T.Y.B.Sc.
(Computer Science)

(Revised Syllabus)

Paper I

Data Communication, Networking & Security

Syllabus

Paper 1
Data Communication, Networking & Security

Unit I

Introduction – Data Communication, Networks, Internet, Intranet, Protocols, OSI & TCP/IP Models Addressing.
Physical Layer – Signals, Analog, Digital, Analog VS Digital, Transmission impairment, Data Rate Limits, Performance.
Digital Transmission – Line Coding (Umipolar, Polar, Biphase), Block Coding (4B/5B Encoding), Analog to digital conversion, PCM, Transmission Modes.
Analog Transmission – Digital to analog conversion (ASK, FSK, PSK, QAM), Analog to Analog conversion.
Multiplexing – FDM, WDM, Synchronous TDM (time slots & frames, interleaving, data rate management).
Spread Spectrum – FHSS, DSSS
Transmission Media – Guided and Unguided.
Switching – Switching, Circuit-Switched Networks, Datagram networks, Concept of Virtual circuit networks, structure of circuit and packet switch. Concepts of DSL and ADSL.

References:

1. Data Communication & Networking (Foronzan) – IV Edition → Chapters (1, 2, 3, 4, 5, 6, 7, 8, 9)

Demo :

1. Demo of installing NIC cards, Min. LAN Settings such as IP Address
2. Demo of various types of cables [if available], Cross cable and its use, Crimping
3. Study of lab network (type of network topology, bandwidth, switches)

Unit II (30 lectures)

Data Link Layer – Error correction & detection. Types of errors. Detection VS Correction, Block Coding, Hamming Distance, Linear Block codes (single parity check, hamming codes), Cyclic codes, CRC Encoder & Decoder, DRC Polynomial and its degree, Checksum.
Data Link Control & Protocol – Framing, Flow & Error Control, Simplest. Stop-N- Wait. Stop-N-Wait ARQ, Go Back N ARQ, Selective Repeat ARQ. Piggybacking.
HDLC & PPP – HDLC Modes, HDI.C Frames.PPP . PPP Transition states
Multiple Access – Random(CSMA), Controlled(Reservation, Polling, Token Passing), Channelization(FDMA, TDMA, CDMA)
Wired LAN – LLC. MAC, Ethernet, Ethernet frame, Addressing, Concept of *M*Base, V Ethernet, Bridged, Switched, Full Duplex Ethernet, Concept of Fast and Gigabit Ethernet

Wireless LAN- Introduction to WLAN (Architecture Hidden Exposed Station Problem) Introduction to Bluetooth & Architecture, Cellular telephony, Concept of LG, 2G, 3G cellular telephony.
Connecting Devices Repeaters, Hubs, Bridges, Spanning tree algorithm.Two & Three layer Switches Routers, Gateways, Backbone networks, Concept of VLAN
Network Layer Logical addressing IPv4 Addresse $$& classless address NATAddressing.

References –

1. Data Communication & Networking (Forouzan) -- IV Edition – Chapter (10, 11, 12, 13, 14, 15, 16, 19)

Demo :

1. Study of network connectively devices [switches, modems/routers etc. installed in lab]

Unit III (30 lectures)

Network layer protocol – internetworking,IPv4, IPv4 protocol packet format, IPv6 Protocol & Packet format, IPv4 VS IPv6, Transition from IPv4 to IPv6,Address Resolution protocols (ARP, RARP), BOOTP, DHCP,
Routing Protocols – Delivery, forwarding, routing, types of routing, routing tables, Unicast Routing, Unicast Routing protocols, RIP, Concepts of OSPF, BGP & Multicast Routing
Transport Layer – Process to process delivery, UCP, TCP
Congestion Control & Quality of Service – Data traffic, Congestion, Congestion Control (Open Loop, Closed Loop & Congestion control in TCP), QoS and Flow Characteristics
Application Layer – DNS, Remote Logging (Telnet), SMTP, FTP, WWW, HTTP

References –

1. Data Communication & Networking (Forouzan) – IV Edition

Demo:

1. Study of LAN Settings such as IP Addr, Subnet mask, Gateway Address, DNS addresses, Proxy etc.
2. Accessing machines in networks, sharing files/folders and printers.
3. Study of commands such as ping, netconfig, ipconfig, arp, netsta, rout, traceroute etc. [commands will depend on OS]
4. Useful Browser Settings.

Unit IV (30 lectures)

Introduction : Introduction to system and network security, security attacks, security services and mechanisms(Fourozan Chp 1),
Cryptography: Traditionaland Modern Symmetric-Key Ciphers(Fourozan Chp 3 and 5),DES and AES.(Williams Chp 2), Asymmetric-Key Cryptography, RSA andELGAMALcryptosystems(Fourozan Chp 10),Message Digest, Digital Signature, Key Management.(Williams Chp 3)
Network Security : Security at Application Layer (E-MAIL(Fourozan Chp 16.1), PGP and S/MIME).(Fourozan Chp 16), Security at Transport Layer (SSL and TLS)).(Williams Chp 7),, Security at Network Layer (IPSec)) .(Williams Chp 6),.

Firewall and Intrusion Detection : Firewalls and their types. DMZ, Limitations of firewalls, Intruders, Intrusion detection (Host based, Networked, Distributed), IDS(Atul Kahate Chp9).
Malicious software and Internet Security : Viruses and related threats, virus countermeasures.(Williams Chp 10),., denial of service attacks, Hacking, Security policies and plan, Strategies for a secure network.

References:

2. BF: "Cryptography & Network Security", Behrouz A. Forouzan, IV Edition Tata McGraw-Hill.
   (1.1-1.4, 3.1-3.4,5.1-5.2,6.1-6.5, 7.1-7.6, 8.1, 8.2, 10.1-10.4, 11.1. 11.3, 13.1-12.5, 15.1-15.4, 16.1-16.3, 17.1-17.4, 18.1-18.4)
1. WS: "Network security essentials applications and standards", William Stallings, II Edition, Pearson Education (1.1-1.6, 2.1-2.6, 3.1-3.5, 5.1-5.2, 3.1-6.4, 7.1-4.3, 8.1-8.2, 9.1-9.3, 10.1-10.3, 11.1-11.3)
2. AC: "Cryptography and Network Security", Atul Kahate, Tata McGrawHill.

Demo:

1. Antivirus software and its settings.
2. Settings, firewalls, Enabling/Disabling ports.
3. Introduction to cyber crime and cyber law.

Additional References:

1. Computer Networks and Internets (5^{th} Edition), Douglas Comer
2. Computer Networks (4^{th} Edition), Andrew Tanenbaum
3. Networking Complete by Sybex Inc. and Sybex Inc.