Introduction to Computer Performance Modeling
ECE/CSC/OR 579 Sections 001 and 601, Spring 2016

Instructor

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Office hours for all: Tue & Thurs, 2--4 PM (or by appointment) in 3064 EB2

Office hours for EOL students: Tue 4--6 PM (or by appointment) in 3064 EB2 (please email me in advance if possible)

Students (including EOL students) are encouraged to come by, or ask questions via email, online chat, or phone call. Other arrangements can be set up upon request.

Objectives

The aim of this course is to present queueing theory and simulation techniques as tools for modeling and studying the performance of communication networks and computer systems. The students will be introduced to classical tools and methodology in probability theory and stochastic modeling as well as simulation techniques, all of which are essential tools for students to conduct advanced research in the area of network performance modeling and analysis.

Students will participate and learn by doing assignments before coming to class, by asking and answering questions during in-class discussions, by performing simulation projects, and by preparing for in-class exams.

At the end of this course, students should be able to

- Apply simulation techniques to develop models of computer and communication systems
- Apply queueing-based models to characterize computer and communication systems
- Use appropriate analytic tools to compute performance measures of interest (e.g., delay, throughput) for a given queueing system
- Design (or choose) the system parameters (e.g., server or link capacity) to achieve a given level of performance
- Evaluate the relative merits of alternative system design solutions
- Engage in research in the field of performance analysis and evaluation

Time and Place

Tue & Thurs, 11:45AM--1:00PM, 2220 EB3

Teaching Assistants: TBA
Prerequisites for this course

- MA 421 Probability Theory or equivalent
- C, C++, or other programming language

Textbook


- Textbook is *not* required to buy, but is highly recommended. It is on reserve in the Hunt library for this course.
- Lecture will be based on class notes, to be posted prior to each class

References (on Reserve in the Hunt library)


Course Website

http://courses.ncsu.edu/ece579/lec/001/

Grading (Tentative)

There will be one midterm exam, one final exam, projects (simulation), and homework assignments.

Homework: 20%, Simulation Projects: 15%
Midterm exam: 25%
Final exam: 40%

Note: All exams will be open books and open notes.

Homework grading

- Homework will be due in class at the beginning of the lecture. See the schedule for due dates of specific homework assignments.
- Late homework assignments will not receive any credit.
- Each question in each homework assignment will have an equal weight, unless otherwise specified.
- EOL students submit HWs via email to the instructor (or TA) by the due date.

Audit students must earn a B average on the homeworks
Course Policies

- New assignments and deadlines will be announced in class. Hard copies of handouts, assignments etc. will usually not be distributed. Updates and copies of assignments will be available only from the web and/or e-mail. It is your responsibility to check whether anything new has been issued if you miss a class.
- Objections to grading of assignments or exams must be filed in writing within one week after they have been returned to you.
- No cheating allowed. Any form of cheating will result in an immediate failure of the course, and may be reported to school for further action.
- During the lecture please turn off any cellular phones, laptops, etc.

Tentative Course Structure*

1. Review of probability theory and random variables
2. Review of z-transforms and Laplace transforms
3. Poisson processes
4. Birth-death processes
5. Markov Processes
6. M/M/1 queue and variants
7. M/Er/1, Er/M/1, and Erlang distribution
8. M/G/1 queue, P-K formula
9. Priority queueing
10. Discrete-Time Markov Chains
11. Other aspects of Performance analysis on networks (random walk on graph, dynamics on network), if time permits

Students with disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653. [http://www.ncsu.edu/provost/offices/affirm_action/dss/](http://www.ncsu.edu/provost/offices/affirm_action/dss/) For more information on NC State's policy on working with students with disabilities, please see [http://policies.ncsu.edu/regulation/reg-02-20-01](http://policies.ncsu.edu/regulation/reg-02-20-01)

Academic integrity

All the provisions of the [NC State University's Code of Student Conduct](http://www.ncsu.edu/provost/offices/affirm_action/dss/) and [University Policy on Academic Integrity](http://policies.ncsu.edu/regulation/reg-02-20-01) apply to this course. In addition, it is my understanding and expectation that your signature on any test or assignment means that you neither gave nor received unauthorized aid.

Captured lectures

This on campus course will be captured and distributed via the Internet and/or electronic media as part of the Engineering Online (EOL) program for the distance students. These video recordings may contain an image of you entering the classroom, asking questions or being a part of the studio class. Please notify Dr. Linda Krute, Director of EOL, in writing at [lkrute@ncsu.edu](mailto:lkrute@ncsu.edu) if you DO NOT want your image to be included in the lecture presentation. If we do not hear from you after the first week of the class, we will assume that you are in agreement with this procedure.