"Course Syllabus"

PART 1: Fundamentals of Data Communications & Networking

- ***Definition and Modeling of a Data Communications System***
- ***Motivation for Networking***
- ***Evolution of Computer Networks***
  - Dumb vs. Smart Terminals
  - Point-to-Point vs. Multipoint vs. Multiplexed Configurations
  - Master-Slave vs. Peer Networks
  - Centralized vs. Distributed Processing
  - The Public Internet
  - Enterprise Networks
- ***Classifications of Networks***
  - Public vs. Private
  - Switched vs. Broadcast
  - Local vs. Wide Area Networks

PART 2: Computer Network Protocols

- ***Need for Protocols, Concept of Layered Architecture***
  - Elements of Protocols
  - The Open System Interconnection Reference Model (OSIRM)
  - The Internet Protocol Suite (TCP/IP)
- ***Data Communications Physical Interface***
  - Asynchronous vs. Synchronous Transmission
  - Digital vs. Analog Signaling
  - HDX vs. FDX Transmission
  - Multiplexing Techniques : Synchronous TDM, Statistical TDM
  - Bit Rate vs. Baud
  - Physical Interface Specifications
  - Transmission Media
- ***Data Link Control Protocols***
  - Error Detection and Control Procedures
    a) Stop & Wait ARQ
    b) Continuous, Go-Back-N ARQ
    c) Selective ARQ
    d) Cyclic Redundancy Checks
  - Flow Control Procedures
    a) Stop & Wait Flow Control
    b) Sliding Window Flow Control
  - Data Link Protocols: HDLC, PPP, etc…

PART 3: WIDE AREA NETWORKS

- ***Switching Technologies***
  - Circuit Switching
  - Packet Switching Technologies
    - Connectionless (Datagrams) Packet-Switched Networks
    - Connection-Oriented (Virtual Circuit) Packet-Switched Networks, X.25
    - Fast Packet Switching Technologies (Frame Relay, Asynchronous Transfer Mode)
    - The Public Internet Structure

PART 4: LOCAL AREA NETWORKS

- ***Introduction and Overview***
  - Definition and Terminology
  - Characteristics of LANs
  - LAN Protocol Architecture

- ***LAN Technology Options***
  - LAN Topologies : Bus, Ring, Hub, …
  - LAN Transmission Media: STP/UTP, Coaxial Cable, Fiber-Optic Cable, ..
  - LAN Hardware Components: NICs, Hubs, MAUs, etc…

- ***LAN Medium Access Methods***
  - Carrier Sense Multiple Access/Collision Detection
  - Token Passing Protocols : Token Ring, Token Bus, Slotted Rings
  - Performance Comparison of Media Access Protocols : Throughput vs. Delay

- ***Legacy LANs***
  - IEEE 802.3 : CSMA/CD (Ethernet)
  - IEEE 802.5 : Token Ring
  - FDDI

- ***High Speed/Switched LANs***
  - 10BaseT
  - 100BT: Fast Ethernet
  - Priority Demand (IEEE802.12)
  - Gigabit Ethernet
  - Switched Rings

PART 5: INTERNETWORKING

- ***MAC Layer Bridging***
  - Functional Definition and Architecture
  - Bridge Operation : Learning Process, Forwarding, Filtering & Flooding
  - Types of Bridges :
    a) Transparent Spanning Tree Bridges
    b) Source Routing Bridges
    c) Translation Bridges
    d) Encapsulating Bridges
    e) Backbone Bridges
  - Bridging Applications: Network Segmentation, WAN Connectivity,…

- ***Network Layer Routing***
  - Functional Definition and Architecture
  - Survey of Routing Algorithms :
    a) Static and Dynamic Routing
    b) Centralized and Distributed Routing
    c) Least Cost Path
    d) Load Sharing
  - Routing with TCP/IP
    a) TCP/IP Protocol Overview
    b) IP Packet Structure
    c) IP Addressing, IP Subnetting, Subnet Masking, VLSM, CIDR
    d) Address Resolution Protocol
  - Internet Routing Protocols: RIP, OSPF, BGP

- ***Transport layer Protocols***
  - Transmission Control Protocol (TCP)
    a) Connection establishment
    b) Socket Addressing, Port numbers
    c) Slow start characteristics, Global synchronization effects
    d) End-to-end sliding window procedures
    e) TCP segment format
    f) Congestion Control with TCP
  - User Datagram protocol (UDP)
    a) Connection-less Operation
    b) Socket Addressing, Port numbers
    c) UDP datagram format

- ***Network Applications***
  - Client-Server Applications
  - Domain Name Services
  - Electronic Mail, File Transfer and Remote Access Applications
  - WWW-based Applications, HTTP, HTML

- ***Network Security***