COURSE CODE	COURSE TITLE	L	T	P	C
1152CS115	INFORMATION AND CODING THEORY	3	0	0	3

A. Preamble :

Information produced in many ways every day such as text, image, video etc. If directly stored as it received makes the security in question mark also it occupies more storage area. This course discusses about the various forms of information and its storage methods.

B. Prerequisite Courses:

Sl No	Course Code	Course Name
1	1151CS104	Digital Electronics

C. Related Courses:

Sl No	Course Code	Course Name
1	1152CS111	Multimedia Systems

D. Course Educational Objectives :

Students undergoing this course are expected to:

- Understand the basics of information theory and coding theories.
- Introduce the concept of amount of information, entropy, channel capacity, error-detection and error-correction codes, block coding, convolution coding, and Viterbi decoding algorithm.
- Understand and explain the basic concepts of information theory, source coding, channel and channel capacity, channel coding and relation among them.
- Describe the real life applications based on the fundamental theory.
- Calculate entropy, channel capacity, bit error rate, code rate, and steady-state probability and so on.
- Implement the encoder and decoder of one block code or convolution code using any program language.

E. Course Outcomes :

Upon the successful completion of the course, students will be able to:

CO Nos	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Understand the basics of information and coding theories.	K2
CO2	Discuss the various capacity reduction based coding techniques for text, audio and speech type of data.	K2
CO3	Compare various capacity reduction based coding techniques for image and video type of data.	K2
CO4	Illustrate various security oriented coding techniques for Block codes.	K2
CO5	Implement various error control techniques for Convolutional codes	K3

F. Correlation of Cos with Pos :

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**H**	**M**		**L**								**L**	**M**		
CO2	**H**	**L**	**M**										**M**		
CO3	**H**	**L**	**M**						**L**				**H**		
CO4	**H**	**L**	**M**	**L**				**L**	**L**		**L**	**L**	**M**	**M**	
CO5	**H**	**L**	**M**	**L**				**L**	**L**		**L**	**L**	**M**	**M**	**L**

3- High; 2-Medium; 1-Low

G. Course Content :

UNIT I INFORMATION THEORY 9

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 memoryless channels – BSC, BEC – Channel capacity, Shannon limit.

UNIT II SOURCE CODING: TEXT, AUDIO AND SPEECH 9

Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 – Speech: Channel Vocoder, Linear Predictive Coding

UNIT III SOURCE CODING: IMAGE AND VIDEO 9

Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard

UNIT IV ERROR CONTROL CODING: BLOCK CODES 9

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

UNIT V ERROR CONTROL CODING: CONVOLUTIONAL CODES 9

Convolutional codes – code tree, trellis, state diagram – Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding

Total : 45 Hours

H. Learning Resources

i.Text Books :

1. R Bose, “Information Theory, Coding and Crptography”, TMH 2007
2. Fred Halsall, “Multidedia Communications: Applications, Networks, Protocols and Standards”, Perason Education Asia, 2002

ii. References Books:

1. K Sayood, “Introduction to Data Compression” 3/e, Elsevier 2006
2. S Gravano, “Introduction to Error Control Codes”, Oxford University Press 2007
3. Amitabha Bhattacharya, “Digital Communication”, TMH 2006