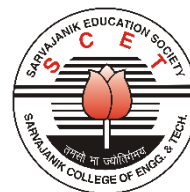




SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology



B. Tech. Semester VI

Subject Name: Information Theory and Coding **Subject Code:** BTEC14601

Type of course: PEC

Prerequisite: Probability and statistics , Digital Communication

Rationale: Nowadays, due to a lot of information communication, storage is an issue for digital data. The course presents how the information can be stored and transmitted effectively. The methods for detection and correction of transmission errors using different channel coding techniques are discussed in this course.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
2	0	2	3	60	25	15	30	20	150

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. no.	Topics	Teaching Hrs.	Module % Weightage
1.	Review of Information Theory: Measure of Information, Entropy, Average length, Error Free Communication Over a noisy channel, Definition of Capacity, types of channel, DMC, Practical Communication System In Light of Shannon's Equation.	6	20
2.	Source Coding: Properties of Code: Uniquely Decodable Code, Block Codes And Instantaneous code, construction of instantaneous code, Optimal Code And Instantaneous decodable codes (IDC), Krafts inequality. Huffman and Shannon-Fano code. Lossless Image Compression, Arithmetic code, LZ Algorithm.	8	25
3.	Channel Coding: Basic of Channel coding and Hamming distance, Channel Capacity- Discrete memory-less channels (DMC), Continuous Sources and Channels: Differential Entropy- Mutual information, Shannon-Harley Theorem, Shannon limit,	8	25
4.	Error Correcting and detecting code: Linear block codes, Hamming codes, Cyclic code, Convolution code, Trellis Diagram, Viterbi decoding Turbo Codes, LDPC Codes	8	30



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Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	25	20	20	15	0

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels (**Revised Bloom’s Taxonomy**)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

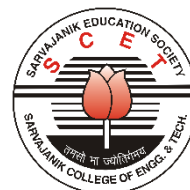
Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Digital and analog communication system	B.P.Lathi Zhi Ding	OXFORD university press. 9780198065340	2019	4 th
2.	Foundation of coding	Jiri Adamek	John Wiley sons 9788126549016	2014	Latest
3.	Error control systems for digital communication and storage	Wicker, Stephen.B	PHI 9788131734407	2010	2 nd
4.	Information theory coding and cryptography	Ranjan Bose	TMH 9780070669017	2018	3 rd

Course Outcome:

Sr. No.	CO Statement After learning this subject students will be able to,	Marks % weightage
CO-1	Compute entropy, information and Capacity	15
CO-2	Design uniquely decodable and instantaneous code	20
CO-3	Design various source codes like Huffman , Arithmetic, Shannon fano ,LZ Algorithm lossless image compression	20
CO-4	Design the encoding and decoding circuits for Linear Block codes, cyclic codes, convolutional codes, Trellis Diagram.	25
CO-5	Apply various codes in real time applications.	20



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Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	1	-	-	2	-	-	-	2	-	1	-	-	2	-
CO-2	3	2	1	-	2	-	-	-	3	2	2	-	-	3	-
CO-3	3	2	2	1	3	-	-	-	3	2	2	2	3	3	2
CO-4	3	2	2	1	3	-	-	-	3	2	2	2	3	3	2
CO-5	3	3	3	2	3	3	-	2	3	2	3	3	3	3	3

List of practical:

1. Verify Kraft’s inequality for binary and ternary codes and generate instantaneous codes.
2. A) Simulate binary Huffman code.
B) Find average length, entropy and coding efficiency of the code.
3. Write a program that takes in channel transition probability matrix and computes Mutual Information & channel capacity of the discrete memory-less channel.
4. Write a program to encode messages for a forward error correction system with a given Linear block code.
5. Write a program to decode the encoded word for a forward error correction system with a given Linear block code.
6. Write a program to encode messages for a system with given Cyclic Polynomial code
7. Decoding the messages for a system with a given cyclic polynomial code and verifying through simulation.
8. Verify the concept of loss less data compression technique using Huffman coding.
9. Write a program to encode messages for a system with convolution code.

List of Open Source/learning websites:

- <https://nptel.ac.in/courses/117101053-Information Theory and Coding>
- <https://nptel.ac.in/courses/108102117-Information Theory, Coding and Cryptography>

List of Open Source software:

- Python, SCilab