GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Engineering

Subject Name Information Theory and Coding

Sr.No	Course content
1.	Probability Theory: Random Variable and Processes: Review of probability concept. Concept of random variable: Function of random variable. Distribution and density function Moments, characteristic function and conditional statistics, sequence of random variables. Rayleigh, Rice, Lognormal, Poisson distributions. Central limit theorem.
2.	Stochastic Processes: Spectral representation and Random processes: classification and application of stochastic process. Autocorrelation and Cross-correlation function, spectral representation and estimation.
3.	Information theory: Discrete messages, the concept of information, uniquely decodable code and instantaneously decodable code. Kraft's in-equality and Sardina's Patterson theorem. Average information- Entropy, Information rate. Coding to increase the average information per bit. Probability based Source coding techniques and application – Huffman coding, Shanon-fano code. Arithmetic coding. Marcov chain. Shannon's theorem and channel capacity. Bandwidth and S/N trade off.
4.	Channel coding: Coding for error detection and correction. Hamming distance. Rectangular coding, Block coding and decoding, Cyclic codes – coding and decoding. Convolution codes. Burst error correction codes.
5.	Application of coding: Multimedia System, Storage and Transmission of text, audio and video. Cryptography and information security.

Reference Books:

1. Probability, Random Variable and Stochastic Processes, A. Papoulis, McGraw Hill.
2. Introduction to data compression, Khalid Sayood,Morgan Kaufmann Publisher.
3. Modern Digital and Analog communication system, B.P.Lathi, Oxford university press.
4. Foundation of coding, Jiri Adamek, John Wiley and Sons.
5. Error Control Coding, Shu Lin and D Costello, PHI
6. Cryptography and Network Security, William Stallings,Pearson education Asia.
7. Digital Communication, John G. Proakis, TMH
8. Data Compression the complete reference, 2nd edition, David Salomon.