Information Theory and Coding	L	T	P	NIL
	3	1	0	

Course Objective: This course provides a deep understanding of probability theory, information theory, and coding techniques, with practical applications in error control, channel coding, and advanced methods like convolution and turbo codes.

S. NO	Course Outcomes (CO)
CO1	Develop a understanding of probability theory, including key theorems and concepts, to model and analyze random phenomena.
CO2	Explore insights into information theory by studying entropy, mutual information, and coding techniques, enabling efficient data compression and transmission.
CO3	Understand the principles of error control coding and channel capacity, applying them to design reliable communication systems.
CO4	Explore advanced coding strategies, such as cyclic and convolutional codes, and apply optimization techniques to solve complex communication problems.

S. NO	Contents	Contact H
UNIT 1	Introduction to Probability, Sample space and events, The axioms of probability Elementary theorems -Conditional Probability and Independence, Baye's theorem. Random variables, discrete probability distribution, discrete functions for random and discrete random variables, continuous random variables.	6
UNIT 2	Uncertainty and Information, Shannon Entropy, Joint and conditional Entropies Mutual Information, Uniquely decipherable and Instantaneous codes, Noiseless coding problem. Source coding Theorem, Block coding, construction of Optimal codes, Huffman's & Shannon – Fano methods.	8
UNIT 3	Discrete memory less channel, channel capacity BSC and other channels	6
UNIT 4	Information measure for continuous ensembles capacity of AWGN channel. Error control coding. The channel coding Theorem, Application to BSC , Source Coding with fidelity criteria. Types of codes, error and error control strategies, Linear block codes, syndrome and error detection, Minimum distance, Error detecting and correcting capabilities of a block code, Syndrome decoding , Hamming codes.	8
UNIT 5	Cyclic codes, Generator and parity – check matrices, encoding, syndrome computation, error detection and decoding.BCH codes, decoding, of the BCH codes Introduction to RS codes. Convolution codes, Maximum likelihood decoding The Viterbi algorithm. Introduction to Turbo codes.	8
UNIT 6	Blind Deconvolution Using Convex Programming, Asynchronous code-division random access using convex optimization.	6
	TOTAL	**42**