SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Information Technology	LP: IT16601 Rev. No: 00 Date: 17.12.18
B.E/**B.Tech**/M.E/M.Tech : Information Technology Regulation:2016 PG Specialisation : NA Sub. Code / Sub. Name : IT16601/Information and Coding Theory Unit : I	

Unit Syllabus: INFORMATION THEORY

Information– Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding -Joint and conditional entropies, Mutual information -Discrete memory less channels – BSC, BEC– Channel capacity, Shannon limit.

Objective: Be familiar with the methods for generation of codes and their decoding techniques.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Information– Entropy, Information rate, classification of codes, Kraft McMillan inequality	1-Ch. 2 (Pg. 13-25)	PPT/BB
2	Source coding theorem, Shannon-Fano coding- algorithm, Problems, Entropy, Efficiency	1-Ch. 2(Pg. 20-25)	PPT/BB
3	Huffman coding- algorithm, Problems, Entropy, Efficiency, Application.	1-Ch. 2(Pg. 25-28)	PPT/BB
4	Extended Huffman coding - algorithm, Problems, Entropy, Efficiency	1-Ch. 2(Pg. 20-25)	PPT/BB
5	Joint and conditional entropies, Mutual information – Principle, properties Channel capacity, Shannon limit.	1-Ch. 2(Pg. 20-25)	PPT/BB
6	Discrete memory less channels –Introduction, Transition probability matrix, Probability of error and correct reception	1-Ch. 2(Pg. 28-35)	PPT/BB
7	Binary Symmetric Channel –Deriving Transition probability matrix, Probability of error and correct reception ,channel capacity	1-Ch. 2(Pg. 28-35)	PPT/BB
8	BEC– Deriving Transition probability matrix, Probability of error and correct reception ,channel capacity	Internet	PPT/BB
9	Channel capacity theorem – definition, problems, usefulness	1-Ch. 2(Pg. 45-50)	PPT/BB

Content beyond syllabus covered (if any):

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Sub. Code / Sub. Name: IT16601/Information and Coding Theory

Unit : II

Unit Syllabus: **SOURCE CODING**

Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MPEG Audio Layers I,II,III, Dolby AC, Atmos - Speech: Channel Vocoder, Linear Predictive Coding, Image Compression.

Objective: Be familiar with the methods for generation of codes and their decoding techniques.

Session No *	Topics to be covered	Ref	Teaching Aids
10	Adaptive Huffman Coding – principles, example, application	2-Ch. 3 (Pg. 130-134)	PPT/BB
11	Arithmetic Coding principles, example, application ,LZW algorithm – binary and non binary principles, example, application	2-Ch. 3 (Pg. 134-140)	PPT/BB
12	Audio – sampling rate, Perceptual coding, Masking techniques, Psychoacoustic model	2-Ch. 3 (Pg. 182-184)	PPT/BB
13	MPEG Audio Layers I,II,III, Dolby AC, Atmos	2-Ch. 3 (Pg. 185-193)	PPT/BB
14	Speech: Channel Vocoder- DPCM,ADPCM,APC	2-Ch. 3 (Pg. 173-179)	PPT/BB
15	Linear Predictive Coding- Code excited LPC	2-Ch. 3 (Pg. 179-181)	PPT/BB
16	Image Compression- GIF, TIFF	2-Ch. 3 (Pg. 140-143)	PPT/BB
17	Digitized documents, Digitized Pictures	2-Ch. 3 (Pg. 144-150)	PPT/BB
18	JPEG- preparation,Forward DCT, Quantization, Encoding	2-Ch. 3 (Pg. 150-168)	PPT/BB

Content beyond syllabus covered (if any):

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Sub. Code / Sub. Name: IT16601/Information and Coding Theory

Unit : III

Unit Syllabus: CHANNEL AND NOISY CODING

Discrete memory less channel - Classification of channels & channel capacity - Calculation of channel capacity - Decoding schemes - Fano's inequality -Shannon's fundamental theorem - Capacity of a band limited Gaussian channel, Implication of the information capacity theorem - Information capacity of colored noise channel - Rate distortion theory - Data compression.

Objective: Be aware of compression and decompression techniques.

Session No *	Topics to be covered	Ref	Teaching Aids
19	Discrete memory less channel - Classification of channels & channel capacity	3-Ch. 2 (Pg. 60-63)	PPT/BB
20	Calculation of channel capacity- channel capacity for MIMO Systems	3-Ch. 2 (Pg. 73-75)	PPT/BB
21	Decoding schemes - Fano's inequality	1-Ch. 8 (Pg. 417-421)	PPT/BB
22	Shannon's fundamental theorem	3-Ch. 2 (Pg. 71-73)	PPT/BB
23	Capacity of a band limited Gaussian channel	1-Appendix. D (Pg. 561-563)	PPT/BB
24	Implication of the information capacity theorem	3-Ch. 2 (Pg. 68-71)	PPT/BB
25	Information capacity of colored noise channel	internet	PPT/BB
26	Rate distortion theory	3-Ch. 1 (Pg. 38-41)	PPT/BB
27	Data compression	4-Ch. 1 (Pg. 3-10)	PPT/BB

Content beyond syllabus covered (if any):

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Sub. Code / Sub. Name: IT16601/Information and Coding Theory

Unit : IV

Unit Syllabus: ERROR CONTROL CODING
Linear Block codes – Syndrome Decoding – Minimum distance consideration – cyclic codes –Generator polynomial – Parity check polynomial – Encoder for cyclic codes – calculation of syndrome, Convolutional codes, turbo codes, Viterbi algorithm.

Objective: Understand error–control coding.

Session No	Topics to be covered	Ref	Teaching Aids
28	Linear Block codes – Syndrome Decoding	3-Ch. 3 (Pg. 102 -105)	PPT/BB
29	Minimum distance consideration	3-Ch. 3 (Pg. 106 -109)	PPT/BB
30	Cyclic codes -Generator polynomial ,Parity check polynomial	3-Ch. 4 (Pg. 132 -141)	PPT/BB
31	Encoder for cyclic codes, calculation of syndrome	3-Ch. 4 (Pg. 144 - 148)	PPT/BB
32	Convolutional codes – Tree, Trellis, Polynomial description	3-Ch. 6 (Pg. 189 - 199)	PPT/BB
33	turbo codes- decoding,	3-Ch. 6 (Pg. 219 - 222)	PPT/BB
34	interleaver design.	3-Ch. 6 (Pg. 223 - 228)	PPT/BB
35	Viterbi algorithm- principles, applications	3-Ch. 6 (Pg. 207 - 210)	PPT/BB
36	Viterbi algorithm -decoding	3-Ch. 6 (Pg. 211 - 214)	PPT/BB

Content beyond syllabus covered (if any):

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Sub. Code / Sub. Name: IT16601/Information and Coding Theory

Unit : V

Unit Syllabus: CODING FOR SECURE COMMUNICATION

Introduction to cryptography-Overview of Encryption Techniques – operations used – Symmetric Cryptography – DES - IDEA – RC Ciphers – Asymmetric Algorithms – RSA Algorithm – PGP- One-way Hashing - Elliptic Curve Cryptography-Diffie-Hellman Key Agreement Protocol-Chaos Functions – Quantum Cryptography – Biometric encryption- Cryptanalyis.

Objective: To be familiar with coding for secure communication.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Introduction to cryptography-Overview of Encryption Techniques	3-Ch. 8 (Pg. 277-282)	PPT/BB
38	Operations used by Encryption Techniques - Symmetric Cryptography	3-Ch. 8 (Pg. 282-285)	PPT/BB
39	DES- Encryption, Key Transformation, Expansion Permutation, Substitution Decryption, Security	3-Ch. 8 (Pg. 285-288)	PPT/BB
40	IDEA – RC Ciphers	3-Ch. 8 (Pg. 288-290)	PPT/BB
41	Asymmetric Algorithms – RSA Algorithm	3-Ch. 8 (Pg. 290-294)	PPT/BB
42	PGP- One-way Hashing	3-Ch. 8 (Pg. 294-298)	PPT/BB
43	Elliptic Curve Cryptography-Diffie-Hellman Key Agreement Protocol	3-Ch. 8 (Pg. 299-303)	PPT/BB
44	Chaos Functions – Quantum Cryptography	3-Ch. 8 (Pg. 303-305)	PPT/BB
45	Biometric encryption- Cryptanalyis.	3-Ch. 8 (Pg. 305-309)	PPT/BB

Content beyond syllabus covered (if any):

Knowledge Representation and Learning

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REFERENCES:

1. Simon Haykin, "Communication Systems", Fourth Edition, John Wiley and Sons, 2001.
2. Fred Halsall, "Multimedia Communications, Applications Networks Protocols and Standards", Pearson Education, Asia 2002.
3. R Bose, "Information Theory, Coding and Cryptography", Fifth Edition, Tata Mcgraw Hill,2009
4. Khalid Sayood, "Introduction to Data Compression", Fifth Edition, Elsevier, 2017.

	Prepared by	Approved by
Signature		
Name	Ms.N. Devi Ms. P. Leela Rani	Dr. V. Vidhya
Designation	AP/IT	HOD/IT
Date	17.12.18	17.12.18
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD