OR 647: Queueing Theory

Spring 2017

Course Overview

We are all familiar with waiting in lines – in the grocery store, on the telephone, at the airport, on the road. Queueing theory is the mathematical study of lines. Because lines form from arrival and service processes that are typically random, queueing theory relies on the mathematical study of stochastic processes.

Some common types of questions that queueing theory can address are:

- What is the average time spent waiting in line?
- How long are the lines on average?
- How many customers wait more than 2 minutes?
- How many customers are turned away?
- How many servers are needed to achieve a target quality of service?
- How fast must the servers work?

Answers to these questions provide decision makers a way to efficiently allocate resources to reduce delay.

This course provides a survey of quantitative models used to analyze queueing systems. The focus is both on mathematical analyses of such models as well as practical issues in using such models to represent real systems.

The course assumes prior knowledge of calculus-based probability. The pre-requisite for this course is OR 542 (Stochastic Models), or STAT 544 (Applied Probability), or permission of the instructor. Knowledge of continuous-time Markov chains (CTMCs) is very helpful, but not required (key aspects of CTMCs will be presented briefly in class).

Class Hours: Wednesday, 4:30 – 7:10 pm, Innovation Hall, room 131
Pre-requisites: OR 542, or STAT 544, or permission of instructor

Instructor: John Shortle
jshortle@gmu.edu
703-993-3571
Engineering Building, room 2210
Office hours: Tue. 1:30 – 3:30, or by appointment. I am also happy to meet before class on Wednesday if you let me know in advance.

Textbook: Gross, D., Shortle, J., Thompson, J. Harris, C. 2008. *Fundamentals of Queueing Theory*, 4th ed., Wiley, Hoboken, NJ.

Student Evaluation Criteria

Homework	15%
Project	15%
Midterm	35%
Final exam	35%

OR 647 Schedule
Last updated 1/20/17

Date	Lecture Topic	Assignments
Jan. 25	Introduction to queueing theory Little's law	
Feb. 1	Review of stochastic processes M/M/1 queue	Hmwk #1 due
Feb. 8	Lindley's equation Simulation of queueing models	
Feb. 15	Simple Markovian queues	Hmwk #2 due
Feb. 22	Simple Markovian queues	
Mar. 1	Simple Markovian queues	Hmwk #3 due
Mar. 8	** Midterm **	
Mar. 15	** Spring Break **	
Mar. 22	Advanced Markovian queues	
Mar. 29	Advanced Markovian queues	Hmwk #4 due
Apr. 5	Queueing networks	
Apr. 12	Queueing networks	Hmwk #5 due
Apr. 19	Fluid models	
Apr. 26	Models with general distributions	Project due
May 3	Models with general distributions	Hmwk #6 due
May 10	** Final Exam **, 4:30 – 7:15 pm	