Queueing Theory

SIE 525, Fall 2015

Contact Information:

Instructor: Babak Haji
Class location: Harvill 130
Class time: 3:30-4:45PM on T/Th
Office: ENGR 310
Office Hours: 5:00-6:00PM on Tuesdays or by appointment
Email: bhaji@email.arizona.edu

Textbook:

1. Textbooks Introduction to Probability Models, eleventh ed., Sheldon Ross, Academic Press, 2014.

2. Sheldon Ross, Stochastic Processes, 2nd edition, Wiley, 1996.

Recommended text:

3. Wolff, R., Stochastic Modeling and the Theory of Queues, Englewood Cliffs, NJ, 1989.

Course Description:

This is a course on the theoretical foundations, models and techniques of queueing theory. Elementary through advanced queueing systems and networks will be covered. The requisite stochastic processes background material will be developed as the course progresses. The objective of this course is to introduce students to the general mathematical foundation and applications in queueing system, different queueing models, how to use models to analyze queueing phenomena and develop queueing solutions, and learning to apply course material to improve thinking, and problem solving.

Topics Covered:

Here is a summery of the topics that would be covered in the class:

- Review of Poisson processes; Markov chains.
- Continuous time Markov chains; birth and death processes, reversibility, generating functions.
- Renewal Processes; semi-Markov processes.

- Introduction to queueing systems; Littles theorem; birth and death queues; multi server and tandem queues, Jackson type networks.
- Steady-state relations: DAASSP (departures and arrivals see same picture) theorem; ROSTA (random observer sees time averages); PASTA (Poisson arrivals see time averages).
- The random modification (remaining work in service); work conservation and work conserving disciplines.
- M/G/1 queue: busy period characteristics; non-preemptive priority queue; optimal priority policies; infinite server queues.
- Generalized M/G/1 queues; servers breakdowns and vacations; Markov modulated arrivals and service; stochastic decomposition; preemptive repeat and resume priorities.

Grading:

There will be problem sets, a mid-term, and a final exam, to be weighted in an overall score as follows:

- Homework/Participation: 20%
- Midterm: 30%
- Final: 50%

Homework:

Each student is individually responsible for expressing their answers in their own terms. Homework is due at the beginning of class one week after it is assigned. Late homework will not be accepted.

Exams:

Valid excuses for failing to meet an exam are personal illness or illness in your immediate family.