Syllabus **CS 536 Data Communication and Computer Networks** **Fall 2001**

Instructor : Prof. Kihong Park
Class : MWF 9:30–10:20 (CS G066)
Office Hours : MWF 10:30-11:30am and by appointment (CS 220)
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Course Homepage : `http://www.cs.purdue.edu/~park/cs536.html`

Teaching Assistants : Tzvetan Horozov (horozov@cs), Tiberiu Stef (tstef@cs)
Office Hours : Horozov: Mon 2:15-3:15pm, Tue 9:30-11:30am (MATH 405)
Stef: Tue/Thu 8:30-9:30am (MATH 417)

Course Content : Graduate-level introductory course to computer networks and data communication.

Prerequisites : Operating systems (CS 413); solid background in C and UNIX (experience with projects and system programming); sound undergraduate-level mathematical preparation (calculus, differential equations, probability and statistics).

Text Books : Required—*Computer Networking*. Kurose & Ross. Addison Wesley, latest edition. The textbooks, including Kurose & Ross, are to be viewed as reference materials; the lectures are the main source of information. Although the overall flow will be the same, the material covered in the lectures will deviate from the textbooks in sequence, presentation, and treatment at various places. Attendance is crucial for the successful completion of the course.

Work Load and Grading Policy : Homework assignments (40 %), midterm (30 %), final (30 %). There will be about 6 assignments. They will be posted on the course homepage `http://www.cs.purdue.edu/~park/cs536.html`. 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 is dealt with in accordance with University policy.

Lab Space : Our main programming and implementation platform will be the cluster of workstations in the Xinu Lab (CS 257) of the Computer Science Building running UNIX (Solaris). Lab times have been set aside for CS 536 (consult your schedules). There are also open times (posted in the Lab) during which the machines can be shared with other users. The lab machines can also be accessed remotely using `telnet`. A typical homework (programming and implementation component) will involve writing TCP/UDP/IP network programs running on a number of IP-connected hosts. Accounts will be automatically created 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 mastery of fundamental networking concepts—architecture, algorithms, and implementations.

Computer networks is a rapidly evolving field, with new standards and improvements in data communication technology occurring, literally, as we speak. This makes the field both exciting and rewarding; however, for those not firmly grounded in its fundamentals, it can also be a confusing and overwhelming subject matter. Fortunately, the fundamentals required in understanding and keeping on top of ongoing developments vary at a much slower pace, and it is these fundamentals that will form the skeleton of the course, with technological advances providing further grounding and context.

This course is a "modern" introduction to computer networks, stressing the logical organization of the three networking features, architecture, algorithms, and implementations. Special emphasis will be given to *performance* issues which will be a recurring and, to some extent, unifying theme of the course. Ultimately, architecture, algorithm, and implemention are geared toward facilitating enhanced performance.

We will learn about the technology and control mechanisms underlying local area and wide area networks (LANs and WANs), the fundamentals of information transmission and coding which underlies all intelligible communication, the protocols that allow diverse networks to interoperate so that messages are seemlessly forwarded (internetworking), the role of data buffering and why, in spite of that, data is sometimes lost on its route from source to destination (a.k.a. queueing).

We will learn how to control the path and flow of data such that network performance is enhanced (routing and congestion control), special problems arising in high bandwidth networks including optical networks, issues surrounding multimedia communication (audio/voice, video/image, bulk/interactive data) and their facilitation, high-level transparent network services including network file systems (NFS), remote procedure calls (RPC), domain name system (DNS), hypertext transfer protocol (HTTP), Web servers, and network computing.

Course Outline :

- Introduction (3 lectures)
- Fundamentals of information transmission and coding (3 lectures)
- Direct link communication: technology and access control (4.5 lectures)
- End-to-end communication: packet switching and circuit switching (1.5 lectures)
- Internetworking with TCP/IP: structure (1.5 lecture)
- Socket programming and network communication (3 lectures)
- Fundamentals of queueing theory (4.5 lectures)
- —–*Midterm*—–
- Internetworking with TCP/IP: functionality (3 lectures)
- Routing and congestion control (4.5 lectures)
- High bandwidth networks and Internet traffic (4.5 lectures)
- Multimedia communication and quality of service (QoS) (4.5 lectures)
- Transparent network services: RPC, HTTP, Web servers, Java and network computing (3 lectures)
- Wireless networks (1.5 lecture)
- —–*Final*—–

§ *The lecture notes will be made available on-line on the course homepage in postscript (ps) format.*