

**Instructor :** Kihong Park

**Class :** TR 10:30–11:45am (CS G66)

**Office Hours :** TR 1:30–2:30pm and by appointment (CS 220)

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**Course Homepage :** <http://www.cs.purdue.edu/~park/cs422-06s.html>

**Teaching Assistant :** Hwanjo Heo

**Office Hours :** MF 3-4:30pm (CS G50)

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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 and Internets*. Douglas Comer. Prentice Hall, latest 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 (25 %), final (25 %), project (10 %). Homework assignments will be posted on the course homepage. There will be about 6 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 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 Purdue 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 PCs running Linux and a number of laptops and configurable network devices. The lab is located in REC 108. 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 automatically set up during the first week of classes. Information on instructional accounts can be accessed at <https://portals.cs.purdue.edu/student>. You need to use your ITaP login & password to access the information. For account-related questions, please consult Candace Walters ([accounts@cs.purdue.edu](mailto:accounts@cs.purdue.edu), 494-9206, CS 210).

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

technology and standards 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 (digital/analog, coding), LAN technology and data link protocols (Ethernet CSMA/CD, switched Ethernet, wireless LANs and TDMA/CDMA), 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), high-level network services (DNS, E-mail, HTTP, SNMP, network security), and multimedia communication.

### Course Outline :

- Introduction: Bird's eye view of computer networks
- 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
- LAN technology and data link protocols (continued): wireless LANs, TDMA/CDMA
- Internetworking using TCP/IP: network programming primer using socket API, 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
- Routing: IP and shortest path
- —*Midterm*—
- Routing (continued): intra- and inter-domain routing protocols (OSPF, RIP, BGP)
- End-to-end reliability: TCP (connection set-up/termination, data transport), forward error correction and UDP
- Congestion control: multimedia streaming, TCP window control, issue of stability/optimality
- Quality of service: Internet traffic and traffic engineering
- Quality of service (continued): real-time traffic and scheduling
- High-level network services: DNS, HTTP, SMTP
- High-level network services (continued): network security, network management
- —*Final*—