

**ISyE 3104 Introduction to Supply Chain Modeling:
Manufacturing & Warehousing
Spring 2013
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Course Meeting Times: TuTh 4:35-5:55pm

Course Classroom: Boggs B6

Instructor Office Hours: TuTh 6:00-7:00pm (or by appointment)

Course TAs: Li Hao and Seunghan Lee

TA Office Hours: TBA

Course Objective

This course is an introduction to the problems underlying the design and operation of contemporary production and service systems. Emphasis is placed on the design and operation of manufacturing and warehousing facilities, but many of the presented results apply also to the design, planning and control of operations taking place in the service sector.

More specifically, the course seeks to offer a balanced development of the following issues:

- A systematic exposition of the overall design, planning and control problem, as it arises in the context of the aforementioned facilities;
- A systematic decomposition of the problem to a series of sub-problems, and the development of analytical/quantitative methodologies for addressing these sub-problems;
- Familiarization of the student with basic computational tools that can support the implementation of the presented analytical methodologies (mainly through the homework assignments);
- An introduction to the emerging issues and needs that arise from the modern, globalized and internet-based economy.

Course Outline

1. Introduction
 - a. Course Objectives, Context, and Outline
 - b. Operations Management as a component of Corporate Strategy
2. Inventory Management for Pure Inventory Systems
 - a. The EOQ formula and its variants
 - b. Periodic Inventory Control Policies and the heuristic of “Power-of-2 Order Intervals”
 - c. Deterministic inventory control with time-varying demand
 - d. Introduction to inventory control with stochastic demand: Newsvendor, basestock and (Q,R) models, the concepts of service level and safety stock
3. Production System Design, Planning and Control
 - a. Production flows for discrete-part manufacturing and their documentation
 - b. Types of layout and workflow control (production authorization mechanisms)
 - c. Design of Synchronous transfer lines: Assembly Line Balancing
 - d. Design of asynchronous transfer lines
 - e. Design of pull systems
 - c. Aggregate Planning
 - f. MRP Explosion for multi-stage production systems
 - g. Lot Sizing

- h. Shop Floor Scheduling
 - i. Production control in Pull systems
 - j. The Just-In-Time Philosophy
4. Layout Design
- a. Systematic Layout Planning
 - b. Cellular Manufacturing: Cell Formation
 - c. Layout Problems in the Warehousing Context
 - i. Overview of the Warehousing Operations, Organization and Product Flow
 - ii. Storage Layouts
 - iii. Design of the Fast-Pick Area
 - iv. Cross-docking

Course Policies

Homework: The homework will consist of some conceptual questions and some computational problems. Collaboration towards its solution is allowed, but each student must turn in his/her work; photocopies will *not* be accepted. Homework must be turned in on the specified due date.

Exams: There will be 2 midterms and a final exam.

Exams will be closed-book, with 2 pages of notes allowed. Furthermore, it is expected that your *Academic Honor Code* will be respected. Make-up exams and incompletes will be given only in case of emergencies, and only after officially documented proof is provided.

Midterm exam dates will be determined as the course evolves.

Grading:

- Homework: 25%
- Midterm I: 20%
- Midterm II: 20%
- Final: 35%

Course Reading Material

- **Textbook:** R. G. Askin and J. B. Goldberg, *Design and Analysis of Lean Production Systems*, John Wiley & Sons, Inc.
- Course slides and any other material posted at my homepage and/or the library reserves

Other useful references:

1. S. Nahmias, *Production and Operations Analysis*, McGraw Hill / IRWIN: This used to be the class textbook for quite a while but currently it is out of print.
2. Any other introductory book on Operations Management; e.g.,
 - Jay Heizer and Barry Render, *Operations Management*, 6th ed., Prentice Hall
 - R. Russel and B. Taylor, III, *Operations Management*, 3rd ed., Prentice Hall
 - Bedworth and Bailey, *Integrated Production Control Systems: Management, Analysis and Design*, John Wiley.
3. Bill Scott, *Manufacturing Planning Systems*, McGraw Hill: A more practical but nicely structured perspective on MRP-based production planning and control.
4. W.J. Hopp and M.L. Spearman, *Factory Physics*, McGraw Hill: An interesting stochastics based analysis of flowlines, controlled by “pull” approaches (JIT-variations).

5. A.C. Hax and D. Candea, *Production and Inventory Management*, Prentice Hall: For those of you interested on a more theoretical view of the production planning and control problem.
6. Tompkins, White, Bozer, Frazelle, Tanchoco, Trevino, *Facilities Planning*, 2nd ed., John Wiley & Sons, Inc.: A nice practical but primarily conceptual perspective on the facility layout, warehouse and material handling system design problems.
7. S. Heragu, *Facilities Design*, PWS Publishing Co., Another, more quantitative analysis of the facility layout, warehouse and material handling system design problems.
8. Francis, McGinnis and White, *Facility Layout and Location: An analytical approach*, 2nd ed, Prentice Hall: A formal theoretical treatment.
9. J. Bartholdi, III and S. Hackman, *Warehouse and Distribution Science*, Rel. 0.08, http://www.isye.gatech.edu/people/faculty/John_Bartholdi/wh/book/wh.pdf
10. Journals and Magazines:
 - IIE Solutions
 - Interfaces
 - International Journal of Production Research
 - Journal of Production and Operations Management
 - Journal of Manufacturing Systems
 - International Journal of Flexible Manufacturing Systems
 - IIE Transactions
 - Operations Research
 - Management Science