

## Computer Networks-I

Semester V

Subject Code: BS51703

Lectures: 60

### Objectives:

The syllabus aims in equipping students with,

- Understanding different types of networks, various topologies and application of networks.
- Understanding types of addresses, data communication.
- To Understand the concept of networking models, protocols, functionality of each layer.

### Unit 1: Introduction to Computer Networks and Network Models

13

#### 1.1 Introduction to Computer Networks

- Basic Concepts:
  - Computer Networks- Goals and applications – Business Application, Home Application, Mobile User and Social Issues
  - Network Hardware - Broadcast and point-to-point
  - Topologies – star, bus, mesh, ring etc.
  - Network Types-LAN, MAN, WAN, Wireless Networks, Home Networks, Internetwork
  - Data Communication-Definition, components, data representation, Data Flow
- Protocols and Standards ( De facto and De jure standard)
- Network Software - Protocol Hierarchies -layers, protocols, peers, Interfaces
- Network architecture, protocol stack
- Design issues of the layers :addressing, error control, flow control, multiplexing and demultiplexing, routing
- Connection-oriented and connectionless service

#### 1.2 Network Models

- OSI Reference Model - Functionality of each layer
- TCP/IP Reference Model, Comparison of OSI and TCP/IP model
- TCP/IP Protocol Suite
- Addressing - Physical, Logical and Port addresses



**Unit 2: Physical layer**

10

- Analog and Digital data
- Digital Signals: Bit rate, Bit length and Baseband Transmission
- Transmission media: Wired and wireless
- Transmission Impairments: Attenuation, Distortion and Noise
- Data Rate Limits
  - Noiseless channel: Nyquist's bit rate
  - Noisy channel : Shannon's law
- Line Coding Characteristics, Line Coding Schemes:
  - Unipolar - NRZ
  - Polar-NRZ-I, NRZ-L, RZ, Manchester and Differential Manchester
- Performance of the Network: Bandwidth, Throughput, Latency(Delay) , Bandwidth –Delay Product and Jitter
- Switching: Circuit Switching, Message Switching ,Packet Switching and comparison
- Physical Layer Devices: Repeaters, Hubs (Active hub and Passive hub)

**Unit 3: Data Link layer**

25

**3.1. The Data Link Layer**

- Design Issues – Services provided to the Network Layer
- Framing – Concept, Methods - Character Count, Flag bytes with Byte Stuffing, Starting and ending Flags with Bit Stuffing and Physical Layer Coding Violations, Error detection and correction and Flow Control
- Error detection code CRC
- Data Link Layer Protocols :
  - Noiseless channel -A Simplex, Stop-And-Wait protocol
  - Noisy channel – Stop & wait, ARQ, Pipelining, Go –back –N, selective repeat and Sliding Window Protocols
- Piggybacking Concepts
- 1-bit sliding window protocol
- Data Link Layer Devices – Bridges and Switches

**3.2. The Medium Access Sublayer**

- Multiple access
- Random Access Protocols :ALOHA – pure and slotted, CSMA – 1-persistent, p-persistent and non-persistent ,CSMA/CD and CSMA/CA
- Controlled Access: Reservation, Polling and Token Passing
- Channelization: FDMA, TDMA and CDMA(Analogy, Idea, Chips, Data Representation, Encoding and Decoding, Signal Level and Sequence Generation)



### 3.3 Wired LANs

- IEEE Standards Data Link Layer, Physical Layer Standard Ethernet MAC Sublayer – Frame Format, Frame Length, Addressing, Access Method
- Physical Layer – Encoding and Decoding, 10Base5, 10Base2, 10Base-T, 10Base-F
- Overview of Ethernet types:
  - Changes In The Standard – Bridged Ethernet, Switched Ethernet, Full Duplex Ethernet
  - Fast Ethernet – Goals, MAC Sublayer, Topology, Implementation
  - Gigabit Ethernet – goals, MAC Sublayer, Topology, Implementation
  - Ten-Gigabit Ethernet – goals, MAC Sublayer, Physical Layer
- Backbone Networks Bus Backbone, Star Backbone, Connecting Remote LANs
- Virtual LANs: Membership, Configuration, Communication between Switches

**\*Contact hours –12 hours**

#### Reference Books:

1. Andrew Tanenbaum ,'Computer Networks', Pearson Education.[4<sup>th</sup> Edition]
2. Behrouz Forouzan ,'Data Communication and Networking', TATA McGraw Hill. [4<sup>th</sup> Edition]

