SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Information Technology	LP: IT18303 Rev. No: 01 Date:18/6/2020
.E/B.Tech/M.E/M.Tech : Information Technology G Specialisation : NA ub. Code / Sub. Name : IT18303/Information and Coding Theory Init : I	Regulation:2018

Unit Syllabus: INFORMATION ENTROPY FUNDAMENTALS

Uncertainty, Information and Entropy – Source coding Theorem – Huffman coding –Shannon Fano coding – Discrete Memory less channels – channel capacity – channel coding Theorem – Channel capacity Theorem.

Objective: To impart knowledge about the three fundamental limits on different aspects of a digital communication system.

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

Content beyond syllabus covered (if any): Extended Huffman coding , Shannon limit

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: IT18303/Information and Coding Theory

Unit : II

Unit Syllabus: DATA AND VOICE CODING

Pulse Amplitude Modulation, Pulse Code Modulation, Time Division Multiplexer, Digital Multiplexers,Differential Pulse code Modulation – Adaptive Differential Pulse Code Modulation – Adaptive subband coding – Delta Modulation – Adaptive Delta Modulation – Coding of speech signal at low bit rates (Vocoders, LPC).

Objective: To understand how data and voice signal are converted to digital form

Session No *	Topics to be covered	Ref	Teaching Aids
10	Pulse Amplitude Modulation - components, Uses,Limitation	1-Ch. 4 (Pg. 161-162)	PPT
11	Pulse Code Modulation – sampling, quantizing, encoding, regeneration, decoding, reconstruction, multiplexing, synchronization	1-Ch. 5 (Pg. 172-180)	PPT
12	Time Division Multiplexer- block diagram, uses, limitations, Digital Multiplexers – T1 system, M12 multiplexer	1-Ch. 4(Pg. 162-165) 1-Ch. 5 (Pg. 218-225)	PPT
13	Differential Pulse code Modulation – Transmitter, Receiver	1-Ch. 5 (Pg. 200-203)	PPT
14	Adaptive Differential Pulse Code Modulation – AQF,AQB,APF,APB	1-Ch. 5 (Pg. 211-215)	PPT
15	Adaptive sub-band coding- coding scheme of Transmitter and receiver	1-Ch. 5 (Pg. 215-217)	PPT
16	Delta Modulation- Transmitter, receiver, quantization noise	1-Ch. 5 (Pg. 203-208)	PPT
17	Adaptive Delta Modulation- scheme of Transmitter and receiver	1-Ch. 5 (Pg. 208-210)	PPT
18	Coding of speech signal at low bit rates- objective, applications	1-Ch. 5 (Pg. 210-211)	PPT

Content beyond syllabus covered (if any):-

Sub. Code / Sub. Name: IT18303/Information and Coding Theory

Unit : IV

Unit Syllabus: COMPRESSION TECHNIQUES

Principles – Text compression – Static Huffman Coding – Dynamic Huffman coding – Arithmetic coding – Image Compression – Graphics Interchange format – Tagged Image File Format – Digitized documents – Introduction to JPEG standards.

Objective: To learn about the techniques to represent text and image data in a efficient manner for transmission

Session No *	Topics to be covered	Ref	Teaching Aids
28	Principles – source encoders & destination decoders, lossless and lossy compression, entropy encoding, source encoding	3-Ch. 3 (Pg. 138-146)	PPT
29	Text Compression – static huffmann coding –encoding,decoding, limitations	3-Ch. 3 (Pg. 146-152)	PPT
30	Dynamic huffmann coding – tree construction, synchronizing, encoding,decoding	3-Ch. 3 (Pg. 152-156)	PPT
31	Arithmetic Coding – encoding algorithm and decoding algorithm, examples	3-Ch. 3 (Pg. 156-158) 2-Ch. 3 (Pg. 185-193)	PPT
32	**LZW algorithm – binary and non binary principles, example, application**	3-Ch. 3 (Pg. 159-162) 2-Ch. 3 (Pg. 173-179)	PPT
33	Image Compression – GIF,TIFF	3-Ch. 3 (Pg. 162-164) 2-Ch. 3 (Pg. 140-143)	PPT
34	Digitized documents, Digitized Pictures	3-Ch. 3 (Pg. 164-172) 2-Ch. 3 (Pg. 144-150)	PPT
35	JPEG- preparation,Forward DCT, Quantization, Encoding	3-Ch. 3 (Pg. 172-190) 2-Ch. 3 (Pg. 150-168)	PPT
36	JPEG- frame format	3-Ch. 3 (Pg. 172-190) 2-Ch. 3 (Pg. 150-168)	PPT

tent beyond syllabus covered (if any): LZW algorithm – binary and non binary principles, example, application

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Sub. Code / Sub. Name: IT18303/Information and Coding Theory

Unit : III

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-Code tree, Trellis Diagram, Viterbi decoding.

Objective: To learn about the techniques to transmit data in robust and efficient manner

Session No	Topics to be covered	Ref	Teaching Aids
19	Linear Block codes - properties, generation of linear block codes	3-Ch. 3 (Pg. 102 -109) 4- Ch.3 (Pg 89-122)	PPT
20	Syndrome- properties, calculation of syndrome , Decoding procedure, Minimum distance consideration	3-Ch. 3 (Pg. 102 -109) 4- Ch.3 (Pg 89-122)	PPT
21	Cyclic codes -Generator polynomial ,Parity check polynomial	3-Ch. 4 (Pg. 132 -141) 4- Ch.4 (Pg 131-155)	PPT
22	Encoder circuit for cyclic codes, circuit for calculation of syndrome	3-Ch. 4 (Pg. 144 - 148)	PPT
23	Convolutional codes – Time domain approach, transform domain approach Tree, Trellis, Polynomial description	3-Ch. 6 (Pg. 189 - 199) 4- Ch.6 (Pg 189-228)	PPT
24	Convolutional codes –state table, state diagram, codeTree,	3-Ch. 6 (Pg. 207 - 214) 4- Ch.6 (Pg 189-228)	PPT
25	Convolutional codes –Trellis diagram , viterbi algorithm for decoding	3-Ch. 6 (Pg. 207 - 214) 4- Ch.6 (Pg 189-228)	PPT
26	Convolutional codes – viterbi algorithm for decoding	3-Ch. 6 (Pg. 207 - 214) 4- Ch.6 (Pg 189-228)	PPT
27	**Turbo codes – interleaver design, application**	3-Ch. 6 (Pg. 219 - 228) 4- Ch.6 (Pg 189-228)	PPT

Content beyond syllabus covered (if any): Turbo codes – interleaver design, application

Sub. Code / Sub. Name: IT18303/Information and Coding Theory

Unit : V

Unit Syllabus: AUDIO AND VIDEO CODING

Linear Predictive coding – code excited LPC – Perceptual coding, MPEG audio coders – Dolby audio coders – Video compression – Principles – Introduction to H.261 & MPEG Video standards.

Objective: To learn about the techniques to represent audio and video data in a efficient manner for transmission.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Audio – sampling rate, Perceptual coding, Masking techniques, Psychoacoustic model	2-Ch. 3 (Pg. 182-184)	PPT
38	Linear Predictive coding – principles, application	3-Ch. 4 (Pg. 201-204) 2-Ch. 3 (Pg. 134-140)	PPT
39	code excited LPC– principles, application	3-Ch. 4 (Pg. 201-204) 2-Ch. 3 (Pg. 134-140)	PPT
40	MPEG Audio Layers I,II,III – principles, application	3-Ch. 4 (Pg. 207-215) 2-Ch. 3 (Pg. 185-193)	PPT
41	Dolby AC - – principles, application	3-Ch. 4 (Pg. 207-215) 2-Ch. 3 (Pg. 173-179)	PPT
42	Video compression principles –motion estimation, motion compensation, implementation issues	3-Ch. 4 (Pg. 215-246) 2-Ch. 3 (Pg. 179-181)	PPT
43	Introduction to H.261 – macro block format, frame format, GOB structure format.	3-Ch. 4 (Pg. 215-246) 2-Ch. 3 (Pg. 140-143)	PPT
44	MPEG video – bit stream structure, DCT derivation,	3-Ch. 4 (Pg. 215-246) 2-Ch. 3 (Pg. 144-150)	PPT
45	MPEG 4 – content based video coding	3-Ch. 4 (Pg. 215-246) 2-Ch. 3 (Pg. 150-168)	PPT

ntent beyond syllabus covered (if any): -

Sub Code / Sub Name: IT18303/Information and Coding Theory

REFERENCES:

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

	Prepared by	Approved by
nature	K. Suresh	
me	Mr.K.Suresh Mr.V.Rajaram	Dr. V. Vidhya
ignation	AP/IT	HOD/INT
e	18/6/2020	18/6/2020

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