

## SYLLABUS FOR ISYE 6203

Summer 2009

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*In all email correspondence, please include ISyE 6203SH in the Subject Line*

Course Web Site: <https://t-square.gatech.edu>

All assignments and handouts will be posted to this web site. Unless otherwise instructed, all solutions to assignments are to be uploaded to this web site.

**Required Textbook:** INTRODUCTION TO LOGISTICS SYSTEMS PLANNING AND CONTROL, by Gianpaolo Ghiani et al, Wiley Interscience, ISBN 0-470-84917-7, New York, 2004

### OUTLINE OF COURSE

#### Description

A study of logistics systems, with emphasis on quantitative approaches for the design and control of freight transportation and supply chain systems. Topics include:

- an introduction to the components of logistics systems, such as suppliers, customers, inventory, orders, and transportation systems, and the interactions between these components;
- models and techniques for the design and control of logistics systems and the development of decision support systems; and
- case studies of applications of such techniques.

#### Objectives

- to develop a familiarity with transportation and supply chain concepts;
- to understand the important issues in logistics system design and control;
- to develop the ability to create quantitative models for the design and control of systems, and to analyze results obtained with such models;
- to develop skill in applying a variety of techniques to solve logistics problems.

#### Topics Covered

- Introduction to supply chain engineering  
*What is a supply chain system? What are its key components? What technical decisions are involved in its design and control, and what engineering approaches are used to make these decisions?*
- Forecasting  
*Most logistics decisions require estimates of future requirements. What basic forecasting techniques are used to develop these estimates?*
  - Extrapolation time-series forecasting
  - Multivariate forecasting via regression

- Supply chain inventory management  
*Mathematical modeling approaches for inventory management are simplistic, and ignore the implications of ordering decisions on the inventory management decisions faced by suppliers. How can the problems that result be better managed? What are reasonable coordination mechanisms?*

- Review of basic inventory management models
- Bullwhip effect
- Vendor-managed inventory

#### Freight transportation modes

*Overview of motor freight, sea cargo, railroad, air cargo, and package express transport providers. What are their key characteristics?*

- Long-haul freight transportation: mode selection and traffic routing  
*How should shippers decide which modes/carriers to use for moving freight? How do transportation and pipeline inventory costs impact inventory management decisions? How should shipments be consolidated to take advantage of scale economies?*
  - Transportation costs and rates
  - Planning shipment sizes and modes
  - Flow models for traffic routing and consolidation
- Short-haul freight transportation  
*Introduction to routing and scheduling problems for a local consolidation terminal. What are the key issues in designing collection and distribution systems? What methods are used to solve routing and scheduling problems?*
  - Traveling salesperson problem
  - Bin packing problems
  - Vehicle routing problems
- Long-haul freight transportation: resource scheduling
  - Assignment problems for scheduling
  - Set covering models
- Network design  
*How does a shipper or a consolidation carrier decide how to structure a terminal network, and then move freight through the terminal network?*
  - Service network design
  - Location/allocation problems

#### **Grading :**

Homework: 30%

Midterm Exam: 35%

Final Exam: 35%

#### **Homework:**

Homework will be assigned every week or two, about seven in total, and the lowest homework grade will be dropped. Homework is meant to be a learning tool. Start all assignments as early as possible. Attempt each exercise on your own. If you are having difficulty, find help as soon as possible. Because the emphasis is on learning you may consult with your

classmates, but *an individual write-up in your words must be submitted*. The best strategy is to attempt each exercise on your own, and then get together with a study group to compare your approaches. In general, late homework submissions will not be accepted without advanced notice of extenuating circumstances outside your control. Under no circumstances will an assignment be accepted after the solution key has been released. If you need more time, make arrangements with me in advance of the due date. *In summary*, late homework will not be accepted without prior arrangement. You are allowed (and encouraged) to work together with other students on homework, as long as you write up and turn in your solutions in your own words. If you received help with an answer, be sure that you understand what you turn in because test questions can come from the homework. You are also encouraged to ask me questions, although you should try to think about the problems before asking. *In other words*, *do not expect to be told how to solve a problem if you cannot show what you have attempted and where you got stuck*. I strongly encourage you to work on extra problems from the book on your own, because I sometimes take exam questions from unassigned exercises in the book.

**Exams :**

All exams will be closed book. In general, no make-up exams will be given without an excuse that complies with Institute grading policy. Treat each scheduled exam as if it is your final exam.

**Academic Honor Code:**

All course participants are expected and required to abide by the letter and the spirit of the Georgia Tech Honor Code; please visit [www.honor.gatech.edu](http://www.honor.gatech.edu) . If there is any way in which I can help you in complying with the honor code, please do not hesitate to ask.

**Who Should Take This Course?**

This course is designed as an introductory course on transportation and supply chain systems currently being used to move products throughout the world. You will learn how to model these logistics problems as deterministic mathematical programs, understand the theory of how to solve them, and gain experience with modeling languages and computer packages that implement many of the solution algorithms. Every industrial engineer and management science student will learn about the key challenges of designing and controlling logistics systems.

**Course Prerequisites:**

Deterministic Optimization at the level of ISyE 6669 can be taken concurrently.