GUJARAT TECHNOLOGICAL UNIVERSITY
MASTER OF COMPUTER APPLICATIONS (MCA)
Semester: V

Subject Name**: Advanced Networking (AN**)
Subject Code**: 650010**

Learning Objectives:

- Develop strong analysis, design, implementation, testing and troubleshooting skills in students regarding TCP/IP based networks and services as relevant to the computer networking needs of the IT industry
- Establish a strong conceptual foundation of the TCP/IP protocol stack, services and related tools/technologies so as to facilitate the development of the above mentioned skills
- Give in-depth understanding of all the commonly used protocols used in the TCP/IP protocol stack
- Design and implement customized TCP/IP based application layer services
- To familiarize with security and performance issues in TCP/IP networks
- Give practical exposure through rigorous laboratory exercises involving programming, network administration assignments like server installation/configuration/troubleshooting, etc. as well as exploratory and research assignments to fulfill the above objectives in a realistic and a relevant way especially from industry and research point of view
- Create a strong conceptual foundation for TCP/IP which can be leveraged for studying advanced topics in TCP/IP, dissertation and System Development Project and further studies
- Create a strong conceptual foundation and offer maximum possible development of required theoretical and practical skills for students aspiring to make a career in Computer Networking like Network Designer, Network administrator, etc.

Prerequisites:

- Digital Data communication concepts
- An overview of the layered architecture as per OSI and TCP/IP model
- Overview of functionality of all layers in the OSI and TCP/IP model
- Differences between OSI and TCP/IP model
- Concepts of LAN, WAN, Internet, Ethernet
- General concepts in routing and basic routing algorithms like Djkistra's shortest path, distance vector routing, link state routing, etc.
- Overview of popular application layer services like DNS, HTTP, SMTP, etc.

(All above pre-requisites are covered in the subject Fundamentals of Networking (FON) Sub Code: 640001 in GTU MCA SEM IV)

Contents:

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

4. **The Domain Name System (DNS), Remote Login And Desktop (TELNET, SSH), File Transfer And Access (FTP, TFTP, NFS), Electronic Mail (SMTP, POP, IMAP, MIME)**
                                                                                             [20%]

    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
    option 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.

5. **World Wide Web (HTTP), Internet Security And Firewall Design (IPsec, SSL), A Next Generation IP (IPv6)**   **[20%]**

    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 header format.

Text Book (Theory):

1) Douglas E. Comer, "Internetworking with TCP/IP - (Vol. 1)   Principles, Protocols, and Architecture", 5th Edition, Prentice Hall of India (PHI) Publishers.

Reference Books (Theory):

1) Behrouz A. Forouzan, "TCP/IP Protocol Suite", 4th Edition, McGraw-Hill
2) W. Richard Stevens, G. Gabrani, "TCP/IP- Illustrated, Vol. 1 (The Protocols)", Pearson Publishers.

Chapter wise coverage from the Text Book:

Chapter No.	Topics/Subtopics	No. of Lectures
4	*	03
5	*	02
6	*	04
7	*	02
8	*	04
9	*	04
11	*	02
12	*	06
19	*	03
22	*	02
23	*	02
24	*	02
25	*	02
26	*	03
27	*	03
30	*	03
31	31.1 – 31.9	01
	Total No. of Lectures	48

* All topics/subtopics from the given chapter to be included in syllabus

Accomplishment of the student after completing the course:

- Have thorough understanding of TCP/IP based systems, services and related tools and technologies
- Be fluent in design and developing Java based TCP/IP socket based networking solutions
- Effectively use available OS commands/utilities as well as popular third party tools for TCP/IP networking depending upon the needs
- Be geared to adapt to more sophisticate networking related packages in Java and hence develop relatively complex applications more reliably and faster.

A suggestive list of CEC activities for AN:

1. OS commands and utilities for TCP/IP
TCP/IP commands and utilities available in any of the following OS (Microsoft Windows 2000 server/ Red Hat Linux/Fedora) A suggestive list for Windows is given below:
- ipconfig
- ping
- arp
- nslookup
- netstat
- tracert
- route print
- telnet
- ftp

Some of the above commands may vary depending upon the OS.

Students may contact different Internet services like FTP, HTTP, SMTP. Daytime, echo, quote, etc. through telnet giving appropriate host name and well known port no. and observe the interaction on command prompt

2. **Server Administration & Client Configuration**
   - Installation, configuration and operation of :
     1) Web Server (Preferably free and open source like Apache)
     2) FTP Server (Preferably free and open source like FileZilla)
   - Configuring a new TCP/IP client (preferably windows or Linux)
     Configuring IP address/s, default gateway, DNS server addresses, DNS suffix, subnet mask, proxy information, etc.

Installation, configuration and operation of non web based email clients like Outlook Express.