

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC SEMESTER : VI
ELECTRONICS AND COMMUNICATION ENGINEERING

Subject Name: **DIGITAL COMMUNICATION**

Sr. No.	Course Contents	Total Hrs
1.	Probability Theory & Random Variables : Review of probability, Conditional Probability and independent events, Random variables, Relation between probability and probability Density , CDF, PDF, Gaussian PDF, Rayleigh Probability Density , Error function and Complementary error function Discrete and Continuous Variable, Joint distribution and marginal densities, conditional densities, Means and moments of a Random Variable, Mean and Variance of the sum of Random variables, Chebyshev's In equality, Central limit theorem, Correlation between Random Variables, Auto correction, Linear mean square Estimation.	9
2.	Information Theory: Concept & Measure of information, Entropy of a Source , Source Coding, Error Free Communication Over a noisy channel, Shannon Theorem, The channel capacity of a Discrete Memory less Channel, Channel capacity of a BSC, The channel capacity of a Continuous Channel, Optimum System, Practical Communication System In Light of Shannon's Equation.	8
3.	Formatting a Base Band Modulation : Base band system, The Sampling Theorem and its applications, interpolation functions, Nyquist Theorem, Under sampling Aliasing, Pulse-Code Modulation(PCM), Quantization Error in PCM, Uniform and Non-uniform Quantization, Differential PCM, ADPCM, Delta Modulation, Adaptive Delta Modulation, SNR Calculation.	7
4.	Digital communication system : Digital multiplexing ,Line coding, PSD of on-off signaling, Polar signalling, Bipolar signaling, Duo binary signal, Pulse shaping, Nyquist first and second criterion for zero ISI and controlled ISI, Regenerative repeaters, Scrambling, Detection error Probability, M-ary communication, Digital Carrier System.	7
5.	Error Correcting Codes : Introduction, Hamming bound condition, Linear block codes, Cyclic codes, Convolution code, Burst Error Correcting and detecting code, Interlaced code for burst and random error Generation, Comparison of coded and un-coded system.	7
6.	Digital Modulation Techniques : QAM, BPSK, QPSK, DEPSK, DPSK, MSK, BFSK, M-ary-FSK, M-ary-PSK.	6
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

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/DeModulation.
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.