Computer Network

BCA(N)-203

Block 1

Unit I

Introduction to computer network, Historical background of computer network, network topologies, Classification Based on Transmission Technology, Broadcast Networks, Point to point networks, LAN, WAN, MAN, internet, application of internet.

Unit II

Introduction to transmission media, guided transmission, unguided transmission, Introduction to Transmission Impairments and Channel Capacity, attenuation, Delay distortion, Noise, Bandwidth and Channel Capacity.
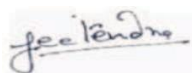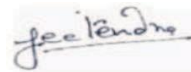
Unit III

Introduction to Network Topology, Mesh Topology, Bus Topology, STAR Topology, Ring topology, Tree Topology, Unconstrained Topology, Combination of topology and transmission media. Introduction to Medium Access Control (MAC), Goals of MACs, Round Robin Techniques Polling, Token Passing, Contention-based Approaches, ALOHA, CSMA, CSMA/CD. Introduction to IEEE CSMS/CD based LANs, IEEE 802.3 and Ethernet, Ethernet - A Brief History, 5.3.2.2 Ethernet Architecture, Encoding for Signal Transmission, The Ethernet MAC Sublayer, The Basic Ethernet Frame Format ,Other important issues.

Unit IV

Introduction to IEEE Ring LANs and High Speed LANs –Token Ring Based, Token Ring (IEEE 802.5), Token Ring Operation, Priority System, Ring Maintenance, Physical Layer Frame Format, Token Bus (IEEE 802.4), Functions of a Token Bus, Frame Form, Logical ring maintenance, Relative comparison of the three standards.

Unit V

Introduction to High Speed LANs – Token Ring Based, FDDI, Medium, Topology, Fault Tolerance, Frame Format Media Access Control, FDDI and the OSI model, Comparison, Introduction to High Speed LANs – CSMA/CD, Successors of Ethernet, Switched Ethernet, Fast Ethernet, Gigabit Ethernet and Brief History and the IEEE 802.3z Task Force, Similarities and advances over Ethernet (IEEE 802.3), Gigabit Ethernet Protocol Architecture GMII (Gigabit Media Independent Interface), Media Access Control Layer.

Block II

Unit VI

Introduction to Wireless LANs, Transmission Media, Infrared, Microwave, Radio, Topology

Medium Access Control, Carrier Sense Multiple Access with Collision Avoidance (CSMA-CA), Framing, Security, IEEE 802.11 extensions.

Unit VII

Introduction to Bluetooth, Topology, Bluetooth Architecture, Bluetooth Layers ,Layer 1: Radio Layer, Layer 2: Baseband Layer, Layer 3: Link Manager Protocol, Layer 4: Host Controller Interface, Logical Link Control and Adaptation Protocol, Layer 6: Radio Frequency Communication (RFCOMM), Layer 7: Service Discovery Protocol, Telephony Control Protocol Spec (TCS), Application Program Interface (API) libraries

Unit VIII

Introduction Cellular Telephone Networks, Cellular Telephone System, Frequency Reuse Principle, Transmitting and Receiving, Mobility Management, Medium Access Control Techniques, First Generation Second Generation System, Second Generation , Third Generation.

Unit- IX

Introduction to Internetworking Devices, Repeaters, Hubs, Bridges, Transparent Bridges, Bridge Forwarding, Bridge Learning , Source Routing Bridges, Switches, Routers, Gateways A Simple Internet.

Unit X

Introduction to Internet Protocol (IP), Addressing, IP Addressing, Subnetting, Network Address Translation (NAT), Address Resolution Protocol (ARP), IP Datagram, Multiplexing and Demultiplexing, Fragmentation and Reassembly, ICMP, IPV6

Unit XI

Introduction to Transport and Application Layer Protocols, User Datagram protocol (UDP) Transmission Control Protocol (TCP), Client-Server Paradigm and its Applications.

Unit XII

Introduction to Routing and Congestion Control, Classification of Routers, Routing Algorithm Metrics, Fixed or Static Routing, Flooding, Intradomain versus Interdomain

Block III

Unit XIII

Introduction to RIP – Routing Information Protocol, Routing Table Format, RIP Timers, Hop-Count Limit, Solution To Slow Convergence Problem., RIP Message Format, RIP version 2.

Unit XIV
Introduction to Open Shortest Path First (OSPF) and Border Gateway Protocol (BGP)
Link-State Algorithm, Routing Hierarchy in OSPF, OSPF Message Format, Additional OSPF Features, Introduction to Border Gateway Protocol, BGP Characteristics, BGP Functionality and Route Information Management, BGP Attributes, BGP Path Selection, BGP Message type, BGP Fixed Header Format, BGP OPEN Message, BGP UPDATE Message, BGP NOTIFICATION Message, BGP KEEPALIVE Message

Unit XV
Introduction to Congestion Control, Causes Of Congestion, Effects of Congestion, Congestion Control Techniques, Leaky Bucket Algorithm, Token Bucket Algorithm, Congestion control in virtual Circuit, Choke Packet Technique, Hop-by Hop Choke Packets Load Shedding, Slow Start - a Pro-active technique, Flow Control Versus Congestion control.

Unit XVI
Introduction to Cryptography and Secured Communication, Symmetric Key Cryptography Monoalphabetic Substitution, Polyalphabetic Substitution, Transpositional CipherBlock Ciphers, Data Encryption Standard(DES), Encrypting a Larges Message, Triple DES, Public key Cryptography, RSA, Introduction to Secured Communication, Security Services, Privacy, Authentication, Integrity and Nonrepudiation using Digital Signature, User Authentication using symmetric key cryptography, User Authentication using Public Key Cryptography, Key Management, Application Layer Security, Virtual Private Network (VPN)

Unit XVII
Introduction to Firewalls, Why a Firewall is needed?, Access Control Policies, Firewall Capabilities, Limitations of a Firewall, Types of Firewalls, Bastion Host, Network Address Translation, Firewall Configurations, Active Firewall Elements.

Suggested Reading:

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
3. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.
4. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", Mc Graw Hill Publisher, 2011.
5. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw – Hill,2011.