TU SYLLABUS

Computer Network and Security *
CT 702

April, 2021

*Institute of Engineering (IOE)

Lecture:3 **Year**: IV
Tutorial:1 **Part**: I
Practical:3

Course Objectives:
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 Layers(5 Hours)**
   - 2.1. Networking 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 Signalling
3. **Data Link Layer (5 Hours)**
   - 3.1. Functions of Data Link Layer
   - 3.2. Framing
   - 3.3. Error Control and Corrections
   - 3.4. Flow Control
   - 3.5. Examples of Data Link Protocol, HDLC, PPP
   - 3.6. The Channel Allocation Problem
   - 3.7. Multiple Access Protocols
   - 3.8. Ethernet

3.9. Networks: FDDI, ALOHA, VLAN, CSMA/CD, IEEE802.3 (Ethernet), 802.4(Token Bus), 802.5(Token Ring), and 802.1 (Wireless LAN)

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 Tables for Classful Address

   4.5. Routing Procotols: 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 Services: 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 Transport Layer

6. **Application Layer (5 Hours)**

   6.1. Web: HTTP & HTTPS

   6.2. File Transfer: FTP, PuTTY, WinSCP

   6.3. Electronics Mail: SMPT, 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. Networ Layer Security (IPsec, VPN)

8.8. Securing Wireless LANs (WEP)

8.9. Firewalls: Application Gateway an Packet Filtering, and IDS

Practicals:

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", 3rd Edition, Prentice Hall India, 1997.

2. W. Stallings, "Data and Computer Communication", Macmillan Press, 1989.

3. Kurose Ross, "Computer Networking: A top down approach", 2nd Edition, Pearson Education.

4. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", 3rd Edition, Morgan Kaufmann Publishers.

Evaluation Scheme:
The questions will conver all the chapters of the syllabus. The evaluation scheme will be as indicated in the table below.

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

*There may be minor deviation in marks distribution.