Program :	**Diploma in Electronics Engineering / Electronics and Communication Engineering**
Course Code : **5043D**	Course Title: **Digital Communication**
Semester : **5**	Credits: **4**
Course Category: **Program Elective / Core**	
Periods per week: **4 (L:3, T:1, P:0)**	Periods per semester: **60**

Course Objectives:

- To enrich on digital pulse modulation techniques, digital modulation schemes.
- To explain various code transmission techniques and associated errors.
- To enrich on the data transmission methods and multiplexing techniques.
- To provide an outline on the spread spectrum communication and multiple access techniques.

Course Prerequisites:

Topic	Course code	Course name	Semester
Multiplexer, binary codes	3044	Digital Electronics	3
Signal modulation	3042	Principles of Electronic Communication	3

Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive level
CO1	Explain various digital pulse modulation techniques	14	Understanding
CO2	Summarize digital modulation schemes, multiplexing techniques and data transmission methods.	15	Understanding
CO3	Build source coding and channel coding methods for digital transmission	15	Applying
CO4	Outline the principles of spread spectrum communication and compare multiple access techniques	14	Understanding

	Series Test	2	

CO – PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3						
CO2	3						
CO3	3	3	2				
CO4	3						

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Explain various digital pulse modulation techniques**		
M1.01	Define digital communication systems	1	Remembering
M1.02	Illustrate Sampling and Quantization.	4	Understanding
M1.03	Interpret the PCM systems	3	Understanding
M1.04	Explain DPCM, DM and ADM	6	Understanding
Contents:			
	Necessity of digital communication systems, Block diagram and sub-system description of a digital communication system,		
	Sampling and Quantization: Definition of sampling, Types of sampling techniques, Sampling theorem and Nyquist rate, Definition of quantization, Uniform and Non-uniform Quantization, Quantization error.		
	Basic elements of PCM, Block diagram of PCM, Quantization noise in PCM, Bandwidth Requirement, Companding		
	DPCM, Delta Modulation, Noise in Delta Modulation: slope overload and granular noise, Adaptive Delta modulation		
CO2	**Summarize digital modulation schemes, multiplexing techniques and data transmission methods.**		
M2.01	Summarize digital modulation schemes.	8	Understanding
M2.02	Compare various multiplexing techniques	4	Understanding

M2.03	Outline data transmission methods	3	Understanding
	Series Test – I	1	

Contents:

Digital modulation schemes Generation and Reception of ASK, BFSK, BPSK, Comparison of ASK, BFSK and BPSK.

Concept of DPSK, QPSK

Multiplexing Techniques: TDM & FDM-Concept, Block diagram, Advantages, Disadvantages, Applications, and Comparison.

Data transmission methods: Simplex, Half-duplex, Full duplex, Synchronous and Asynchronous

CO3	Build source coding and channel coding methods for digital transmission		
M3.01	Define the terms used in information theory.	1	Remembering
M3.02	Interpret the channel capacity	2	Understanding
M3.03	Explain the necessity of coding and methods of coding	5	Understanding
M3.04	Make use of various channel coding techniques to detect error in codes and its correction	7	Applying

Contents:

Information theory: Information, Entropy, Channel Capacity - Shannon Hartley theorem

Coding theory: Need for Coding, Coding requirements, Shannon- Fano algorithm, linear block codes – definitions, properties

Error detection: Parity bit method,

Error detection and correction codes: Hamming Code, Convolution Codes.

CO4	Outline the principles of spread spectrum communication and compare multiple access techniques.		
M4.01	Illustrate the concept of spread spectrum modulation	7	Understanding
M4.02	Compare various multiple access techniques	6	Understanding
M4.03	Define OFDM.	1	Remembering
	Series Test – II	1	

Contents:

Spread Spectrum modulation: Introduction, Pseudo-Noise sequences, direct sequence spread spectrum (DSSS), frequency-hop spread spectrum (FHSS).

Multiple Access Techniques: TDMA, FDMA, CDMA-RAKE receiver

Introduction to Multicarrier communication: Importance of orthogonally spaced Sub carriers, OFDM, Frequency-Time representative of an OFDM signal, Spectrum of OFDM signal frequency.

Text / Reference:

T/R	Book Title/Author
T1	Principles of Communication systems – Taub and Schilling
T2	Communication Systems - Simon Haykin
R1	Digital Communication -John G. Proakis, Masoud Salehi, , McGraw Hill Education Edition, 2014
R2	Digital Communication: Fundamentals and Applications- Sklar B and Ray P.K
R3	Elements of Information Theory- T Cover and J Thomas
R4	Digital Communications – Sanjay Sharma

Online Resources:

Sl.No	Website Link
1	https://nptel.ac.in/courses/117101051/
2	https://www.tutorialspoint.com/digital_communication
3	https://nptel.ac.in/courses/108101113/