



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
IT35	Information Theory and Coding	3	1	-	3	1	-	4
		Examination Scheme						
		ISE		MSE		ESE		
		10		30		100 (60%weightage)		

Pre-requisite Course Codes		
After successful completion of the course, student will be able to:		
Course Outcomes	CO1	Compute source information based on capacity of channel for transfer of Information.
	CO2	Identify Compression Algorithm to reduce the Size of Information.
	CO3	Find errors in the Information and correct them.
	CO4	Represent Information using number theory systems.
	CO5	Identify cryptographic algorithm to secure information.

Module No.	Unit No.	Topics	Ref.	Hrs.
1	Information Theory and Source Coding		2	06
	1.1	Uncertainty and Information		
	1.2	Entropy		
	1.3	Joint Entropy and Conditional Entropy		
	1.4	Mutual Information		
	1.5	Types of Channel		
	1.6	Prefix Coding		
	1.7	Channel Capacity		
2	Data Compression		4	12
	2.1	Lossy & Lossless Compression Schemes		
	2.2	Run Length encoding		
	2.3	Dictionary Based Compression, LZW		
	2.4	Huffman Coding 2.4.1 Adaptive Huffman Compression		
	2.5	Sliding Window Compression LZ77		
	2.6	Image Compression 2.6.1 GIF 2.6.2 JPEG		
2.7	Video Compression			



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		2.7.1 Motion Compensation 2.7.2 H.261 2.7.3 MPEG		
3	Error Control Coding Techniques		1	10
	3.1	3.1 Types of Codes Error Checking & Correcting Codes 3.1 Linear Block Codes 3.1.1 Matrix Description of Linear Block Codes 3.1.2 Equivalent Codes 3.1.3 Parity Check matrix 3.1.4 Syndrome Decoding 3.1.5 Error Correction		
	3.2	Cyclic Codes 3.2.1 Polynomials 3.2.2 Matrix Description of Cyclic Codes 3.2.3 Cyclic Redundancy Check (CRC) Codes 3.2.4 Circuit Implementation of Cyclic Codes		
	3.3	Convolutional Codes 3.3.1 Convolutional Encoder 3.3.2 Polynomial Description of Convolutional Codes		
4	Basic Number Theory		3	06
	4.1	Modular Arithmetic		
	4.2	Congruence		
	4.3	Modular Exponentiation		
	4.4	Fermat's Little and Euler Theorem		
	4.5	Prime Number Generation		
	4.6	Random Number Generation		
	4.7	Primitive Roots		
	4.8	Discrete Probability		
	4.9	Discrete Logarithms		
5	Cryptographic Techniques		5	08
	5.1	Security Goals, Threats and Attack on Information		
	5.2	Classic Cryptography		
	5.3	Symmetric Key Cryptography 5.3.1 DES 5.3.2 AES 5.3.3 Triple DES		
	5.4	5.4 Public and Private Key Cryptography 5.4.1 RSA 5.4.2 Diffie-Hellman		
	5.5	Hash Function 5.5.1 MD5 5.5.2 SHA-1 5.5.3 Digital Signature		
Total				42



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References:

1. Ranjan Bose, "*Information Theory, Coding and Cryptography*", 2nd edition, Tata McGraw Hill, 2008.
2. Thomas Cover, "*Element of information theory*", 2nd edition, Wiley.
3. Ivan nivan , "*An Introduction to Theory of numbers* " , 5th edition, Wiley.
4. Ze-Nian Li& Mark.S.Drew, "*Fundamentals of Multimedia*", PHI publication, 2011.
5. Trappe and Washington, "*Introduction to Cryptogrpahy with Coding theory*", Pearson, 2007.