

## **COMPUTER NETWORKS**

**CT....**

**Lecture : 3**

**Year : IV**

**Tutorial : 1**

**Part : I**

**Practical : 3**

### **Course Objective:**

To understand the concepts of computer networking, functions of different layers and protocols, and know the idea of IPV6 and security.

#### **1. Introduction to Computer Network**

**(5 hours)**

- 1.1 Uses of Computer Network
- 1.2 Networking model client/server, p2p, active network
- 1.3 Protocols and Standards
- 1.4 OSI model and TCP/IP model
- 1.5 Comparison of OSI and TCP/IP model
- 1.6 Example network: The Internet, X.25, Frame Relay, Ethernet, VoIP, NGN and MPLS, xDSL.

#### **2. Physical Layer**

**(5 hours)**

- 2.1 Network monitoring: delay, latency, throughput
- 2.2 Transmission media: Twisted pair, Coaxial, Fiber optic, Line-of-site, Satellite
- 2.3 Multiplexing, Circuit switching, Packet switching, VC Switching, Telecommunication switching system (Networking of Telephone exchanges)
- 2.4 ISDN: Architecture, Interface, and Signaling

#### **3. Data Link Layer**

**(5 hours)**

- 3.1 Functions of Data link layer

- 3.2 Framing
- 3.3 Error Detection and Corrections,
- 3.4 Flow Control
- 3.5 Examples of Data Link Protocol, HDLC, PPP
- 3.6 The Medium Access Sub-layer
- 3.7 The channel allocation problem
- 3.8 Multiple Access Protocols
- 3.9 Ethernet,
- 3.10 Networks: FDDI, ALOHA, VLAN, CSMA/CD, IEEE 802.3, 802.4, 802.5, and 802.11.

#### **4. Network Layer**

**(9 hours)**

- 4.1 Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway
- 4.2 Addressing: Internet address, classful address
- 4.3 Subnetting
- 4.4 Routing: techniques, static vs. dynamic routing , routing table for classful address
- 4.5 Routing Protocols: RIP, OSPF, BGP, Unicast and multicast routing protocols
- 4.6 Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Protocols: ARP, RARP, IP, ICMP

#### **5. Transport Layer**

**(5 hours)**

- 5.1 The transport service: Services provided to the upper layers
- 5.2 Transport protocols: UDP, TCP
- 5.3 Port and Socket
- 5.4 Connection establishment, Connection release
- 5.5 Flow control & buffering
- 5.6 Multiplexing & de-multiplexing
- 5.7 Congestion control algorithm: Token Bucket and Leaky Bucket

#### **6. Application Layer**

**(5 hours)**

- 6.1 Web: HTTP & HTTPS

- 6.2 File Transfer: FTP, PuTTY, WinSCP
- 6.3 Electronic Mail: SMTP, POP3, IMAP
- 6.4 DNS
- 6.5 P2P Applications
- 6.6 Socket Programming
- 6.7 Application server concept: proxy caching, Web/Mail/DNS server optimization
- 6.8 Concept of traffic analyzer: MRTG, PRTG, SNMP, Packet tracer, Wireshark.

## **7. Introduction to IPV6 (4 hours)**

- 7.1 IPv6- Advantages
- 7.2 Packet formats
- 7.3 Extension headers
- 7.4 Transition from IPv4 to IPv6: Dual stack, Tunneling, Header Translation
- 7.5 Multicasting

## **8. Network Security (7 hours)**

- 8.1 Properties of secure communication
- 8.2 Principles of cryptography: Symmetric Key and Public Key
- 8.3 RSA Algorithm,
- 8.4 Digital Signatures
- 8.5 Securing e-mail (PGP)
- 8.6 Securing TCP connections (SSL)
- 8.7 Network layer security (IPsec, VPN)
- 8.8 Securing wireless LANs (WEP)
- 8.9 Firewalls: Application Gateway and Packet Filtering, and IDS

Practical:

- 1. Network wiring and LAN setup
- 2. Router Basic Configuration
- 3. Static and Dynamic Routing

4. Creating VLAN
5. Router access-list configuration
6. Basic Network setup on Linux
7. Setup of Web Server, DNS Server, DHCP Server
8. Virtualizations

References:

1. A.S. Tanenbaum, "Computer Networks", 3<sup>rd</sup> Edition, Prentice Hall India, 1997.
2. W. Stallings, "Data and Computer Communication", Macmillan Press, 1989.
3. Kurose Ross, "Computer Networking: A top down approach", 2<sup>nd</sup> Edition, Pearson Education
4. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", 3<sup>rd</sup> Edition, Morgan Kaufmann Publishers

**Evaluation Scheme:**

The questions will cover all the chapters of the syllabus. The evaluation scheme will be as indicated in the table below.

<b>Chapters</b>	<b>Hour</b>	<b>Marks Distribution*</b>
1	5	8
2	5	8
3	5	8
4	9	16
5	5	8
6	5	8
7	4	8
8	7	16
<b>Total</b>	<b>45</b>	<b>80</b>

\*There may be minor deviation in marks distribution