| CS311: Information Theory and coding | L | T | P | Nil |
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**Course Objective:** To introduce fundamentals of Information theory and various coding techniques.

| S. No. | Course Outcomes (CO) |
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| CO1 | Apply fundamental probability concepts to analyze and solve problems involving random variables. |
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| CO2 | Compute and analyze information measures like entropy and mutual information, and design optimal source codes. |
| CO3 | Evaluate channel capacity and apply error control coding techniques to ensure reliable communication. |
| CO4 | Design and implement various error-correcting codes, including cyclic and BCH codes, for effective error detection and correction. |
| CO5 | Apply advanced information theory techniques, such as convex optimization, to solve complex coding and decoding problems. |

| S. No | Contents | Contact Hours |
|-------|----------|---------------|
| 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. | 10 |
| UNIT 3 | Discrete memory less channel, channel capacity BSC and other channels | 8 |
| 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. | 10 |
| 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** | **48** |