ITE3005	Information Coding Theory	L	T	P	J	C
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Pre-requisite	**ITE2003**	**Syllabus version**				
		1.0				

Course Objectives:
- To understand various devices used in Digital Communication.
- To understand the impact of interference on discrete time devices.
- To learn the various coding and sampling techniques

Expected Course Outcome:

1) Understand the design and construction of devices used in Communication Systems.

2) Address the challenges imposed in different types of Communication Systems

3) Design and construct various digital communication systems and implement various sampling and coding techniques.

4) Use and apply various coding techniques to analyze different communication systems.

5) Comprehend how the compression techniques are used in the communication mediums.

6) Understand the error control techniques to find the error during transmission.

7) Learn and implement error control coding and block codes.

Student Learning Outcomes (SLO):	**1, 2, 6**

[1] Having an ability to apply knowledge of mathematics, science, and engineering

[2] Having a clear understanding of the subject related concepts and of contemporary issues

[6] Having an ability to design a component or a product applying all the relevant standards and with realistic constraints

Module:1	**Information Theory**	**6 hours**

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.

Module:2	**Data Coding Techniques**	**5 hours**

Pulse Code Modulation-Delta modulation-Adaptive Delta Modulation-Differential Pulse code modulation-Comparison of Different Pulse code Modulation Techniques.

Module:3	**Textual Data Encoding Techniques**	**4 hours**

ASCII-Unicode- Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm.

Module:4	**Audio and Speech Coding**	**6 hours**

Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III,

Dolby AC3 - Speech: Coding Speech at lower pulse rate(ADPCM) Channel Vocoder, Linear Predictive Coding.

Module:5	**Source Coding: Image and Video**	**5 hours**

Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF.

Module:6	**Compression Techniques**	**7 hours**

Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard.

Module:7	**Error Control Coding: Block Codes**	**9 hours**

Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder - CRC -Convolutional codes – code tree, trellis, state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding.

Module:8	**Contemporary issues:**	**3 hours**

	Total Lecture hours:	**45 hours**

Text Book(s)

1.	R Bose, Information Theory, Coding and Cryptography, TMH, 2008.

Reference Books

1.	Stefan M. Moser, Po-Ning Chen, A student's guide to Coding and Information Theory, Cambridge University Press, 2012.
2.	K Sayood, Introduction to Data Compression, Third Edition, Elsevier, 2012.
3.	S Gravano, Introduction to Error Control Codes, Oxford University Press, 2007
4.	Amitabha Bhattacharya, Digital Communication, TMH 2006, Fred Halsall, Multimedia Communications: Applications, Networks, Protocols and Standards, Pearson Education Asia, 2011

Recommended by Board of Studies	05-03-2016		
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