Data Communication and Networking

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Data Communication and Networking	4	3	0	1	Class XII Pass	NA

COURSE OBJECTIVE

The course provides a unified and fundamental view of the broad field of computer networks. Furthermore, the easy to understand and extremely relevant world of Computer Networking is introduced in a top down Approach. Introduction to intranets and intranet servers and browsers, networks and network-servers, LANs/WANs, Internet working technologies, the OSI reference model for networking protocols, CSMA/CD, TCP/IP implementation

COURSE OUTCOME

Upon successful completion of this course the student will be able to:

- Gain a comprehensive understanding of computer network protocols, models, and architectures.
- Develop the ability to design and analyze various Local Area Network (LAN) topologies and technologies.
- Acquire knowledge of application layer protocols (HTTP, FTP, SMTP, DNS) and data link layer protocols (HDLC, error control, flow control).
- Understand medium access protocols and their role in efficient network communication.
- Learn network layer concepts, routing techniques, and transport layer protocols (TCP/UDP), with a basic introduction to the session and presentation layers.

SYLLABUS

Unit I **(6 Hours)**

Introduction: Introduction to computer networks, evolution of computer networks and its uses, Advantages and Disadvantages of Computer Network, reference models: OSI reference Models, TCP/IP Protocol Suit Networking fundamentals: Internet, Circuit switching vs Packet switching, ISPs, Delay and Loss in Packet Switched Networks

Unit II **(6 Hours)**

Local Area Network: LAN Architecture, LAN topologies- Bus/ Tree LAN, Ring LAN, Star LAN, Wireless LAN, Ethernet and Fast Ethernet, Token Ring

Unit III **(10 Hours)**

Application layer and data link layer: Application Layer Protocols: HTTP, FTP, SMTP, DNS Data link layer design issues, Flow Control- Stop and Wait, Error Detection, Error Control, error detection and correction, data link layer protocols, sliding window protocols, example of data link protocol- HDLC .

Unit IV **(9 Hours)**

Medium access layer: Channel allocation problem, multiple access protocols, Introduction to ALOHA, CSMA/CD, CSMA/CA

Unit V **(7 Hours)**

The network layer: Introduction, Routers, Network layer concepts, shortest path routing, flooding, distance vector routing, link state routing (without algorithms), congestion control and quality of service, internetworking, IP, Ipv4 Addressing vs Ipv6

Unit VI **(7 Hours)**

The transport layer: The transport layer services, elements of transport protocols, TCP and UDP, Brief introduction to presentation and session layer, E-mail

REFERENCES

1. Data Communication & networking: Forouzan, B. A.
2. Data and Computer Communications, W. Stallings, Prentice Hall of India
3. Computer Networks: Tanenbaum, Andrew S, Prentice Hall

PRACTICAL COMPONENT (IF ANY)

All practicals should be performed on Packet Tracer or any open-source network simulator.

LIST OF PRACTICALS (30 Hours)

1. Simulate Network Setup with basic devices (PCs, routers, switches) and configure IP addressing.
2. OSI Model Simulation using Wireshark or Packet Tracer to analyze network traffic and protocols.
3. Simulate Circuit Switching vs Packet Switching to demonstrate the differences in data transmission.
4. Configure and simulate different LAN topologies (Bus, Ring, Star, Tree) in PacketTracer.
5. Configure Ethernet and Fast Ethernet networks, test communication between devices.
6. Set up and simulate Token Ring network with token passing for access control.
7. Configure and test HTTP, FTP, SMTP, and DNS protocols between devices.
8. Implement and simulate Stop-and-Wait and Sliding Window Protocols for flow control and error detection.
9. Simulate ALOHA, CSMA/CD, and CSMA/CA protocols for multiple access and channel allocation.