



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Diploma Engineering College
Semester-4 (Diploma)

Subject: Digital Communication System - DETEC14203

Type of course: Professional Core

Prerequisite: Knowledge of Mathematics and Circuits.

Rationale: This course covers the principles of digital communication, including data representation, modulation, error control, and signal processing. It helps students understand how digital systems maintain reliable transmission despite noise and prepares them for applications in modern communication networks.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
3	0	2	4	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Unit No.	Course content	Hrs	% Weight age
1	Introduction to Digital Communication: analog to digital, elements of digital communication, types of transmission, parallel data transmission, serial data transmission, synchronous transmission, asynchronous transmission, comparison of analog and digital communication, sampling, types of sampling, Nyquist rate, sampling theorem, Aliasing, quantization, Quantization error,	9	20%



2	Digital Modulation: Pulse code modulation, elements of PCM, differential pulse code modulation transmitter, differential pulse code modulation receiver, delta modulation, Adaptive Delta Modulation, Digital Communication - Techniques, multiplexing, types of multiplexer, Regenerative Repeater	9	20%
3	Line Codes: Line codes, types of line codes, Unipolar line code, Polar line code, Bipolar line code, Encoding, Bi-phase Encoding, Bi-phase Manchester, Differential Manchester	9	20%
4	Digital Modulation Techniques: Introduction, Amplitude Shift Keying, ASK Modulator, ASK Demodulator, Frequency Shift Keying, FSK Modulator, FSK Demodulator, Phase Shift Keying, Binary Phase Shift Keying (BPSK), BPSK Modulator, BPSK Demodulator, Quadrature Phase Shift Keying (QPSK), QPSK Modulator, QPSK Demodulator, Differential Phase Shift Keying (DPSK), DPSK Modulator, DPSK Demodulator	9	20%
5	Data Transmission Circuits : Transmission Modes, Simplex Mode, Half-Duplex Mode, Full-Duplex Mode, Digital and Analog Transmission, Bandwidth, Digital to Analog Conversion, Synchronous and Asynchronous Data Transmission, Data Transmission Circuit, Characteristics of Data Transmission Circuits, Modem, role of the modem, Working of a Modem, Types of Modems, Modem Interconnection	9	20%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	Case Study: Students will study and compare at least two digital modulation techniques (e.g., ASK, FSK, PSK, QAM, OFDM). They will explain their working principles, advantages, and applications in real-world systems such as Wi-Fi, 4G/5G, and satellite communication. and upload the report to the GMIU Web Portal.	10
2	Evaluation of Analog and Digital Modulation Techniques with Real-World Applications Students will prepare a comparison report highlighting key differences in signal representation, noise handling, error control, and system efficiency. Real-world examples should be included (e.g., AM/FM vs QAM, analog TV vs digital TV). and Upload the report to the GMIU Web portal.	10



3	Industry Application Analysis: Students will research one industrial sector (e.g., telecommunications, defense, broadcasting) that relies heavily on digital communication and prepare a report on its system architecture, technologies used, and communication challenges and upload report it on the GMIU Web portal.	10
Total		30

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	15%	25%	25%	20%	15%	0%

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from the above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Understand the fundamentals of digital communication, including sampling and quantization, and compare analog and digital system
CO2	Describe the principles of PCM, DPCM, Delta Modulation, and multiplexing techniques, and analyze their performance characteristics.
CO3	Apply and evaluate different line coding techniques for efficient and reliable digital data transmission.
CO4	Analyze and compare various digital modulation techniques such as ASK, FSK, PSK, QPSK, and DPSK, and select appropriate methods for specific communication requirements.
CO5	Explain different data transmission modes, transmission circuits, and modem operations used in digital communication system

List of Practical:

Sr. No.	Description	Unit No.	Hrs
1	Study of sampling and quantization of an analog signal and verification of Nyquist criterion.	1	2
2	Study of analog to digital conversion using PCM.	1	2



3	Study and implementation of Pulse Code Modulation (PCM) system..	2	2
4	Study and implementation of Differential Pulse Code Modulation (DPCM) system.	2	2
5	Study and implementation of Delta Modulation (DM) and Adaptive Delta Modulation (ADM).	2	2
6	Study of multiplexing techniques – TDM and FDM.	2	2
7	Study of regenerative repeaters in digital communication.	2	2
8	Study and implementation of line coding techniques – Unipolar, Polar, Bipolar.	3	2
9	Study and implementation of Manchester and Differential Manchester encoding.	3	2
10	Study and implementation of Amplitude Shift Keying (ASK) modulation and demodulation.	4	2
11	Study and implementation of Frequency Shift Keying (FSK) modulation and demodulation.	4	2
12	Study and implementation of Binary Phase Shift Keying (BPSK) modulation and demodulation.	4	2
13	Study and implementation of Quadrature Phase Shift Keying (QPSK) modulation and demodulation.	4	2
14	Study and implementation of Differential Phase Shift Keying (DPSK) modulation and demodulation.	4	2
15	Study of data transmission circuits – Simplex, Half-Duplex, Full-Duplex, and modem operation.	5	2
Total			30

Instructional Method:

The course delivery method will depend on the content requirements and the students' needs. The teacher, in addition to conventional teaching methods using the blackboard, may also use various tools such as demonstrations, role-playing, Quizzes, brainstorming, and MOOCs.

From the content, 10% topics are suggested for flipped mode instruction.



Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, and Virtual Laboratory

The internal evaluation will be done based on the Active Learning Assignment.

Practical/Viva examination will be conducted at the end of the semester for the evaluation of the performance of students in the laboratory.

Reference Books:

- [1] B.P. Lathi, "Modern Digital and Analog Communication Systems", Oxford University Press
- [2] Kennedy George, "Electronic Communication Systems", McGraw-Hill Education
- [3] D. Roddy, "Electronic Communications", Pearson.
- [4] Katre J.S. , "Analog and Digital Electronics", TECHKNOWLEDGE PUBLICATION.

