Program	Second Year B.Tech. Information Technology (Semester III)	CL	TL	LL	SL	C
Course Name: Communication Systems	**Course Code:** ITCOR1MD201	2	-	2	2	3
Course Type:	Multidisciplinary Minor -I (MD)					
Pre-requisite:	NIL					

I RATIONALE

Analyzes communication concepts, applies coding, compression, and error control techniques, and models wireless communication for efficient data transmission.

II COMPETENCY

Demonstrate the ability to analyze and apply communication system concepts and compression methods for effective data transmission and processing

III COURSE OUTCOMES (COs)

After the completion of course based learning Learners will be able to,

Course Outcome Number	Course Outcome Statement
1	Compute code efficiency using source coding schemes based on entropy and information theory principles.
2	Apply compression algorithms for implementing basic lossy and lossless data compression.
3	Apply error control coding techniques.
4	Analyze wireless communication techniques.

IV TEACHING-LEARNING & ASSESSMENT SCHEME

				Learning Scheme						Assessment Scheme												
				Actual Contact Hrs/Week			SL	Total	Credits		Theory					Practical				SLA		Total
Sr. No.	Course Title	Course Type	Course Code					Notional		Exam	CIA		ESE	Total		CIAP	ESEP	Total				
				CL	TL	LL		Hours		Duration in Hrs	MSE Max	CCE Max	Max	Max	Min	Max	Max	Max	Min	Max	Min	
5	Communication System	MD	ITCOR1MD201	2	-	2	2	90	3	2	20	20	60	100	40	25	-	25	10	25	10	150

V LABORATORY LEARNING OUTCOME AND SUGGESTED LIST OF EXPERIMENTS (Minimum 8)

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment Titles(Minimum 8)	Relevant COs
1	Calculate entropy and channel capacity for a given set of source probabilities.	Calculate entropy and channel capacity for a given set of source probabilities.	CO1
2	Develop Huffman coding algorithms.	Develop and simulate Huffman coding algorithms.	CO2
3	Implement dictionary-based compression using LZW.	Implement dictionary-based compression using LZW.	CO2
4	Apply RLE (Run Length Encoding) to compress and decompress simple data.	Apply RLE (Run Length Encoding) to compress and decompress simple data.	CO2
5	Implement Error Checking and Correcting Codes	Implement Error Checking and Correcting Codes	CO3
6	Implement Linear Block Codes	Implement Linear Block Codes	CO3
7	Model the TDMA system using simulation tools	Modeling and simulation of TDMA for wireless communication	CO4
8	Demonstrate the ability to troubleshoot common issues in FDMA simulation	Modeling and simulation of FDMA for wireless communication	CO4
9	Simulate the working of CDMA to analyze system performance	Modeling and simulation of CDMA for wireless communication	CO4
10	Implement a system for Smart Image Transmission	Design and implement a system for Smart Image Transmission with Compression Algorithm.	CO2
11	Decide the suitable compression algorithm and develop the compressed image.	A satellite imaging company transmits daily vegetation index maps to ground stations. Each map is a grayscale image (256×256 pixels, values 0–255) representing vegetation density. Due to slow changes in vegetation patterns, large areas of the image have the same pixel values. Decide the suitable compression algorithm and develop the compressed image.	CO2

VI THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	1. Explore concept of information theory and entropy 2. Compute the efficiency and limitations of various source coding schemes	**Information Theory and Source Coding** 1.1 Introduction to Information Theory 1.2 Entropy and Types of Entropy 1.3 Source Coding 1.4 Prefix Coding 1.5 Channel Capacity	8
2	CO2	1. Implement lossy and lossless compression algorithms 2. Describe various image compression techniques	**Compression Algorithms** 2.1 Huffman Coding 2.2 Shannon-Fano-Elias Coding 2.3 Arithmetic Coding 2.4 Lempel-Ziv Algorithm 2.5 Run Length Encoding 2.6 Lossy and Lossless Compression Schemes 2.7 Image Compression – GIF,JPEG	8
3	CO3	1. Describe different types of codes and their roles in error detection and correction. 2. Describe linear block codes.	**Error Coding Techniques** 3.1 Types of Codes 3.2 Error Checking and Correcting Codes 3.3 Linear Block Codes	6
4	CO4	1. Analyze the progression across different wireless generations and wireless communication. 2. Apply multiple access techniques and spread spectrum methods for effective resource allocation in wireless systems.	**Wireless Communication techniques** 4.1 The progression of wireless generations from 1G to 5G, based on developments and variances in technology. 4.2 Multiple Access Techniques: FDMA, TDMA, CDMA 4.3 Spread Spectrum Techniques (DSSS, FHSS)	8

VII SUGGESTED SELF LEARNING ACTIVITIES

Study of Applications areas of communication.

Study of Information Theory and Coding concepts in detail.

Teacher shall allocate activities relevant to COs.

VIII SUGGESTED COURSE ARTICULATION MATRIX

Course Outcomes (COs)	Program Outcomes (POs)											Programme Specific Outcomes (PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	2	1	1	-	-	-	-	-	-	2	-
CO2	2	2	2	1	1	-	-	-	-	-	-	2	-
CO3	2	2	2	1	1	-	-	-	-	-	-	2	-
CO4	2	2	2	1	1	-	-	-	-	-	-	2	-

IX SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS

Text Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Information Theory, Coding and Cryptography	3rd Edition	Ranjan Bose	Tata McGraw Hill	2016
2	Information Coding Techniques	2nd Edition	R Avudaiammal	Tata McGraw Hill	2009
3	Wireless Communications	1st Edition	T.L. Singal	McGraw Hill Education	2017

Reference Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Elements of Information Theory	1st Edition	Thomas M. Cover, Joy A. Thomas	Wiley	2005
2	Wireless Communications	2nd Edition	Andrea Goldsmith	Cambridge University Press	2023

Online References

Sr. No	Website Name
A	https://nptel.ac.in/courses/108102117,Information Theory, Coding and Cryptography by Prof. Ranjan Bose
B	https://www.coursera.org/learn/information-theory,Digital Communication by Prof. Abhishek Suryanarayana