

ECE 257A  
**Multuser Communications and Networking**  
Fall Quarter 2007

**Instructor:** Professor Tara Javidi (EBU1 66602, x2-4924, email: tara@ece.ucsd.edu)

**Instructor Office Hours:** T/TH: 8:30-10:00am, T/TH 5:00-6:00pm and by appointment.

**Text:** Appropriate material will be posted on-line. In addition the following texts are recommended:

1. Data Networks, Bertsekas and Gallagar
2. The Mathematics of Internet Congestion Control, R. Srikant

**Time & Place:** TuTh 3:30pm-5:00pm in WLH 2210

**Credit Hours:** 3

**Prerequisite:** No formal prerequisite, though, knowledge of calculus, signals and systems, elementary queuing analysis, and stochastic processes is assumed.

**Overview of Course:** We will study basic mathematical topics used in analysis/design of communication and computer networks. We will (more or less) follow the following plan:

- Week 1: Congestion Control: Introduction to TCP and an Optimization Framework
- Week 2: Convex Optimization and Dual Methods; Dual Congestion Controller or TCP Vegas
- Week 3: Adversarial Games of Rate Allocation; Strategic vs. Price-taking Users
- Week 3: Facts about Markov Chains: Lyapunov-Foster Theorem
- Weeks 4: Switch Fabrics: Stability of Maximum Weighted Matching
- Weeks 5: Intro to Fluid Models, Stability of Maximum Matching with Speedup
- Week 6: Shortest Path Routing: Dijkstra and Distributed Bellman-Ford Algorithms
- Week 7: Stable Routing: Max-Pressure (Back Pressure) Routing
- Week 8: Minimum Delay Routing and Price of Anarchy
- Week 9: Midterm (Thursday, Nov 29th), Overview of Queueing/Server-Scheduling

The last week of class is dedicated to class project and presentations.

**Homework:** There will be four problem set (each consists of 4-6 problems) assigned according to the following plan:

- Problem Set 1: Assigned October 6<sup>th</sup>, Due October 18<sup>th</sup>
- Problem Set 2: Assigned October 18<sup>th</sup>, Due November 1<sup>st</sup>
- Problem Set 3: Assigned November 1<sup>st</sup>, Due November 13<sup>th</sup>
- Problem Set 4: Assigned November 13<sup>th</sup>, Due November 27<sup>th</sup>

HWs are due at the beginning of the class. If you are turning your HW early, please either drop them in my mailbox on the second floor of EBU1 no later than 8:30am on the day they are due, or you can leave them with my assistant, Mr. J. Minan whose office is EBU1-6603.

The students are encouraged to discuss the assigned problem set, although, they are responsible to provide and turn in their own individual composition. It is highly recommended that each student attempts to first work on the problems alone to be able to best utilize the discussion with colleagues and office hours. This is the most effective approach to learning.

**Class Project:** Each student is responsible to read a paper on the general topic of communication/computer networking (some papers are suggested each lecture), prepare a report and present the material in the class.

The report has to be the student's original writing. The goal of this assignment is to motivate the students for a more research-based activity. You can discuss the material with anybody who can help you.

**Midterm Examination** consists of 2-4 questions very similar to the HW sets. If you have done your HWs, this should be a piece of cake and more of a formality.

**Exam Policy:** The exam is closed notes and textbook but the students are allowed to prepare and use a double-sided A4 sheet to summarize the items they think they would need. No electronic devices (calculators, laptops, Pilots, cell phones, beepers, etc.) are allowed for exams.

**Grading:** Problems: 28%, Research paper report and presentaion: 30 %, Midterm Exam: 42%.

**Web Page:** The Web Page for the course (alternatively, you can access this from my faculty page) is located at <http://fleece.ucsd.edu/tjavid/ECE257A/ECE257A.html>

This page contains all announcements about the class, a list of the instructors' office hours, and all handouts from the class.