

Course code: Course Title	Course Structure			Pre-Requisite
<b>SE311: Information Theory and Coding</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>NIL</b>
	<b>3</b>	<b>1</b>	<b>0</b>	

**Course Objective:** To introduce fundamentals of coding and information theory.

S. NO	Course Outcomes (CO)
<b>CO1</b>	Introduce the principles and applications of information theory.
<b>CO2</b>	Comprehend various communication channel and error control code properties.
<b>CO3</b>	Apply linear block codes for error detection and correction.
<b>CO4</b>	Apply cyclic codes and parity generator for performance analysis & cyclic codes for error detection and correction.
<b>CO5</b>	Apply information theory and coding concepts to solved real-world problems.

S. NO	Contents	Contact Hours
<b>UNIT 1</b>	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.	<b>6</b>
<b>UNIT 2</b>	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.	<b>8</b>
<b>UNIT 3</b>	Discrete memory less channel, channel capacity BSC and other channels	<b>6</b>
<b>UNIT 4</b>	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.	<b>8</b>
<b>UNIT 5</b>	Cyclic codes, Generator and parity – check matrices, encoding, syndrome computation and 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.	<b>8</b>
<b>UNIT 6</b>	Blind Deconvolution Using Convex Programming, Asynchronous code-division random access using convex optimization.	<b>6</b>
<b>TOTAL</b>		<b>42</b>

## REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
<b>1</b>	Robert B. Ash, "Information Theory", Dover Science Publications, 2 <sup>nd</sup> Edition.	<b>1998</b>
<b>2</b>	Joy A. Thomas, Thomas M. Cover, "Element of Information Theory", John Wiley & Sons, 2 <sup>nd</sup> Edition.	<b>2013</b>
<b>3</b>	Shu Lin, Daniel J. Costello, "Error Control Coding: Fundamentals and Applications", Pearson, 1 <sup>st</sup> Edition.	<b>1982</b>

<b>4</b>	C. E. Shannon, "A Mathematical Theory of Communication", The Bell System Technical Journal.	<b>1948</b>
<b>5</b>	C. E. Shannon, "Communications in the presence of noise", Proceedings of the IRE.	<b>1949</b>
<b>6</b>	Simon Haykin, "Communication Systems", Wiley, 5 <sup>th</sup> Edition.	<b>2017</b>