

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Computer Science & Engineering

Subject Name: Major Elective I-Information Theory & 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.