University of Southern California

Course Title: EE/CS 450 “Introduction to Computer Networks”

Semester: Fall Semester 2002

Lecture: TTH 7:30-8:50 AM, OHE 100, Studio D

Discussion Session: W 8:30-9:20 AM, Studio D

Instructor: Professor A. Zahid

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Office Hours: TTH 7:00-7:25 AM, 9:00-10:45 AM, 1:00-3:00 PM

Teaching Assistant: Mr. Karim Seada

T/A Office and Office Hours: W 10:00-12:00 PM, EEB201

Graders: Ms. Deniz Gurkan and Ms. Jieyu Zheng

Graders Office and Office Hours:
   Deniz: F 11:00-1:00 PM, EEB533
   Jieyu: M 3:30-5:30 PM, EEB201

Grading: Max \{(40, M), (50, F), (10, HW)\}, \{(30, M), (60, F), (10, HW)\}\)

Grading Scales: (85-100, A- to A), (70-84, B- to B+), (55-69, C- to C+), (45-54, D- to D+). **There is absolutely no curve**

Required Textbook: Computer Networks, A system approach, 2nd Edition
   Larry Peterson & Bruce Davie

Exams Dates: Midterm, Oct 17, 7:30 ~ 8:50 AM, Final, Dec 12, 4:30 ~ 6:30 PM
   No Make-up exams no matter what your reasons are.

Homeworks: Assigned weekly. No late or electronic Homeworks are accepted. Remote Location students should contact DEN for a fax number or e-mail address
“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