Introduction to Computer Performance Modeling
ECE/CSC/OR 579, Spring 2018

Instructor

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Office hours: Mon 2—3PM & Wed. 10:30—11:30AM (or by appointment) in 3064 EB2

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 via Markov chains for general networked systems

Time and Place

Mon &Wed. 11:45AM--1:00PM, 1010 EB1

Teaching Assistants: TBA

Prerequisites for this course

- MA 421 Probability Theory or equivalent
- C, C++, or other programming language
References (on Reserve in the Hunt Library)


Note:

- References are *not* required to buy, but you may want to have some of them on your bookshelf. They are on reserve in the Hunt library for this course.
- Lecture will be mostly based on class notes, to be posted prior to each class

Course Moodle Website

https://moodle-courses1718.wolfware.ncsu.edu/course/view.php?id=6398

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
- Late homework assignments will not receive any credit.
- Each question in each homework assignment will have an equal weight, unless otherwise specified.
- Only hardcopy (handwritten or typed) will be accepted in class. No online submission.

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 formular
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. See https://dso.dasa.ncsu.edu/ for more information. 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

**Academic integrity**

All the provisions of the NC State University's Code of Student Conduct and University Policy on Academic Integrity 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.