Course Meeting Times: TuTh 12:00-1:25pm  
Course Classroom: IC105  
Instructor Office Hours: TuTh 10-11pm or by appointment

Course Objective
This course is an introduction to the concepts and problems underlying the design and operation of contemporary production systems. Emphasis is placed on the design and operation of manufacturing 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 design, planning and control problems that arise in the context of the aforementioned facilities.
- A systematic introduction to inventory control theory and its application in the contemporary production and distribution networks.
- A formal analysis of the dynamics of production processes, based on queueing theoretic concepts and models.
- The integration of the results developed in Step 3 to the prevailing production planning and control framework(s).

Tentative Course Outline
1. Introduction: Course Objectives, Context, and Outline
   - Contemporary organizations and the role of Operations Management (OM)
   - The basic organizational structure and the scope of the OM issues addressed in this course
   - Corporate strategy and its connection to operations
   - The basic course structure
2. Inventory Control Theory
   - The basic EOQ model and some of its variants
   - Replenishment coordinating approaches
   - Dynamic Lot Sizing
   - Statistical Inventory Control Models
     - The News Vendor Model
     - The Base Stock Model
     - The (Q,r) Model
   - An introduction to multi-echelon models
3. Factory Physics: A queueing-theoretic analysis of serial production systems
   - Characterizing a flow line as a queueing system
   - Some fundamental relationships between the line attributes and its performance indices
   - The nature, role and impact of the operational variability
   - An introduction to logical control of production systems
4. Integrating the Factory Physics insights to the OM practice
   - Process Design, Capacity Planning and Line Balancing
• Hierarchical Production Planning
  • The classical Hierarchical Planning framework
  • Forecasting
  • Aggregate Planning
  • Master Production Scheduling (MPS) and Material Requirement Planning (MRP), and their limitations
  • Shop floor scheduling
• Just-in-Time (JIT) and Lean Manufacturing
  • The JIT philosophy
  • JIT practices and the KANBAN production authorization system
  • Shop-floor control based on the CONWIP production authorization model
  • Production Planning and Scheduling for CONWIP-controlled production systems
  • The JIT limitations

Course Prerequisites: ISYE 6650 (Probabilistic Models) and ISYE 6669 (Deterministic Optimization)

Course Policies

Homework: Homework will be assigned at the completion of each course unit, and it will consist of conceptual, theoretical and computationally-oriented problems and projects / case studies. 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 two midterms and a final exam. Tentative exam dates are as follows:
  • Midterm I: October 10
  • Midterm II: November 7
  • Final: TBA
Exams will be closed-book, with 2 pages of notes allowed for each midterm and 6 pages for the final. The final exam will be comprehensive, while the covered material for the midterms will be specified during the course development. No make-up exams and incompletes will be provided. Naturally, it is expected that the Academic Honor Code will be respected.

Grading:
  • Homework: 25%
  • Midterms: 20% each
  • Final: 35%

Course Reading Material

• Course slides and any other material posted at my homepage and/or the library electronic reserves.

Notice that the textbook will have a complementary role to the material presented in class.

Other useful references:
1. Any other introductory book on Operations Management; e.g.,


8. E. Silver, D. Pyke and R. Peterson, *Inventory Management and Production Planning and Scheduling*, Wiley: Maybe the most standard textbook on Inventory Control theory.

9. 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