

# EE 550 Course Syllabus — USC Fall 2006

## Design and Analysis of Data Networks

### I. COURSE INFORMATION

#### *Instructor:*

Michael J. Neely (EEB 520, mjneely@usc.edu, 213-740-3505)  
Office Hours: Monday/Tuesday 10:00am-12:00pm or by appointment, EEB 520

#### *Teaching Assistant:*

Chih-Ping Li (EEB 525, chihpinl@usc.edu, 213-740-7337)  
Office Hours: 10:00am-12:00pm Wednesday

#### *Class Location and Time:*

OHE 100b, Mon./Wed. 5:00-6:20 pm

#### *Electronic Documents and DEN:*

Electronic documents for this course will be routinely available on the DEN website: <http://den.usc.edu/>

#### *Textbook:*

The course will use the following required textbook:  
*Data Networks (2nd ed.)* by D. Bertsekas and R. Gallager

Students interested in supplemental reading might consider additional texts such as the following:

- 1) *Computer Networks: A Systems Approach (2nd ed.)* by L. Peterson and B. Davie (a good overview and description of current networking technology).
- 2) *Computer Networks (4th ed.)* by A. S. Tanenbaum (an alternative).
- 3) *Introduction to Probability Models (8th ed.)* by S. Ross (probability, Markov Chains, Renewal Theory)

#### *Grading:*

There will be weekly problem sets, a midterm, a group project, and a final, to be weighted in an overall score as follows: Homeworks 15%, Midterm 35%, Final 40%, Project 10%. The following minimum letter grades are guaranteed to students with a final score that is within the specified intervals: 85-100 A, 70-85 B, 55-70 C, 40-55 D

The above thresholds may be adjusted at the end of the semester at the discretion of the instructor. Any such adjustments will be in favor of a higher letter grade.

#### *Homeworks / Class Participation / Quizzes:*

Some homeworks will have a “design your own problem,” where you will write a problem on one page and a solution on a second page. The problems and solutions will be posted on DEN for everyone to view everyone else’s.

Class participation is strongly encouraged. There may be quick random quizzes given for a small amount of extra credit. DEN students will return their quizzes by email or DEN, and will have a fixed time from the time they start viewing the lecture.

#### *Plagiarism and Cheating:*

Plagiarism (copying or modifying someone else’s work and presenting it as your own) and other forms of cheating will not be tolerated. Please ask the TA or instructor if you have questions about proper behavior. Information about plagiarism, cheating, and USC policies can be found at the following web link:

<http://www.usc.edu/student-affairs/SJACS/publications-f.html>

#### *Exam Dates:*

Midterm Exam: Wednesday, Oct. 11 (\*5:00-6:20pm, location TBA)

(\*I may extend the midterm time to either 5-7pm or 4:30-6:30pm, based on student feedback, to provide a full 2 hours for the midterm.)

Final Exam: Wednesday, December 6 (4:30-6:30 pm, location TBA)

*Course Project:*

You will work on a project involving a deeper study of a particular network technology or concept. The project can be done alone, but group projects with two to four people are strongly encouraged. The project will involve a report, analytical and/or simulation results, and a class presentation. You should fit your project goals and results into the context of the theory taught in the course, although the project does not have to be confined to technologies we cover in the course. Ask a question, take a guess about expected results, and then evaluate your guess via analysis and/or simulations. All groups must submit reports and presentation slides, along with a paragraph describing the contributions of each member. The reports should be approximately 5-10 pages, and the slides should be appropriate for a 10-15 minute presentation. The logistics of group presentations will be determined later. While it may not be possible for every group to present, we will try to accommodate everyone.

*Example Project Topics:* Packet Switch Scheduling for specific networks or switches, Optical Networks, Ad-Hoc Networks, ARQ over Satellite Links, Queues in Space, Multiple Access for Wireless, Optimal Routing and Backpressure algorithms, Energy Aware Networking, Random Early Drop and Congestion Control, TCP Reno/Vegas, etc.

A good example project is to get a team together to explore suggested improvements in wavelength assignment algorithms for a particular optical network. Formulate a hypothesis, take a guess about expected results, motivate your guess, do analysis/simulation, and compare performance to algorithms discussed in class.

## II. TENTATIVE COURSE OUTLINE

The following is a tentative list of topics to be covered, according to approximate lecture dates. We will not necessarily stick to this schedule throughout the course.

- Aug. 21, 23: Layering, Network Services, Framing and Error Recovery
- Aug. 28, 30: Data Link Layer, ARQ, Correctness Proofs
- Sep. 4: Labor day (no classes)
- Sep. 6: Selective Repeat, Intro/review of Queueing and Little's Theorem
- Sep. 11, 13: M/M/1, M/M/m, Jackson Networks
- Sep. 18, 20: Markov Chain Truncation, Circuit Switch Networks, Wavelength Continuity for Optical Networks
- Sep. 25, \*27: M/G/1 Analysis, Reservations and Polling [\*Note: Wednesday Sept. 27 class will be rescheduled]
- Oct. 2, 4: Multiple Access, Aloha
- Oct. 9: Splitting Algorithms, Oct. 11: MIDTERM EXAM (5:00-6:20pm, location TBA)
- Oct. 16, 18: CSMA, CSMA/CD, Ethernet
- Oct. 23, 25: Token Rings, Satellite Reservations
- Oct. 30, Nov. 1: Switching and Scheduling
- Nov. 6, 8: Shortest Path Algorithms, Broadcast Routing and Spanning Trees
- Nov. 13, 15: Optimal Routing, Backpressure Algorithms
- Nov. 20, 22: Flow Control, TCP/IP
- Nov. 27, 29: Special Topics and Presentations
- Final Exam: Wednesday December 6 (4:30-6:30 pm, location TBA)

\*Note: I will be traveling on Wednesday Sept. 27, and will give a makeup lecture to be scheduled sometime before or after (likely Friday Sept. 29). Students are encouraged to attend the makeup lecture. This makeup lecture will also be recorded on DEN.