Course Description

This course provides fundamental knowledge of inventory theories. Students will learn concepts and models for various inventory systems. These systems include single- and multi-location, and deterministic and stochastic inventory models. Common studied inventory policies, such as power-of-two, base-stock, batch-based, and time-based policies will be introduced and analyzed. While this course mainly focuses on centralized control (first best) models, several well-known decentralized models will be introduced and discussed at the end of the course.

This is a lecture-based course. However, students are expected to read the course materials before the class and participate the class discussion. In addition, students are expected to take turns to discuss business articles related to inventory issues at the beginning of each class.

Grading Policy

Your final grade depends on the following items: (1) four take-home assignments, (2) midterm exam, (3) class presentation and (4) final exam.

Note that some of the assignment questions require you writing codes. It is necessary to learn a computer language, such as C++ or Matlab, to complete these questions.

Textbooks

[Zipkin] Zipkin, P. 2000. Foundation of Inventory Management
[Porteus] Porteus, E. Stochastic Inventory Theory
Other papers and book chapters; see course outline below.
Course Outline

Class 1 (8/31)  Topics: Overview of the course; Single-stage models  
  - EOQ  
  - Newsvendor  
  - Base-stock  

Readings:  
  - [Zipkin] 3.1-3.6, 6.1-6.2.2  

Class 2 (9/7)  Topics: Advanced single-stage model; stationary demand  
  - (r,Q) and (r, nQ)  
  - (s,S)  

Readings:  
  - [Zipkin] 6.2.3-6.2.5; 6.4-6.6  

Class 3 (9/14)  Topics: Single-stage model; finite horizon  
  - Optimality of base-stock and (s,S) policies  
  - Markov modulated demand  

Readings:  
  - [Zipkin] 9.1-9.6  
  - [Porteus] 4.2, 7.1
Assignment 1 distributed

Class 4 (9/21)  ** Out of town (reschedule time) **
Topics: Multi-stage model; deterministic demand
- Power-of-two policies
Readings:
- [Zipkin] 5.1-5.3
- Shang (2005), unpublished technical note
  http://faculty.fuqua.duke.edu/~khshang/Working%20Papers/g060305.pdf

Class 5 (9/28)  Topics: Serial system with stochastic demand
- Base-stock policies
- Approximations
Readings:
- [Zipkin] 8.1-8.3.3

Class 6 (10/5)  In-Class Midterm Exam
Readings:

Assignment 2 distributed
Class 7 (10/12)  Topics: Serial system with stochastic demand
• (r,Q) policies
• Lower bounds and approximations
Readings:
• [Zipkin] 8.3.7-

(10/13-10/17)  No Class; Fall Break

Class 8 (10/26)  Topics: Distribution system with stochastic demand
• Base-stock policies
Readings:
• [Zipkin] 8.5-8.6

Class 9 (11/2) Topics: Distribution system and assembly system
• (r,Q) policies
Readings:
• [Zipkin] 8.4.
Class 10 (11/9)  Topics: Serial system with nonstationary demand
• Optimal policy & approximations
Readings:
• [Zipkin] 9.8-

Assignment 3 distributed

Class 11 (11/16)  Topics: Time-based models
• Serial systems with (s,T) & (r,nQ,T) policies
Readings:

(11/21-11/25)  Thanksgiving Break

Class 12 (11/30)  Topics: Coordination mechanisms & potential research topics
Readings:

**Assignment 4** distributed

TBA Final Exam