EE E6761 - Computer Communication Networks
Course Information

Professor Dan Rubenstein — Fall 2000

Course Resources

Contact Information		
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Office Hours	Monday 2-3pm or by appt.	Thursday 4-6pm

Course URL: http://www.cs.columbia.edu/~danr/EE6761

Course meeting time / location: 4:10 pm - 6:40 pm on Tuesdays in 545 Mudd

Pre-Requisites

- Familiarity with data structures and algorithms
- C or C++ programming (Java acceptable if TA is willing)
- A course in probability is recommended

Description

We are rapidly approaching an era in which the Internet will be the primary means of communication and information exchange. Already, millions use e-mail as a routine form of communication, and the World Wide Web (WWW) has become a primary source for gaining access to enormous volumes of information, as well as to a variety of services, such as on-line shopping, stock trading, and banking.

This course is designed to bring students up to the state of the art in networking research with a focus on Internet technologies, and to provide the tools necessary to allow students to stay current after the course ends. The course will cover a blend of theoretical topics and cite practical examples, mainly from the Internet.

Since this is a 4.5 credit graduate-level course, the pace will be fast, and the workload will probably be quite heavy.

Grading

Your grade consists of:

25% Homework

- 3-5 small programming assignments covering network and protocol programming.
- 5-10 written assignments covering theoretical topics.

25% Mid-term: Date and format (open / closed book) to be decided in class

50% Project: Students are expected to complete a project that involves preliminary exploration into a current networks research topic. It is preferred that students work in groups of 3-5 students. Each group will write a report describing the project.

Collaboration

The goal is to have students learn the material. If you feel that you learn better through collaboration, by all means please do. Collaboration $\neq$ Copying: if you simply copy what someone else has done, you probably have not learned what you were supposed to have by thinking about the problem / designing the program, etc. Put your own thought into your work!

For homework, every student must write their answers / submit their code separately. Collaboration is forbidden on the midterm, but is strongly encouraged on the project.

Class Attendance

Class attendance is not mandatory and you don't have to attend if you don't want to. However, you are responsible for whatever comes up during discussion in class. Also, I have more sympathy for students who are doing poorly if they can demonstrate that they are trying, part of which includes attending class.

Since lecture is 2.5 hours long, there will be a 5-10 minute break somewhere near the midpoint of each lecture. If by 5:45 we still haven't taken a break, please don't be afraid to point that out to me.

Reading / Texts

Internet and network technology changes so quickly that only very recently published books are up to date. The recent books are written in a descriptive style, and are a bit light on teaching fundamental concepts and theory. We will be using Kurose-Ross as the main text and you should purchase it. Bertsekas-Gallager is an excellent text for covering the theory and fundamentals. I'm trying to figure out how to incorporate the more theoretical material without forcing you to buy the book.

You should attempt to do the reading before class.

- **Required:** James F. Kurose and Keith W. Ross, *Computer Networking: A Top-Down Approach Featuring the Internet*, Addison-Wesley, 2000. ISBN 0-20-147711-4
- **Strongly Recommended:** Dimitri Bertsekas and Robert Gallager, *Data Networks (2nd ed.)*, Prentice Hall, 1992. ISBN 0-13-200916-1.
- **Others**
  - Alberto Leon-Garcia and Indra Widjaja, *Communication Networks: Fundamental Concepts and Key Architectures*, McGraw-Hill, 2000. ISBN 0-07-022839-6.
  - Larry L. Peterson and Bruce S. Davie, *Computer Networks: A Systems Approach (2nd ed.)*, Morgan-Kaufmann, 1999. ISBN 1-55860-514-2
  - Andrew S. Tanenbaum, *Computer Networks (3rd ed.)*, Prentice Hall, 1996. ISBN 0-13-349945-64
- Periodically, there will also be handouts or links on the course web page to reading.

Computing Accounts

Students will need access to a UNIX or UNIX-like environment to complete the programming assignments, and such an account will also be beneficial for the course project. For CVN students, accounts are available at http://www.cvn.columbia.edu/Services/Computer_Accounts/computeraccount.html. For on-campus students, see http://www.columbia.edu/acis/accounts/create/current.html. If you already have some other account that you would prefer to use, that is fine. However, please create the AcIS account as well since it may be useful for project collaboration.

Group Project

CVN students have expressed some concern about forming groups for the group project. If being part of a group is difficult because of geographical constraints, I will accept projects from smaller groups (i.e., 2 or 1 person). In other cases, given the expected size of the class, it is *strongly* preferred that you work in groups of 3-5 people.

Student Feedback

I'm always looking for ways to improve the course. If you have any comments or criticism about the course, or find any mistakes or misleading facts / comments in the lecture, lecture notes, or other handouts, please feel free to contact me. This includes comments on the material being covered, teaching style, pace of the class, workload, etc. I will try and accommodate, but I can't make any promises...

Syllabus and Schedule

Schedule subject to change...

Date	Week #	Topics
9/5	1	Course mechanics; Intro; Protocol Layering; Socket Programming
9/12	2	Internet Hardware / Addressing / DNS
9/19	3	Transport layer services: connection setup / reliability / flow control
9/26	4	Transport layer services: congestion control, TCP, multicast, anycast
10/3	5	Switching / Routing: LAN, bridge, gateway, lookups, queueing
10/10	6	Routing algorithms: unicast, multicast, anycast
10/17	7	Catch up on material / midterm review, or midterm
10/24	8	Lower layers: physical / data-link protocols / wireless
10/31	9	Real-time / multimedia networking
11/7	10	NO CLASS
11/14	11	Network measurement and inference / RED
11/21	12	Network fairness; pricing; reservations, and differentiated services
11/28	13	Security
12/5	14	Additional topics / catch-up / project summaries