

Branch Name:	Information and Communication Technology
Semester/Year:	Semester I / First Year
Subject Title:	Information Theory and Coding
Subject Code:	2ET2080102T
Pre-requisite:	Probability Principles, Linear Algebra, and Calculus

Course Objective:

PG Students of ICT Department need to possess good understanding of the fundamentals and applications of digital communication system. The course presents in detail the theory and practice of efficient storage and transmission of information over noisy channels. They are expected to be able to design efficient error correcting codes. Theory concepts of source coding, error detecting and correcting schemes, their encoding and decoding process, cryptography will be verified through implementation in MATLAB and Simulink.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCE		SEE		CCE		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Subject Contents			
Sr. No	Topic	Total Hours	Weight (%)
1	Basic concept of coding, Unique decodable codes and instantaneous decodable codes (IDC) Construction of IDC, Kraft's inequality and McMillan's theorem, Huffman and Shannon-Fano code.	6	18%
2	Entropy, Entropy of sources and their extension. Lossless image	4	10%

	compression		
3	Arithmetic Coding Basic of channel coding and Hamming distances, channel capacity and shannon's fundamental theorem	4	10%
4	Linear block codes ; Systematic linear codes and optimum decoding for the binary symmetric channel; Generator and parity Check Matrices Syndrome decoding on symmetric channels; Hamming codes	8	25%
5	Cyclic code, Burst errors, BCH Code, Reed Solomon Codes	4	10%
6	Convolution codes, Viterbi decoding algorithm	4	10%
7	Wozencraft's sequential decoding algorithm, Fann's algorithm and other sequential decoding algorithms	4	10%
8	Cryptography	2	7%

Review Presentation: The student is expected to spend minimum 2 hours per week (as mentioned in the teaching and evaluation scheme) to refer at least two peer reviewed journal papers related to this domain/subject. The student is expected to identify issues/challenges and emerging trends in the domain/subject. Student is supposed to explore various video lectures (E.g. NPTEL) available in the domain/subject. Student is required to make a review-presentation on the work carried out for the same.

Recommended sites for journal papers are (1) dl.acm.org (2) springer.com (3) sciencedirect.com (4) elsevier.com (5) ieeexplore.ieee.org (6) scholar.google.co.in (7) scopus.com or similar of similar repute.

Course Outcome:

Upon successful completion of this course the student would be able to:

- To obtain an understanding of the theoretical principles of source coding.
- To focus on the application of Information Theory to communications in general and on channel coding and capacity in particular.
- To analyze various error correcting codes.
- To compare coded vs. uncoded system.
- To Use MATLAB for analysis of various source coding and channel coding techniques.

List of References:

1. Jiri Adamek, Foundation of coding, John Wiley and sons.
2. A.J. Viterbi and J.K.Ormura, Principal of Digital Communication and Coding, McGraw Hill
3. Bernard Sklar, Digital communication fundamental and Application, PE India.

4. N. Abramson, Information and Coding, McGraw Hill, 1963
5. M Mansurpur, Introduction to Information Theory, McGraw Hill, 1987
6. R.B.Ash, Information Theory, Prentice Hall, 1970
7. Shu Lin and D.J.Costello Jr., Error Control Coding, Prentice Hall, 1983

E-Resources:

1. <http://nptel.ac.in/>
2. Interesting Video: Claude Shannon - Father of the Information Age

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	To obtain an understanding of the theoretical principles of source coding.	1 Remembering 2 Understanding
CLO2	To focus on the application of Information Theory to communications in general and on channel coding and capacity in particular.	2 Understanding 3. Apply
CLO3	To analyze various error correcting codes.	4 Analyze
CLO4	To compare coded vs. uncoded system.	3 Applying
CLO5	To analyze various Cryptography Method.	4 Analyze
CLO6	To Use MATLAB for analysis of various source coding and channel coding techniques.	6 Create

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M	M	L	L	M			L				H	L		
CLO2		L	M	H	L	L					L	L	M	L		

CLO3	L	M	M	L	M	H		M		L			M	L		
CLO4	M	LM	M	L	M	H		M	L				M	L		
CLO5	M	L	L	L	M	H		M		L			H	L		
CLO6	L	M	L	L	M	H		M			L		H	L		

H: High, M: Medium, L: Low