Syllabus **CS 422 Computer Networks** **Fall 1999**

Instructor : Prof. Kihong Park
Class : TR 1:30–2:45 (SMTH 118)
Office Hours : TR 3–4pm, F 11–noon (CS 220)
E-mail : `park@cs.purdue.edu` (Tel. : 494–7821)
Course Homepage : `http://www.cs.purdue.edu/homes/park/cs422.html`

Teaching Assistants : Tapan Karwa, Sohil Maru
Office Hours : Karwa: MW 2:30–4pm (CS G72); Maru: M 1–2:30pm, T 8:45-10:15am (MT 407)
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Course Content : Undergraduate introductory course to computer networks and data communication.

Prerequisites : CS 354 (Operating Systems); undergraduate CS preparation up to senior year.

Text Books : Required—*Computer Networks: A First Course*. Jean Walrand. McGraw-Hill, 2nd edition. Reference—*Internetworking with TCP/IP, Vol. II*. Comer & Stevens, Prentice Hall, 1994 (2nd ed.). The textbook is an additional source of reference to material covered in class; the lectures are the main source of information. Attendance is crucial for the successful completion of the course.

Work Load and Grading Policy : Homework assignments (40 %), midterm (30 %), final (30 %). Homework assignments will be posted on the course homepage `http://www.cs.purdue.edu/homes/park/cs422.html`. There will be about 7–9 assignments involving both written and programming/implementation problems. Late assignments will not be accepted.

Discussion of initial ideas and approaches regarding homework assignments is fine. *Collaboration* on homeworks (i.e., jointly exploring the specifics of a solution), however, is not allowed. Academic dishonesty is a serious matter and will be dealt with in accordance with University policy.

Lab Space : Our main programming and implementation platform will be the Undergraduate Systems and Security Lab which is composed of a cluster of workstations running UNIX (Solaris) and a number of laptops and configurable network devices. The lab is currently located in CS 257 (Xinu Lab) but will move its location to REC. Lab times have been set aside for CS 422 (consult your schedules). There are also open times (posted in the Lab) during which the machines can be shared with other users. We will carry out network experiments and use socket programming to access TCP/IP for network communication implementations.

Accounts will be set up and distributed during the first week of classes. For account-related questions, please consult Candace Walters (`clw@cs.purdue.edu`, (765) 494–9206, CS 210).

Goal of the Course : The primary goal of the course lies in the understanding of fundamental networking concepts and its applications. Computer networks is a rapidly evolving field, with new standards and

improvements in networking technology occurring as we speak. This makes the field exciting; however, without a firm grounding in its fundamentals, it can also be a confusing and overwhelming subject matter. This course is a modern introduction to computer networks, stressing the logical organization of the three networking features—architecture, algorithms, and implementations. Emphasis will be placed on software and implementation issues and, to some extent, performance issues.

The course will cover historical background/current issues facing modern communication networks, network architecture (hardware/software), fundamentals of data transmission (digitial/analog, coding), LAN technology and data link protocols (Ethernet CSMA/CD, switched Ethernet, FDDI token ring, wireless networks and TMDA/CDMA/MACA, SONET), packet/circuit switching and wide-area networks, internetworking using TCP/IP (socket programming in UNIX), routing (shortest path, IP, hierarchical), congestion control and quality of service (TCP, leaky bucket, RSVP), ATM networks (ATM protocol stack, IP-over-ATM), high-level network services (DNS, E-mail and MIME, HTTP, SNMP, network security), and multimedia communication.

Course Outline :

- Historical background, current issues, and network architectures
- Fundamentals of data transmission: transmission media, digital vs. analog, framing/coding, multiplexing (TDM, FDM)
- LAN technology and data link protocols: point-to-point links and stop-and-go/sliding window flow control, Ethernet and CSMA/CD, switched Ethernet
- Packet/circuit switching and wide-area networks: store-and-forward networks, source routing, virtual/permanent circuits and call set-up, LAN/WAN addressing, hop-by-hop vs. end-to-end control
- Internetworking using TCP/IP: network programming primer using socket API, client/server design (concurrent/iterative)
- Routing: IP, IP and ARP, shortest path, hierarchical
- ––*Midterm*––
- End-to-end reliability: TCP (connection set-up/termination, data transport), forward error correction and UDP
- Congestion control: TCP window control, issue of stability/optimality
- Quality of service: limitations of FIFO, weighted fair queueing, resource reservation and RSVP
- Quality of service (continued): multicasting and RSVP, traffic shaping (leaky bucket)
- ATM networks: traffic classification, ATM protocol stack, IP-over-ATM
- High-level network services: DNS, E-mail and MIME, HTTP and WWW
- High-level network services (continued): network security, network management
- Multimedia communication: multimedia data, video/audio compression using MPEG, RTP
- ––*Final*––