Syllabus **CS 422 Computer Networks** **Spring 2011**

Instructor : Kihong Park
Class : MWF 4:30–5:20pm (LILY 3102)
Office Hours : MW 3:30–4:15pm, 5:30–6pm, and by appointment (LWSN 1211)
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Course Content : Undergraduate introductory course to computer networks and data communication.

Prerequisites : CS 354 (Operating Systems); proficiency in C programming.
Text Books : Required—*Computer Networks and Internets*. Douglas Comer. Prentice Hall, 5th edition. Reference—*Internetworking with TCP/IP, Vol. II*. Comer & Stevens, Prentice Hall, 1994. 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 successful completion of the course.

Work Load and Grading Policy : Homework assignments (50 %), midterm (25 %), final (25 %). Homework assignments will be posted on the course homepage. There will be 6–7 assignments involving both written and programming problems. The latter entail prototype system implementation and benchmarking. Late assignments will not be accepted.

Discussion of initial ideas 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 Purdue University policy. Please consult

http://spaf.cerias.purdue.edu/cpolicy.html

for course policy related information.

Lab Space : Our main programming and implementation platform will be the Undergraduate Systems and Security Lab which is comprised of a cluster of PCs running Linux. The lab is located in LWSN B148. PSO times have been set aside for CS 422 (consult your schedules). There are also open times during which the machines can be shared with other users. We will use socket programming to access TCP/IP for network communication implementation and experiments. Accounts will be automatically set up during the first week of classes. Information on accounts can be accessed at https://portals.cs.purdue.edu/student using ITaP login & password. Please direct account-related questions to accounts@cs.purdue.edu.

Goal of the Course : The goal of the course lies in understanding fundamental networking concepts, their implementation and application in today's information technology world. Computer networks

is a rapidly evolving field, with new networking technologies and standards in the works 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—with focus on performance. We will devote significant time discussing wireless networks, a key driver of today's network technology. The course will cover historical background and current issues facing modern communication networks, network architecture (hardware, software), fundamentals of data transmission (wired, wireless), LAN technology and data link protocols (Ethernet CSMA/CD, switched Ethernet, wireless LAN CSMA/CA, cellular network TDMA, FDMA, CDMA, SDMA/MIMO, and mobility), packet/circuit switching in wide-area networks, internetworking using TCP/IP (socket programming in Linux), routing (IP, intra- and inter-domain), congestion control (TCP and multimedia UDP streaming), real-time video/audio/voice and quality of service, and high-level network services (DNS, HTTP, SNMP, e-mail, network security).

Course Outline :

- Introduction: bird's eye overview of computer networks
- Fundamentals of data transmission: wired/wireless media, digital vs. analog transmission, data coding, multi-user communication and multiplexing
- LAN technology and data link protocols: point-to-point links and sliding window flow control, Ethernet and CSMA/CD, switched Ethernet
- LAN technology and data link protocols (continued): wireless LAN and CSMA/CA, cellular networks and advanced multi-user communication (CDMA, SDMA/MIMO), mobility
- Internetworking using TCP/IP: network programming using socket API, network client/server design
- 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
- ——*Midterm*——
- Routing: IP and shortest-path intra-domain routing (OSPF, RIP)
- Routing (continued): inter-domain policy routing (BGP) and network connectivity
- End-to-end reliability: TCP (connection set-up/termination, data transport), forward error correction and UDP
- Congestion control: TCP window control, real-time and on-demand/buffered multimedia streaming
- Quality of service: Internet workload, traffic engineering and scheduling
- High-level network services: DNS, HTTP, SMTP
- High-level network services (continued): network management (SNMP), network security
- ——*Final*——