



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

## COURSE CONTENT

DATA COMMUNICATION AND NETWORKS								
<b>VII Semester: CSE   CSE (DS)   CSE(CS)   IT</b>								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
<b>ACSE36</b>	Open Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	40	60	100
<b>Contact Classes: 48</b>	<b>Tutorial Classes: Nil</b>	<b>Practical Classes: Nil</b>			<b>Total Classes: 48</b>			
<b>Prerequisites: Basic understanding of operating systems, computer networks, and Network Security and Cryptography”.</b>								

### I. COURSE OVERVIEW:

This course provides a comprehensive understanding of the principles, architectures, and protocols used in modern data communication and computer networking systems. It introduces how data is transmitted, routed, controlled, and delivered across networks ranging from local area networks to the global Internet.

### II. COURSE OBJECTIVES:

#### The students will try to learn:

- I. Fundamentals of data communication networks.
- II. Demonstrate the functions of various protocols of the Data Link Layer.
- III. Demonstrate the functioning of various routing protocols.
- IV. Functions of various Transport Layer protocols.
- V. Understand the significance of Application Layer protocols.

### III. COURSE OUTCOMES:

- CO1: Explain the fundamentals, categories, and architectures of data communication and computer networks.
- CO2: Analyze and apply Data Link Layer protocols, error detection and correction, and multiple access mechanisms.
- CO3: Demonstrate and compare routing algorithms for efficient data transmission.
- CO4: Apply concepts of IP addressing, subnetting, supernetting, and understand IPv4 and IPv6 protocols..
- CO5: Explain the services and mechanisms of the Transport Layer, and congestion control using TCP and UDP.
- CO6: Describe the working principles and applications of Application Layer protocols.

## **IV. COURSE CONTENT:**

### **MODULE 1: INTRODUCTION TO DATA COMMUNICATIONS (10)**

Introduction to Data Communications: Components of data communication, data representation, data flow. Computer Networks: Definition, uses of networks, network topologies, categories of networks. Multiplexing Techniques: Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM). Reference Models: OSI reference model, TCP/IP reference model, comparison between OSI and TCP/IP models. Physical Layer: Guided transmission media, unguided transmission media (wireless communication).

### **MODULE 2: DATA LINK LAYER (10)**

Data Link Layer design issues and services. Error detection and correction techniques. Elementary data link layer protocols. Sliding window protocols. Multiple access protocols: ALOHA, CSMA, CSMA/CD, CSMA/CA. Collision-free protocols. Ethernet technologies: Ethernet physical layer, Ethernet MAC sub-layer.

### **MODULE 3: NETWORK LAYER (10)**

Network layer design issues. Routing algorithms: optimality principle, shortest path routing, flooding, distance vector routing, count-to-infinity problem, link state routing, hierarchical routing. Congestion control algorithms. IP addressing: IPv4, CIDR, subnetting, supernetting. Packet fragmentation. IPv6 protocol and transition from IPv4 to IPv6.

### **MODULE 4 TRANSPORT LAYER (10)**

Transport layer services. Elements of transport protocols. Addressing. Connection establishment and release. Error control and flow control. User Datagram Protocol (UDP). Transmission Control Protocol (TCP): service model, segment header, connection establishment and release, sliding window, congestion control algorithm.

### **MODULE 5: APPLICATION LAYER (10)**

Introduction to application layer and services. Application layer paradigms: Client–Server model. Application layer protocols: HTTP, E-mail, World Wide Web (WWW), TELNET, Domain Name System (DNS).

## **V. TEXTBOOKS:**

1. James James F. Kurose & Keith W. Ross, Computer Networking: A Top-Down Approach, 6th Edition, Pearson.
2. Behrouz A. Forouzan, Data Communications and Networking, 4th Edition, McGraw-Hill Education.

## **VI. REFERENCE BOOKS:**

1. Bhusan Trivedi, Data Communication and Networks, Oxford University Press, 2016.
2. Andrew S. Tanenbaum, Computer Networks, 4th Edition, Pearson Education.
3. W. A. Shay, Understanding Communications and Networks, 3rd Edition, Cengage Learning.

## **VII. WEB REFERENCES**

1. NPTEL – Data Communication – by IIT Kharagpur.
2. GeeksforGeeks – Computer Networks – Tutorials on OSI, TCP/IP, routing, and protocols.
3. Cisco Networking Academy (NetAcad) – Networking fundamentals, routing, and switching resources.
4. IBM SkillsBuild – Networking Fundamentals – Basics of data communications and computer networks.
5. Cloudflare Learning Center – TCP/IP, DNS, HTTP, and Internet working concepts.

## **VIII. MATERIALS ONLINE**

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. PowerPoint presentation
11. E-Learning Readiness Videos (ELRV)