INFORMATION THEORY AND CODING

Course Code	20EC6601B	Year	III	Semester	II
Course Category	HONORS3	Branch	ECE	Course Type	Theory
Credits	4	L-T-P	3-1-0	Prerequisites	Digital Communications
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Interpret measurement of information and errors-L2
CO2	Apply knowledge to design various source codes and channel codes-L3
CO3	Design encoders and decoders for block and cyclic codes-L4
CO4	Analyse the performance of channel coding techniques-L4

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation   2-Medium correlation   3-Strong correlation
       * - Average value indicates course correlation strength with mapped PO

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2													
CO2	3								2			2	3	
CO3		3								2		2	3	
CO4		3							3	3		3	3	
Average* (Rounded to nearest integer)	3	3							3	3		2	3	

Syllabus		
Unit No.	Contents	Mapped CO
I	**Coding for Reliable Digital Transmission and storage** Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies. **Source Codes:** Shannon-fano coding, Huffman coding, Lempel Ziv Coding	CO1
II	**Linear Block Codes** Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array	CO1-CO2

	and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system	
III	**Cyclic Codes** Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.	CO3,CO4
IV	**Convolutional Codes** Encoding of Convolutional Codes- Structural and Distance Properties, state, tree, trellis diagrams, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.	CO3, CO4
V	**BCH Codes** Minimum distance and BCH bounds, Decoding procedure for BCH codes, Syndrome computation and iterative algorithms, Error locations polynomials for single and double error correction	CO3,CO4

Learning Resources
Text Books
1. Shu Lin, Daniel J.Costello,Jr, –Error Control Coding- Fundamentals and Applications Prentice Hall, Inc 2014. 2. Man Young Rhee- Error Correcting Coding Theory, McGraw – Hill Publishing 1989
Reference Books
1. John G. Proakis -Digital Communications, 5th Ed., TMH 2008. 2. Salvatore Gravano- Introduction to Error Control Codes -oxford
e- Resources & other digital material
https://nptel.ac.in/courses/108/105/108105159/