

**COURSE TITLE** : **DATA COMMUNICATION**  
**COURSE CODE** : **4132**  
**COURSE CATEGORY** : **B**  
**PERIODS/WEEK** : **4**  
**PERIODS/SEMESTER** : **60**  
**CREDITS** : **4**

**TIME SCHEDULE**

<b>MODULE</b>	<b>TOPICS</b>	<b>PERIODS</b>
<b>1</b>	<b>Concepts of Data Communication</b>	<b>15</b>
<b>2</b>	<b>Physical Layer</b>	<b>15</b>
<b>3</b>	<b>Transmission Media</b>	<b>15</b>
<b>4</b>	<b>Data Link Layer</b>	<b>15</b>

**Course General Outcomes:**

<b>Sl.</b>	<b>G.O</b>	<b>On completion of this course the student will be able :</b>
1	1	Understand the concept of Data Communication
	2	Understand the concept of networks
	3	Understand the concept of network model
2	1	Understand Data and Signals
	2	Understand Digital and Analog Transmission
	3	Understand Bandwidth Utilization -Multiplexing
3	1	Understand Guided and Unguided transmission media
	2	Understand Switched Networks.
4	1	Understand Error Detection and Correction
	2	Understand Data Link Controls

### **Specific Outcomes:**

#### **Module I. Overview of Data Communication and Networking.**

- 1.1 Understand the concept of Data Communication.
  - 1.1.1 Explain data communication concepts.
  - 1.1.2 Explain briefly components of data communication.
  - 1.1.3 Discuss different data representation forms.
  - 1.1.4 Discuss different data flow methods.
  
- 1.2 Understand the concept of networks.
  - 1.2.1 Define different network attributes.
  - 1.2.2 Discuss different physical structures of network.
  - 1.2.3 Discuss categories of networks.
  - 1.2.4 Explain interconnection of Networks.
  - 1.2.5 Define protocol.
  - 1.2.6 Discuss various standards.
  
- 1.3 Understand the concept of network model
  - 1.3.1 Discuss the layered approach.
  - 1.3.2 Explain ISO OSI layered architecture.
  - 1.3.3 Describe the functions of layers in OSI model.

#### **Module II. The Physical Layer.**

- 2.1 Understand Data and Signals.
  - 2.1.1 Differentiate Analog and Digital Data and signals.
  - 2.1.2 Explain Periodic analog signals.
  - 2.1.3 Define the terms sine wave, Phase, Wave length, time and frequency domains, and bandwidth.
  - 2.1.4 Explain Digital signals.
  - 2.1.5 Define the terms bit rate and bit length.
  - 2.1.6 Describe digital signals transmission.
  - 2.1.7 Describe Transmission impairments and various types.
  
- 2.2 Understand Digital and Analog Transmission
  - 2.2.1 Explain Analog to Digital Conversion
  - 2.2.2 Explain Transmission modes
  - 2.2.3 Explain Digital to Analog Conversion
  - 2.2.4 Explain Analog to Analog Conversion.
  
- 2.3 Understand Bandwidth Utilization -Multiplexing
  - 2.3.1 Explain Frequency Division Multiplexing.
  - 2.3.2 Explain Wavelength Division Multiplexing.
  - 2.3.3 Explain Time Division Multiplexing.

#### **Module III. The Transmission Media.**

- 3.1 Understand Guided transmission media.
  - 3.1.1 Explain about Twisted pair cable.

- 3.1.2 Explain about Coaxial Cable.
- 3.1.3 Explain about Optical fiber cables.

### 3.2 Understand Unguided media.

- 3.2.1 Describe wireless propagation.
- 3.2.2 Describe Radio Waves.
- 3.2.3 Describe Micro Waves.
- 3.2.4 Describe Infrared Waves.

### 3.3 Understand Switched Networks.

- 3.3.1 Explain Circuit switched Networks.
- 3.3.2 Explain Packet switching – datagram, virtual circuit.
- 3.3.3 Explain the structure of a switch.

## **Module IV. Data Link Layer Services**

### 4.1 Understand Error Detection and Correction

- 4.1.1. Define Key terms related to error detection and correction.
- 4.1.2. Explain different coding schemes
- 4.1.3. Discuss block codes
- 4.1.4. Discuss cyclic codes
- 4.1.5. Explain error detection and correction methods
- 4.1.6. Explain check sum error detection
- 4.1.7. Explain forward error correction methods

### 4.2 Understand Data Link Controls

- 4.2.1. Explain the framing concepts
- 4.2.2. Discuss flow and error control
- 4.2.3 Discuss Data link layer protocols
- 4.2.4 Explain HDLC
- 4.2.5 Explain point to point protocol

### 4.3 Understand random access protocols like ALOHA, CSMA, CSMA/CD

## **CONTENT DETAILS**

### **MODULE I – CONCEPTS OF DATA COMMUNICATION**

Concepts – components of communication - representation- text, numbers, images, audio, video – Data flow – simplex, half duplex, full duplex – Network attributes – performance, reliability, security – Physical structure – type of connections, topology – Categories – LAN, WAN, MAN – Inter connection - circuit, packet – protocols – standards – layered approach – ISO OSI model – functions of layers.

## **MODULE II – PHYSICAL LAYER**

Analog and digital – data, signals – Periodic analog signals – sine wave, phase, wave length, time and frequency domains, bandwidth – digital signals – bit rate, bit length – digital transmission – base band, broad band – impairments – attenuation, distortion, noise – analog to digital – PCM– Transmission modes – parallel, serial , asynchronous, synchronous – digital to analog – ASK, FSK, PSK – analog to analog – AM, FM, PM – Multiplexing – FDM, WDM, TDM

## **MODULE III – TRANSMISSION MEDIA**

Guided – twisted pair, co-axial, fiber optic – unguided – wireless – radio, micro wave, infrared – switched networks – circuit switched – packet switched – datagram, virtual circuit – switch – structure – space division – time division – structure of packet switch

## **MODULE IV – DATA LINK LAYER SERVICES**

Error detection and correction – terms – types of errors, redundancy, detection versus correction, coding – coding schemes – block code , parity check – cyclic codes – CRC– check sum – forward error correction – framing – character oriented, bit oriented – flow and error control – DLL protocols – Simple, Stop and wait – HDLC – Point to point protocol– ALOHA, CSMA, CSMA/CD.

### **Text Book(s):**

1 . Data Communications and Networking – Behrouz A. Forouzan – McGraw Hill Edn.-Fourth Edition/Fifth Edition

### **REFERENCES:**

1. Computer Networks – Andrew S. Tanenbaum – Prentice Hall-Fifth Edition
2. Data Communication & Networks - William Stalling- Prentice Hall-Tenth Edition
3. Data Communications, Computer Networks and Open Systems –Fred Halsall , Addison-Wesley, 1996