.P.Lathi .Zhi Ding(international 4th Edition), OXFORD university press.
2. Principle of communication system by Taub . Schilling (2nd Edition), TATA McGRAW-HILL.

References Books:
1. An Introduction to Analog and Digital Communications by Simon Haykin, Wiley India.
2. Digital Communications by Simon Haykin, Wiley India.

List of Suggested Practical Assignments:

1. To understand and the concept of Pulse Code Modulation and To observe   the Performance of PCM system.
2. To understand and the role of signal compression/Expansion on S/N ratio.
3. To understand the concept of Delta Modulation and to achieve the Delta Modulation / De- Modulation.

4. To study the performance of An-adaptive Delta modulator/De-modulator circuits
5. To Study and observe the performance of Digital carrier system—ASK.
6. To Study and observe the performance of Digital carrier system—FSK.
7. To Study and observe the performance of Digital carrier system—PSK.
8. To Study and observe the performance of Return to Zero (RZ) types of line codes.
9. To Study and observe the performance of Non- Return to Zero (NRZ) types of line Codes.
10. To establish a PCM based transmission-reception link.
11. To Study and observe the effect of signal Distortion using EYE-Diagram.
12. To Study and Perform sampling theorem and reconstruction.
13. To Study and perform Error Detection and Correction codes.
14. To perform TDM-PCM Transmission and Reception.
15. To study and perform Data Conditioning carrier modulation.
16. To study and perform Data Re-Conditioning carrier De-modulation.
17. To study and perform TDM pulse amplitude modulation/demodulation.
18. To study and perform PAM, PWM, PPM.
19 Few simulation exercises on digital communication techniques / basic systems

Mini Project

Mini project with emphasis on design and implementation is compulsory with the help of hardware and simulation tools.