Modeling and Performance Analysis of Communication Networks

ECGR6187/ECGR8187 - Spring 2016

Instructor:

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Office Hours: via email (or by appointments)

Teaching Assistant:

N/A

Lecture Schedule:

Thursday 5:00pm--7:45pm, EPIC G222

Course Website:

The course website is available through **Moodle 2**. All the course-related handouts, assignments, and announcements will be posted at the course website.

Course Content:

This course is an advanced graduate-level course focusing on the ***theoretical*** foundation for performance analysis techniques of communication networks. With such foundation, students will learn how to ***mathematically*** model network systems, switches, routers, protocols, etc. The underlying principles of computer systems analysis (which are based on queuing theory) will be studied. Analytical methods based on queuing theory will be used to study the behavior of communication networks, for example, the time spent by a packet waiting to be transmitted on a given link or through a whole network.

The course will start with the introduction of queuing systems and Markov processes. Then, the behavior of various queuing systems and Markovian queues will be studied, such as the typical M/M/1 queuing model to be used in message-switched networks and the M/M/m/m queue employed to characterize the call loss behavior of local offices in telephone networks. In addition, the related analytical models adopted to study the performance of local area networks will also be covered.

Textbook:

L. Kleinrock, "***Queueing Systems, Volume 1, Theory***," John Wiley & Sons, January 1975. ISBN: 0-471-49110-1

***Reference Books*:**

- D. Bertsekas and R. Gallager, ***Data Networks***, Second Edition, Prentice Hall, 1992. **ISBN: 0-13-200916-1**
- R. D. Yates and D. J. Goodman, ***Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers***, Second Edition, John Wiley & Sons, 2005. **ISBN: 0-471-27214-0**
- A. Leon-Garcia, ***Probability and Random Processes for Electrical Engineering***, Second Edition, Prentice Hall, 1993. **ISBN: 020150037X**

Prerequisites:

Students are expected to have a good understanding of probability and random processes. The fundamental concepts such as conditional probabilities, random variables, probability density function (pdf), and expectation will be used intensively in the class. An undergraduate course on Computer Networks is also helpful.

Grading:

There are approximately 5 homework assignments, two **in-class close-book/notes** midterm exams, and a final **comprehensive** exam required for this course. They will count toward the grade as follows:

Homework:	15%
Midterm 1:	25%
Midterm 2:	25%
Final Exam:	35%

However, the instructor reserves the right to make adjustments to these weights based on a posteriori evaluation of the relative difficulty and fairness of the exams and homework assignments.

Tentative Course Outline:

The following topics will be covered as time permits:

- Probability Theory Refresher
- Overview of Queuing Systems
- Random Processes
- Birth-Death Queuing Systems
- Networks of Markovian Queues
- M/G/1 Queuing Systems
- Performance of Local Area Networks

Course Policies:

- There will be **no make-up exams**. Students who cannot attend an exam with health emergency must show official proofs.
- Assignments are due at the beginning of the class. Assignments will be graded and solutions will be provided. Late assignments are not accepted and will have a **grade of zero**.
- All assignments are assumed to be an **individual effort** unless otherwise specified by the instructor.
- If you end up doing poorly in the class, please DO NOT ask for "extra work" to raise your grade. This would not be fair to other students.

Students with Disabilities:

UNC Charlotte is committed to access to education. If you have a disability and need academic accommodations, please provide a letter of accommodation from Disability Services early in the semester. For more information on accommodations, contact the Office of Disability Services at 704-687-0040 or visit their office at Fretwell 230.

Academic Integrity:

All students are required to read and abide by the Code of Student Academic Integrity. Violations of the Code of Student Academic Integrity, including plagiarism, will result in disciplinary action as provided in the Code. Definitions and examples of plagiarism are set forth in the Code. The Code is available from the Dean of Students Office on online at http://www.legal.uncc.edu/policies/ps-105.html

The following is strictly prohibited:

- Copying, with or without modification, someone else's work when this work is not meant to be publicly accessible (e.g., a classmate's program or solution).
- Submission of material that is wholly or substantially identical to that created or published by another person, without adequate credit notations indicating authorship (plagiarism).

You are encouraged to discuss problems and papers with others as long as this does not involve copying of code or solutions. Any public material that you use (open-source software, help from a text, material you find on the web, material from a paper, substantial help from a friend, etc...) should be acknowledged explicitly in anything you submit.

If you have any doubt about whether something is legal or not, please do check with the Instructor.

Note:

The standards and requirements set forth in this syllabus may be modified at any time by the course instructor. Notice of such changes will be by announcement in class.