

OPR/STA 564/COS 562: Queueing Networks

Fall 2004

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Text. Fundamentals of Queueing Theory , 3thed., by Gross and Harris

Course Objectives. This course is designed to introduce graduate and advanced undergraduate students to some basic models and techniques for analyzing queues and other congestion phenomena. The course will emphasize recent advances in queueing networks. Applications to computer and communication systems as well as classical engineering problems will be discussed.

A prerequisite is a course in probability and some exposure to stochastic processes. Throughout the course, basic concepts of stochastic processes - including Poisson processes, birth/death processes, Markov chains, and renewal theory- will be introduced and used in the analysis of queueing systems.

Course Content. Topics covered will include:

1. Basic concepts and notation: examples of queues; variables of interest, graphical analysis.
2. Review of probability and stochastic processes: review of probability; Poisson and exponential distributions; birth-death processes; steady-state properties.
3. Birth/death queueing models: $M/M/1$; $M/M/c$; finite waiting room models; machine interference.
4. Networks of queues: queues in series; open Jackson networks; closed Jackson networks; cyclic networks; convolution algorithm, mean value analysis.
5. More general Markovian queues: batch arrivals, bulk service; method of stages and Erlang distributions; priority models.
6. Non-exponential queues: Imbedded Markov chains, $M/G/1$ and $G/M/1$; waiting time distributions; busy period analysis; $GI/G/1$ queues.
7. Design and Control of queues: optimal design, optimal control; critical number policies.
8. Special topics: sample-path analysis; insensitivity; vacation models, approximations; renewal theory, ... etc.

Homework. Homework will be assigned weekly and selected problems will be graded.

Course Evaluation. There will be two tests (40%), homework assignments (10%), project (20%) and a final exam (30%). The letter grade will be an A : 90 – 100; B : 80 – 89; C : 70 – 79; D : 60 – 69; F : below 60. A + or – will be assigned according to university policies

Attendance. Students are expected to attend all classes. A grade of *F* will be assigned if a student misses two or more classes without a written valid excuse. A student is considered not attending if he/she is late to class or leaves before the end of the period. If a student misses a class due to illness, etc., then she/he is responsible for the material covered during the missed class. *Poor attendance results in discouragement and poor grades.*

Incomplete . A student who is passing the course and misses the final exam will be given an incomplete only under extraordinary circumstances and with prior consent of the instructor. The incomplete should be resolved within one semester or a grade of *F* will be given. If a student is failing the course and misses the final exam, then a grade of *F* will be assigned

Make-up Tests . Make-up tests will be given *only* under extraordinary circumstances and with prior consent of the instructor. No Make-up will be allowed without a *sufficient written documented proof of the emergency*

Cancelation of Classes due to Weather. If the university cancels classes due to a weather emergency on a day when a test is scheduled, the test will be given *during the next class meeting*
Course Material.

My Lecture Notes are available in PDF format on the WWW at URL:
usm.maine.edu/~eltaha/courses then click on *Queueing Class Notes*. You may download the PDF file and view using Acrobat reader or you may print a hard copy using any printer.

Academic Support for Students with Disabilities. Students who may need assistance due to disability are encouraged to contact the Office for students with Disabilities, 2nd floor, Luther Bonney 242. (780-4706; /TTY 780-4396; oassd@usm.maine.edu.)

Important Policies.

1. Students are responsible for any announcements made in the class regarding schedule changes or any other policy matters.
2. Students are allowed to bring a 3x5 inch crib sheet for use during the tests. The sheet should contain only formulas, and no numerical examples.
3. Lecture attendance is mandatory. Two or more unexcused absences will automatically result in a failing grade.

Common Disruptive Classroom Behavior.

The following list, distributed to faculty by *USM*, has been adapted from Amada, G. (1999) *Coping with Misconduct in the College Classroom*, Asheville, NC: College Administration Publications, Inc. Pages 1-8.

1. Grandstanding. Students who use a classroom discussion as a chance to speak about their favorite subjects despite the irrelevancy their comments may have in regard to the discussion of the class as a whole. Other students use the classroom as a place to communicate to their peers, tales of their personal lives, which is also not appropriate to the setting. Some students attempt to soak up the attention that they receive from their peers even though it may be annoying to other students in the class.

2. Sleeping in Class. This may not seem to be disruptive to a class, but in fact, is disruptive in two ways: the student who is snoozing is not interested and not participating in the classroom discussion. If a professor does nothing about it, it sends a message to the other students that involvement in the class is not of much importance to the professor. This may make the students feel like they shouldn't have to participate either. Secondly, sleeping in class is considered to be disrespectful to the teacher and the other students.

3. Prolonged Chattering. Students who carry on private conversations among themselves in the classroom are disruptive to other students because their frivolous chatter does not pertain to the classroom discussion whatsoever. This is rude and inappropriate and should not be tolerated.

4. Excessive Lateness. Tardiness is tolerated by many professors, because students have legitimate reasons for being late. However, professors don't like it when students are late because it disrupts the classroom and other students are focused on the late student instead of on the professors' lecture. Professors' need to state to the students the importance of arriving in a timely manner.

5. Over Inattentiveness. Some students find it difficult to mentally pay attention for the full length of the class. They read a book, newspaper, or doodle on paper. This is also considered disrespectful to the professor and other students in the class.

6. Eating, Drinking, Gum Chewing, Smoking, Carrying Pagers & Cell Phones, and Passing Notes. All of these are considered disruptive in a class room setting and should not be tolerated.

7. Unexcused Exits from Class. These exits from class are disruptive and should be discouraged unless the student has a legitimate reason and/or has spoken to the professor before hand.

8. Verbal or Physical Threats, to Students or Faculty. Cases of threat to students and faculty has risen dramatically in recent years. These are definitely considered unacceptable.

9. Disputing the Instructor's Authority or Expertise. Students who have received substandard grades or evaluations from their instructors sometimes try to devalue the professor's authority, judgment, and expertise.