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 (time permitting)
3. Factory Physics: A queueing-theoretic analysis of serial production systems
   - Flow lines as the preferred layout for discrete-part, repetitive manufacturing
   - Flow line classification: Push vs. Pull, Synchronous vs. Asynchronous production lines, KANBAN and CONWIP-based production systems
   - Characterizing a flow line as a queueing system
   - Understanding the fundamental relationships between the line attributes and its performance indices
   - Analyzing the impact of the various operational detractors and the resulting operational variability
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**

The course grade will be based on three exams: two midterms and the final exam. Each midterm will count for 30% of the grade and the final exam for the remaining 40%. All the exams will be designed and graded by the course instructor.

Furthermore, Mr. Yan Bi (yanbi@gatech.edu) will function as a local TA and facilitator of the course, monitoring the course progress, administering the exams, and providing also direct TA support. Students can also address questions and issues to the course instructor through email (especially those that cannot be covered satisfactorily by the TA); the instructor will respond either by email, if possible, or arrange for a Skype-based appointment to discuss the issue with the student.

The students will also be assisted in their study by a set of materials provided at the course website: [http://www2.isye.gatech.edu/~spyros/courses/IE6201/Spring-10/course_materials.html](http://www2.isye.gatech.edu/~spyros/courses/IE6201/Spring-10/course_materials.html)

This website contains (i) PowerPoint presentations that are either presented in posted (video) lectures or supplement and summarize the in-class developments, (ii) a sample exam, and (iii) homework together with its solutions that can be used by the students as an aid to their study of the course materials. In addition, the reading assignment provided at the beginning of each homework provides detailed guidance regarding the material that must be covered by the students at each part of the course.

Finally, the exam timing and structure will be as follows:

• The 1st midterm will take place upon the completion of inventory control theory and will address the introductory material of the course and all the material concerning inventory control. A more detailed listing regarding the material of this exam is provided in Hws 1 and 2. The exam will last 90 minutes, it will be closed-book with 2 pages of notes allowed. Calculators are also allowed (in fact, they will be necessary). **Tentative Exam Date:** 6/22/12
• The 2nd midterm will take place upon the completion of the theory on Factory Physics and will essentially address the material concerning the modeling and analysis of various types of production systems through queueing theoretic models. A more detailed listing
regarding the material of this exam is provided in Hws 3 and 4. The exam will last 90 minutes, it will be closed-book with 2 pages of notes allowed. Calculators are also allowed (in fact, they will be necessary). **Tentative Exam Date:** 7/13/12

- The final exam will be comprehensive with more emphasis (about 50% of it) placed on the material covered in the last part of the course and not addressed in Midterms 1 and 2. The part concerning the last part of the course is described in Hw 5. This exam will last 2 hours and 50 minutes, it will be closed book, with 6 pages of notes allowed. Calculators will also be allowed. **Tentative Exam Date:** 7/30/12

**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.,
   - Jay Heizer and Barry Render, *Operations Management, 6th ed.*, Prentice Hall
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