Coding Theory and Applications

CourseCode	23EC4701B	**Year**	IV	**Semester**	I
Course Category	PE–IV	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Digital Communications
ContinuousInternal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		BL
CO1	Construct and analyze linear block codes using generator matrices and parity-check matrices**.**	L2
CO2	Design of Cyclic code encoder and decoder	L3
CO3	Construction of tree and Trellis diagrams for convolutional codes	L3
CO4	Analyse of Burst error correcting codes and BCH codes and also carry out their applications	L4

Contribution of Course Outcomes towards achievement of Program Outcomes &Strength of correlations (3-High, 2: Medium, 1:Low)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2								1		1	2	2
CO2	3								1		1	3	2
CO3	3								1		1	3	2
CO4	3	2							1		1	2	2
Avg.	3	2							1		1	3	2

Syllabus		
Unit No.	**Contents**	**Mapped CO**
1	Channel Coding: Types of Errors, 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 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	CO1
2	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.	CO2
3	Convolutional Codes: Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Viterbi decoding, Applications of Convolutional codes in ARQ system.	CO3
4	Burst–Error Correcting Codes: Decoding of Single-Burst error Correcting Cyclic codes, Burst-Error-Correcting Convolutional Codes, Bounds on Burst Error-Correcting Capability, Interleaved Cyclic and Convolutional Codes, Phased-Burst –Error-Correcting Cyclic and Convolutional codes.	CO4

5	BCH Codes: BCH code- Definition, Minimum distance and BCH Bounds, Decoding Procedure for BCH Codes- Syndrome Computation and Iterative Algorithms, Error Location Polynomials and Numbers for single and double error correction	CO4

Learning Resources
Text Books
1. Shu Lin, Daniel J.Costello, Jr, Error Control Coding- Fundamentals and Applications –Prentice Hall, Inc.,1983 2. Man Young Rhee- Error Correcting Coding Theory- McGraw-Hill Publishing,1989.
Reference Books
1. Bernard Sklar, PE Digital Communications-Fundamental and Application , 2nd Ed.,2009 2. John G. Proakis, Digital Communications- 5th Ed., TMH, 2008.
e- Resources & other digital material
1. https://nptel.ac.in/courses/117/103/117103065/