

# LECTURE PLAN OF B. TECH (CSE) and DD (CSE)

Course Type	Course Code	Name of Course	L	T	P	Credit
	CSE17105	Information and Coding Theory	3	0	0	9

Course Objective
The objective of the course is to give an insight into Information Theory, Source Coding, and Error Control Coding.
Learning Outcomes
<p>Upon successful completion of this course, students will:</p> <ul style="list-style-type: none"> <li>• have a broad understanding of Information Theory, Source Coding, and Error Control Coding.</li> <li>• have a high-level understanding of different approaches so that digital data can be reliably transmitted over a noisy channel.</li> </ul>

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction to Information Theory, Uncertainty and Information, Information Measure, Entropy of Markov Sources, Extensions of Sources; Channel Models, Channel Capacity.	5	<ul style="list-style-type: none"> <li>• Comprehensive introduction about the course content will be delivered.</li> <li>• To study a different mathematical model for measuring the information content of a message.</li> <li>• To understand the significance of channel capacity in the context of communication aspect.</li> </ul>
2	Source Coding: Instantaneous Codes, Kraft Inequality, Source Coding Theorem, Shannon Codes, Shannon-Fano Codes, Huffman Codes, Arithmetic Codes.	5	<ul style="list-style-type: none"> <li>• To learn the need of source coding and to get an overview of different categories of source codes.</li> </ul>
3	Fundamentals of Channel Coding: Decoding Rules, Definition of Block code, Single parity check codes, Product code, Hamming codes, Error-detection and error-correction capabilities of block codes. Bounds on size of codes.	7	<ul style="list-style-type: none"> <li>• To understand the need for channel coding in a communication system.</li> <li>• To learn some special class of Block codes and their encoding-decoding procedures.</li> <li>• To realize error-detection and error-correction capabilities of block codes.</li> </ul>
4	Definition of linear codes, Parity Check Matrix, Decoding of Linear Block code.	3	<ul style="list-style-type: none"> <li>• This unit will help student to understand another class error control codes like Linear Code and its encoding-decoding mechanism.</li> </ul>
5	Definition of Cyclic codes, Encoding and Decoding of Cyclic codes, LFSR based Cyclic code Encoding-decoding.	6	<ul style="list-style-type: none"> <li>• To understand encoding-decoding mechanism of cyclic codes.</li> <li>• To realize encoding-decoding of cyclic codes using LFSR.</li> </ul>
6	Definition of BCH codes, Encoding and Decoding of BCH codes, PGZ Decoder, Reed-Solomon codes.	7	<ul style="list-style-type: none"> <li>• To understand the need for burst error correcting codes.</li> <li>• To learn BCH and Reed-Solomon codes.</li> </ul>
7	Convolution codes: Encoding, State diagram, Trellis diagram, Viterbi Decoder, Turbo codes.	6	<ul style="list-style-type: none"> <li>• To understand the basic differences between block codes and Convolution codes.</li> <li>• To realize encoding-decoding of Convolution codes and Turbo codes</li> </ul>

## Text Books:

1. R. Togneri and C. J. S. deSilva, Fundamentals of Information Theory and Coding Design, CRC Press
2. S. Gravano, Introduction to Error Control Codes, Oxford

## Reference Books:

1. K. Sayood, Introduction to Data Compression, Morgan Kaufmann
2. S. Lin and D. J. Costello, Error Control Coding, Prentice Hall
3. Todd K. Moon, Error Correction Coding, Wiley-Interscience