

**COURSE TITLE** : **DIGITAL COMMUNICATION**  
**COURSE CODE** : **5201**  
**COURSE CATEGORY** : **A**  
**PERIODS PER WEEK** : **4**  
**PERIODS PER SEMESTER** : **52/5**  
**CREDITS** : **4**

**TIME SCHEDULE**

MODULE	TOPIC	PERIODS
1	Pulse and Pulse Code Modulation	13
2	Digital Modulation Techniques	13
3	Information Theory and Coding	13
4	Transmission Techniques and Error Control	13
<b>TOTAL</b>		<b>52</b>

Course General Outcome:

MODULE	G.O.	On completion of the study of this course the students will be able:
1	1	To understand different Pulse Modulation Techniques.
	2	To understand Pulse Code Modulation and different PCM Techniques.
2	3	To comprehend Digital Modulation Techniques.
	4	To understand QPSK and MSK.
3	5	To understand the Concept of Information Theory and Requirement for Coding.
	6	To understand the Different Error Detection and Error Correcting Codes.
4	7	To comprehend different Multiplexing and Transmission Techniques.
	8	To understand Error Control Methods and Data security.

**On completion of the study of this course the students will be able:**

**MODULE – I PULSE AND PULSE CODE MODULATION.**

**1.1.0 To understand Different Pulse Modulation Techniques**

- 1.1.1 To list the different Pulse Modulation Techniques.
- 1.1.2 To explain PAM Modulation and Demodulation.
- 1.1.3 To explain PWM Modulation and Demodulation.
- 1.1.4 To explain PPM Modulation and Demodulation.
- 1.1.5 To compare the different Pulse Modulation Techniques.

### **1.2.0 To understand Pulse Code Modulation**

- 1.2.1 To describe Sampling Theorem and its significance.
- 1.2.2 To explain Pulse Code Modulation- Basic elements of PCM.
- 1.2.3 To explain Quantization.
- 1.2.4 To know Noise in PCM.
- 1.2.5 To describe Non Uniform Quantization and Companding.
- 1.2.6 To explain Differential PCM.
- 1.2.7 To explain Delta Modulation.
- 1.2.8 To describe Slope Overload and Granular Noise.
- 1.2.9 To explain Adaptive Delta Modulation.

## **MODULE – II : DIGITAL MODULATION TECHNIQUES**

### **2.1.0 To comprehend Digital Modulation Techniques**

- 2.1.1 To know the concept of Band Pass Data Transmission Systems.
- 2.1.2 To explain BFSK system.
- 2.1.3 To explain BPSK system and its spectral properties.

### **2.2.0 To understand QPSK and MSK**

- 2.2.1 To explain QPSK system and its spectrum.
- 2.2.2 To explain MSK system.
- 2.2.3 To explain Gaussian Minimum Shift Keying.

## **MODULE – III : INFORMATION THEORY & CODING**

### **3.1.0 To understand the concept of information Theory and requirement for coding.**

- 3.1.1 To know the terms message and information.
- 3.1.2 To define Entropy.
- 3.1.3 To derive the equation for finding Entropy.
- 3.1.4 To state theorem on Channel Capacity (Shanon Hartley).
- 3.1.5 To list the requirements for Coding.
- 3.1.6 To know Coding for Shanon- fano algorithm.

### **3.2.0 To understand the different Error Detection and Error Correction Codes.**

- 3.2.1 To explain the error detection code-Parity Bit Method.
- 3.2.2 To explain the Error Detection and Correcting Codes: Hamming Codes, CRC and Convolution Code.
- 3.2.3 To list Limitations of FEC codes.
- 3.2.4 To know the Term Burst error.
- 3.2.5 To describe Block Interleaving & Convolution Interleaving.

## **MODULE – IV: TRANSMISSION TECHNIQUES AND ERROR CONTROL**

### **4.1.0 To comprehend different Multiplexing and Transmission Techniques**

- 4.1.1 To describe the concept of TDM and FDM with Simple Block Diagram.
- 4.1.2 To explain the different Data Transmission Methods- Simplex, Half-duplex, Full duplex.
- 4.1.3 To Explain Synchronous and Asynchronous Data Transmission.
- 4.1.4 To explain switching—Circuit, Message and Packet.

### **4.2.0 To understand Error Control Methods And Data Security**

- 4.2.1 To describe error controls – Stop and Wait ARQ, Sliding window ARQ , Selective-Reject ARQ.
- 4.2.2 To describe Data Security.
- 4.2.3 To know Ciphers
- 4.2.4 To describe Public-Key Algorithm: RSA
- 4.2.5 To know Digital Signature.

## **MODULE – I: Pulse Modulation**

Sampling theorem and its significance - Pulse modulation- PAM, PWM, PPM –modulation and demodulation. Model of a Digital Communication system -Basic Elements of PCM—Quantization-- Noise in PCM--Non uniform quantization—Companding Differential PCM-- Delta Modulation--Noise in Delta Modulation--slope overload and granular noise Adaptive Delta modulation.

## **MODULE - II : Digital Carrier Modulation**

Introduction--Elements of Band Pass Data Transmission system -BFSK- Generation and detection. BPSK- Generation and detection, Spectrum and bandwidth QPSK – Spectrum - MSK- Gaussian Minimum Shift Keying.

## **MODULE – III : Information Theory & Coding**

Message—Information--Finding Entropy--, Channel Capacity - Shanon Hartley theorem-- Need for Coding, Coding requirement-- Shanon Fano algorithm; Error detection-- Parity bit method-- Error detection and correction codes-- Hamming Code,CRC,Convolution Codes-- Limitations of FEC codes- Burst Error Correction-- Block interleaving--Convolution interleaving

## **MODULE – IV: Transmission Techniques and Error Control**

Multiplexing Techniques – FDM, TDM.-- Data Transmission Methods- Simplex, Half-duplex, Full duplex -- Synchronous and asynchronous data transmission-- different switching Error control methods – Stop and Wait ARQ—Sliding window ARQ--Selective-Reject ARQ Advantages- - data security- ciphers- public key algorithm-RSA-Digital signatures.

## **REFERENCE**

1. Principles of Communication systems – Taub and Schilling.
2. Electronics Communication Systems – Wayne Tomasi—Pearson.
3. Data and Computer Communication – William Stallings--Pearson.
4. Communication Systems - Simon Haykin.
5. Electronic Communication system - Roy Blake 2nd Edition, Thomson & Delmar.
6. Principles of Digital communication-J.Das,S.K Mullick,P.K Chatterjee.