ISyE 6203
Transportation and Supply Chain Systems
Spring 2009
Syllabus

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Class Times: Tuesday, Thursday 12:05-1:25 pm

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.
Prerequisites:
Optimization at the level of ISyE6669. You should also have or develop working knowledge of optimization modeling software. A knowledge of probabilistic modeling and statistics at the undergraduate level will also be assumed, as will working knowledge of spreadsheet and database software.

Reading Material:
- Ghiani, Gianpaolo; Laporte, Gilbert; and Musmanno, Roberto, Introduction to Logistics Systems Planning and Control, Wiley, 2004: This text will be used as a significant source of content for the course.
- Course notes available weekly on T-Square (http://t-square.gatech.edu/): Many ideas will be expanded in lecture, and some of these notes will be available for download.
- Assigned readings from academic journals.

Reference Texts:
Unfortunately, there exists no perfect textbook for graduate study of transportation and supply chain systems from the engineering perspective. If you wish to have additional reference material, I recommend the following books:

Logistics Modeling Software:
- AMPL A Modeling Language for Mathematical Programming, authors Fourer, Gay, and Kernighan. Available in graduate computer lab, and for download at http://www.ampl.com
- Visual XPRESS Windows interface for XPRESS$^\text{MP}$. Available in graduate computer lab.

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:

Grades will be assigned as follows:

• Homework: 30%

• Midterm exam: 30%

• Final exam: 40%

The final examination will be cumulative. If a student has completed all work (homework/cases, midterm) for the course and received a passing grade on each (70% and above), the final grade will be determined by the maximum of the grade given by the above formula and the final examination grade.

Homework and Cases:

The course will include 8-10 homework assignments. You should start working on each homework early, that way you will have time to ask (and understand) questions in class before the homework is due. Late homework will not be accepted. Some homework will focus on case studies to be discussed in class, and students must prepare for class discussions. You are encouraged to discuss homework and cases and learn from each other, but each person must submit his/her own work, unless the assignment specifically indicates that you should turn in a group assignment.

Exams:

Exams will cover material discussed in class, as well as reading assignments and homeworks. The exams will be comprehensive and closed book. Any queries on exam grades must be submitted in writing to the instructor, together with the exam in question. Make-up exams will be scheduled only in case of serious, unavoidable occurrences. It is your responsibility to take the exams at the designated times. The midterm exam is scheduled for Tuesday March 3, in class. Travel arrangements are not sufficient reason to warrant a make-up exam or an incomplete grade.

Academic Honor Code:

All course participants (myself, teaching assistant, and students) are expected and required to abide by the Georgia Tech Honor Code. Please familiarize yourself with the code, and use it to guide your conduct.