Course Outline

MIE 1606 S
Queueing Theory
Winter, 2013
Course Meets:

Instructor:	Dr. Sami Najafi, Room 411 Rotman
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Office Hours:	By appointment

Course Goals

The course aims to introduce the common queuing techniques and their applications in manufacturing and service operations management. The course relies on using Stochastic Processes to study single and multi-server queues. Even though the course is mainly focused on classic lecture sessions, some part might be assigned to studying recent research papers that apply queueing systems preferably from journals such as Management Science, M&SOM, and Operations Research.

Text Book

Fundamentals of Queueing Theory, by Donald Gross and Carl M. Harris.
3rd Edition Wiley & Sons, INC 1998

Optional Reading

Introduction to Probability Models, Sheldon Ross
10th Edition, Academic Press, 2009

Evaluation and Grades

Grades are a measure of the performance of a student in individual courses. Each student shall be judged on the basis of how well he or she has command of the course materials.

One quiz	5%
(Possible) Mid Term Exam	30%
Paper presentation	20%
Final Exam	45%

Tentative Weekly Schedule

Week	Topic
1	**Introduction on Queueing Systems:** Definitions and Applications **Overview of Probability Theory:** Random variables, Expected values, joint distributions, conditional probability and expectation
2	**Overview of Probability Theory (Part II):** Using conditional probability in obtaining conditional expectations, Bays formula, Moment generating functions, convergent series, Z-transform
3	**Exponential and Poisson distributions:** Definitions and important properties, Relation between Exponential and Poisson distributions, Erlang distribution.
4	**Markov Chains:** Markov processes, classification of states, limit probabilities, Continuous-Time Markov Chains (CTMC), limit relations in CTMC
5	**General framework of Queueing Systems:** Transient and Stable periods, Idle and busy periods, Deterministic Queueing systems
6	**Exponential Models in Queueing Systems:** Birth-and-Death processes, M/M/1, M/M/1/k, M/M/m, M/M/m/K, M/M/inf, M/M/m/C, exponential models with changing arrival and service rates
7-8	**Advanced Markovian Systems:** M/M/1 with bulk arrivals, M/M/1 with bulk service, M/E/1, E/M/1, Priority of Queues, Queueing Networks
9-10	**Non-Markovian Queues:** M/G/1, M/G/1 with bulk arrivals, M/G/m, G/M/1
10	**Optimization of Queueing Systems:** Optimal capacity and costs in a queueing system
11	**Paper presentation or written Final Exam**