

GUJARAT UNIVERSITY

K. S. SCHOOL OF BUSINESS MANAGEMENT
[Five Years' (Full-time) Integrated Degree Course]

Semester-7 [M.Sc. (CA & IT)]

Subject Code: - KS_C_CC-475

Subject Name: - Advanced Networking

Course Credit: - 3

Objective:

Develop a strong conceptual foundation of the TCP/IP protocol stack and services.
Depth understanding of protocols used in the TCP/IP protocol stack.

Unit No.	Course Content	Weight-age (%)
1	Classful Internet Addresses, Mapping Internet Addresses to Physical Addresses Internet Protocol: Connectionless Datagram Delivery: 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 cache Timeout, ARP refinements, Relationship with other protocols, ARP implementation, ARP Encapsulation and identification, ARP protocol format, Automatic ARP cache revalidation 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.	(20%)
2	Internet Protocol: Forwarding IP Datagrams, Error And Control Messages , Classless And Subnet Address Extensions , User Datagram Protocol : Introduction, Forwarding in the Internet, Indirect and Direct delivery, Table driven IP forwarding, Next hop forwarding, Default routes, Host specific routes, IP forwarding algorithm, Forwarding with IP addresses, Handling incoming datagrams, Establishing routing tables. 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. Introduction of CIDR, Minimizing Network Numbers, Proxy ARP, Subnet Addressing, Flexibility in subnetting, Variable length subnets, Subnet masks, Unified Forwarding Algorithm, Broadcasting to Subnets, Anonymous point to point networks, Classless Addressing and Supernetting, CIDR address blocks and Bit masks, Data Structures and Algorithms for classless lookup, Searching by mask length, Binary trie	(20%)

	structures, Longest match and mixture of route types, PATRICIA and level compressed tries. Introduction of UDP, Need for UDP, UDP message format, UDP Pseudo header, UDP encapsulation and protocol layering, Layering and UDP Checksum computation, UDP multiplexing, demultiplexing, and role of ports in multiplexing and demultiplexing, UDP applications, port numbers of well known UDP based applications	
3	Reliable Stream Transport Service , Private Network Interconnection Bootstrap And Auto configuration :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, Karn's algorithm and timer backoff, Explicit feedback mechanism, Congestion control, TCP connection establishment and termination, Dealing with silly window syndrome. Introduction to VPN, Private and hybrid networks, VPN addressing and routing, Extending VPN technology to individual hosts, VPN with private addresses, Introduction to NAT, NAT translation table creation, multi-address NAT, port mapped NAT, Interaction between NAT and ICMP, Interaction between NAT and Applications, NAT in presence of fragmentation, Conceptual address domains, Introduction to slirp and IPtables. Introduction to DHCP, History of bootstrapping, Using IP to find IP Address, DHCP Retransmission Policy, DHCP Message format, Need for dynamic configuration, DHCP Lease concept, Multiple addresses and Relays, Lease renewal States, Address acquisition states, Early lease termination, DHCP options and message type, Options overload, DHCP and DNS	(20%)
4	The Domain Name System , Remote Login And Desktop , File Transfer And Access , Electronic Mail: Need for DNS, Flat versus hierarchical namespace, Centralized versus distributed Names database, Delegation of authority for names, Subset authority, Internet domain Names, Top-level domains, Mapping domain names to addresses, Domain Name Resolution, Efficient translation, Caching, DNS message format, Compression, Inverse mappings, Pointer queries, DNS resource records, Dynamic DNS, DNSSec. Introduction, Remote interactive computing, Telnet protocol, Accommodating Heterogeneity, Client side and server side control commands, Telnet options and Options negotiation, SSH. Different ways of sharing a file, Features, Process model, TCP Port numbers, Data connection and control connection, User's view of FTP, Anonymous FTP, Secure FTP, TFTP, NFS, RPC, XDR. Introduction to E-mail protocols., Mailboxes, Names and Aliases, Alias expansion and mail forwarding, SMTP, POP, IMAP, MIME Extensions for non ASCII data, MIME Multipart messages.	(20%)
5	World Wide Web , Internet Security And Firewall Design: 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	(20%)

Recommended Lecture Scheme: Approximately 40 To 45 lectures

Recommended Practical Scheme:

Assignment: Minimum 3 assignments

Main Reference Books:

1. Internetworking with TCP/IP - (Vol. 1.) Principles, Protocols, and Architecture
By Douglas E. Comer, Prentice Hall of India (PHI), Sixth Edition

Reference Books:

1. TCP/IP protocol suite By Behrouz A. Forouzan published by Tata McGraw-Hill (TMH).
2. TCP/IP- Illustrated, Vol. 1 (The Protocols) By W. Richard Stevens published by Pearson Education Asia Publishers.
3. Inside TCP/IP By Karanjit S. Siyan published by Techmedia Publishers.
4. Java Network Programming By Elliotte Rusty Harold published by Oreilly Publishers.
5. Java Threads By Scott Oaks & Henry Wong published by Oreilly Publishers.