

Branch Name:	Signal Processing and Communication
Program Code:	ET214
Course Name:	Digital Modulation and Coding
Course Code:	2ET2140101T
Pre-requisite Course:	Fundamentals of basic digital communication systems

Course Objectives:

1. Understanding of the fundamentals and applications of digital communication system.
2. Theory and practice of digital M-ary modulation methods and their transmission over noisy channels.
3. Concepts of modulations, error detecting and correcting schemes, their encoding and decoding process through implementation in MATLAB and Simulink.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40		-	-	-	100

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	Band pass modulation techniques: representation of bandpass signals and systems, representation of digitally modulated signals (M-PAM, M-QAM, M-FSK, M-PSK, QPSK, DPSK) with signal space diagrams, continuous phase modulations (CPM, CPFSK, MSK, GMSK), multiplexing techniques, Basics of OFDM.	10	28	
2	Block codes: introduction of maximum likelihood decoding, Types of errors, Introduction to linear block codes, syndrome and error detection, minimum distance of block codes, error detecting and error correcting capabilities of block code, syndrome decoding, hamming codes, Description of cyclic codes, generator and parity matrix of cyclic codes, encoding of cyclic codes, syndrome computation and error detection, decoding of cyclic codes, cyclic hamming codes, shortened cyclic codes, problems.	07	20	
3	BCH Codes and Reed-Solomon Codes: Description of BCH codes, decoding of BCH codes, implementation of error detection, non-binary BCH codes and Reed-solomon code, Finite Fields, Reed-Solomon Encoding, Reed-Solomon Decoding,, problems, single burst error correcting codes, interleaved codes.	06	14	
4	Convolution codes: Encoding of convolution codes, encoding of convolution codes using time-domain approach, encoding of convolution codes using transform-domain	10	28	

	approach, state diagrams and code tree of convolution codes, trellis diagram, problems.		
5	Modern coding: Introduction to Turbo Coding, iterative decoding. Introduction to Low Density Parity Check Code	06	10

List of Text Book:

1. “Error Control Coding: Fundamentals and Applications”, Shu Lin and Daniel J. Costello, Prentice Hall Series
2. “Digital Communication”, John G. Proakis, Fourth Edition, McGraw Hill
3. “Digital Communications Fundamentals and Applications”, Bernard Sklar, Prentice Hall

List of Reference Books:

1. “Principal of Digital Communication and Coding”, A.J. Viterbi and J.K. Ormura, McGrawHill.
2. “Information and Coding”, N. Abramson, McGraw Hill,

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom’s Taxonomy Level
CLO1	Compare various Bandpass modulation techniques	1 Remembering 2 Understanding
CLO2	Understand behavior of Block Codes and also evaluate different error correcting codes.	2 Understanding 5. Evaluate
CLO3	Compare RS and BCH codes also understand interleaving codes using MATLAB.	4 Analyze
CLO4	Encoding and Decoding of Convolution Codes	3 Applying
CLO5	Introduction and application of Modern Coding	3 Applying 4 Analyze
CLO6	Learn Basics of OFDM and MIMO System	2 Understanding

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1					L	M						H	H	M	L	
CLO2		H	M	M	L					L		H		M	L	
CLO3		M	H		L									H		L
CLO4		M	H		L			L					L		M	H
CLO5	H	M	H		L				L			H	L		M	H
CLO6	H	M	H		L							M	L		M	H

H: High, M: Medium, L: Low