



Marwadi University

Master of Science (Information Technology)

Semester III

Subject Code: 02MS0307

Subject Name: (Elective-II) Advanced Networking (AN)

Learning Objectives:

- Give in-depth understanding of all the commonly used protocols used in the TCP/IP protocol stack.
- Design and implement TCP/IP based application layer services.
- To get familiar with security and performance issues in TCP/IP networks.
- Create a strong conceptual foundation for TCP/IP which can be leveraged for studying advanced topics in TCP/IP, dissertation and further studies.

Prerequisites:

- Digital data communication concepts
- Overview of layered architecture of TCP/IP & OSI model.
- Overview of functionality of all layers in the OSI & TCP/IP model.
- Compare TCP/IP and OSI model.
- Concepts of LAN, WAN, MAN, internet and Ethernet.
- General concepts of routing and forwarding and routing algorithms.
- Overview of well-known application layer services like DNS, HTTP, and SMTP etc.

Unit	Course content	Hours
1	Classful Internet Addresses, Mapping Internet Addresses to Physical Addresses (ARP), Internet Protocol: Connectionless Datagram Delivery (IPv4): Introduction, Universal identifiers, IP addresses and network connections, original classful addressing scheme, special purpose IP addresses like directed broadcast and network broadcast, Limited broadcast, Loopback address, Subnet and Classless extensions, Weaknesses in Internet addressing, Dotted decimal notation, Network byte order, Special address conventions. Concept of physical address, Address resolution problem, Relationship between network address and physical address, Two types of physical addresses, Resolution through direct mapping, Resolution through dynamic binding, ARP basic, Concept and reason for connectionless and best effort delivery system at network layer, purpose of Internet protocol, IPv4 datagram format, interpretation and significance of each header fields, IP options.	10
2	Internet Protocol: IP, ICMP, CIDR, UDP Introduction, Forwarding in the Internet, Indirect and Direct delivery, Table driven IP forwarding, Nexthop forwarding, Default routes, Host specific routes, IP forwarding algorithm, Forwarding with IP addresses, Handling incoming datagrams, Establishing routing tables.	10



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	<p>Introduction of ICMP Need for a controlling protocol, Error Reporting versus Error Correction, ICMP message delivery, ICMP message format, Ping, Formats of different type of messages like Echo(Request and Reply), Congestion , Unreachable Destinations, Source Quench, Router advertisement and Solicitation, etc..</p> <p>Introduction of CIDR Introduction of UDP, Need for UDP, UDP message format, UDP Pseudo header, UDP encapsulation and protocol layering, UDP applications, port numbers of well- known UDP based applications</p>	
3	<p>Reliable Stream Transport Service (TCP), NAT, VPN, DHCP Introduction, Need for stream delivery, Properties of reliable delivery service, Providing reliability, Concept of sliding windows, Ports, connections and endpoints, Active and Passive opens, Segments, Streams and sequence numbers, Variable window size and flow control, TCP segment format, Out of band data, TCP options, Acknowledgment, Retransmission and timeouts, Accurate measurement of RTT, Explicit feedback mechanism, Congestion control, TCP connection establishment and termination. Introduction to VPN. Introduction to NAT, NAT translation table creation. Introduction to DHCP, DHCP Message format</p>	10
4	<p>DNS, TELNET, SSH, File transfer and access (FTP, NFS), E-Mail(SMTP,POP,IMAP,MIME) Need for DNS, Flat versus hierarchical namespace, Centralized versus distributed Names database, Top-level domains, Mapping domain names to addresses, Domain Name Resolution, DNS message format, Dynamic DNS, Telnet options adoption negotiation, SSH. Different ways of sharing a file, Features. Introduction to E-mail protocols., Mailboxes, Names and Aliases, Alias expansion and mail forwarding, SMTP, POP, IMAP, MIME.</p>	08
5	<p>HTTP, IPsec, SSL, IPV6 Importance of Web, Architectural components, URL, HTTP, HTTP methods, HTTP error messages, Connection types, Significance of different HTTP header fields, Negotiation, Conditional requests, Proxy servers, Caching, HTTP security and E- Commerce. Introduction to IPsec and SSL, Need for Security, IPsec, AH, SA, ESP, Authentication and mutable header fields, Tunneling, Required security algorithms, SSL and TLS, Firewalls, Firewall implementation issues, Packet filtering, Stateful firewalls, proxy servers, Monitoring and logging, Introduction to IPv6, Need for new IP protocol, IPv6 features, IPv6 base</p>	10



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	header format. Introduction to SDN and IoT.	
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Text Book(s):
1. Douglas E. Comer, "Internetworking with TCP/IP - (Vol. 1) Principles, Protocols, and Architecture", 5th Edition, Prentice Hall of India (PHI) Publishers.
Reference Book(s):
1. Behrouz A. Forouzan, "TCP/IP Protocol Suite", 4th Edition, McGraw-Hill 2. W. Richard Stevens, G. Gabriani, "TCP/IP- Illustrated, Vol. 1 (The Protocols)", Pearson Publishers.
Unit wise coverage from Book(s):
Unit 1 to 5: Douglas E. Comer, "Internetworking with TCP/IP - (Vol. 1) Principles, Protocols, and Architecture", 5th Edition, Prentice Hall of India (PHI) Publishers.