



C. U. SHAH UNIVERSITY

Wadhwan City

FACULTY OF: - Technology and Engineering
DEPARTMENT OF: - Information Technology
SEMESTER: - VIII
CODE: - 4TE08ITC1
NAME: – Information Theory and Coding

Teaching & Evaluation Scheme: -

Subject Code	Subject Name	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hours	Marks	Hours	Pr/Viva	TW	Pr	
4TE08ITC1	Information Theory and Coding	3	0	2	5	4	30	1.5	70	3.0	-	20	30	150

Objectives:

The objectives of the course are:

- To gain the knowledge of probability theory and its uses in applications.
- To gain the knowledge information theory.
- To gain the knowledge of coding and data compression techniques.

Prerequisites:

- Basic knowledge about Discrete Structures (sets, functions, relations, countability, proofs, Boolean logic, first-order logic, formal reasoning and deduction) and mathematics.
- Basic knowledge of probability theory.

Course outline:

Sr. No.	Course Contents	Total Hrs.
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.	12
2	Stochastic Processes: Spectral representation and Random processes, Classification and application of stochastic process. Autocorrelation and Cross-correlation function, spectral representation and estimation.	08
3	Information Theory: Discrete messages, the concept of information, uniquely decodable code and instantaneously decodable code.. Average information-Entropy, Information rate. Coding to increase the average information per bit.	08

	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.	14
5	Application of coding: Multimedia System, Storage and Transmission of text, audio and video. Cryptography and information security.	06
	Total	48

Learning Outcomes:

After completing this course, students will be able to:

- Use probability theory in various applications.
- Design compression algorithm in various applications.
- Understand the concepts of coding in communication engineering.

Books Recommended:

1. Probability, Random Variable and Stochastic Processes, **A. Papoulis**, McGraw Hill.
2. Introduction to data compression, **Khalid Sayood, Morgan Kaufmann** Elsevier (2006).
3. Modern Digital and Analog communication system, **B.P.Lathi**, Oxford university press.
4. Error Control Coding, **Shu Lin and D Costello**, PHI
5. Cryptography and Network Security, **William Stallings**, Pearson.
6. Digital Communication, **John G. Proakis**, Tata Mcgraw Hill
7. Data Compression the complete reference, 2nd edition, **David Salomon**.