

FOMGT 456 - Management Science Applications
Spring 2000
Professor Anna Nagurney
Office: Room 304
Phone: 545-5635
Class Time: Mondays and Wednesdays 8:40-9:55
Office Hours: to be announced in class

Course Description and Syllabus

This course is an advanced course in Management Science with a focus on both theory and the development of models and their use in the real world. Methodologies that are covered include: integer and nonlinear programming, basic network models and programming, inventory theory, decision theory, and queuing theory.

The course uses research papers which show direct application of management science tools in industrial, corporate, and public policy arenas, and which have resulted in major cost savings, profit increases, and/or direct benefit to welfare. The papers are accompanied with videos in which the tools are illustrated and the models. Applications of Management Science which are studied in the course include: Finance, Transportation and Logistics, Telecommunications, as well as Industrial Applications in the Steel and Forest Sectors. In addition, novel applications of Management Science to health care policy decision-making and treasure discovery are also discussed.

The prerequisite to the course is the satisfactory completion of FOMGT 353 or permission of the instructor.

Outline of Topics to be Covered

1. Review of linear programming

Supplementary papers and videos, which illustrate applications to finance and telecommunications, respectively:

"A Solution to Post Crash Debt Entanglements in Kuwait's al-Manakh Stock Market," by Eliman, et al., Interfaces 27 (1997) pp. 89-106.

"Optimizing Restoration Capcaity in the AT&T Network," by Ambs, et al. to appear in Interfaces (2000) Jan/Feb volume.

2. Fundamentals of integer programming

Supplemental paper and video, which illustrates an application to operations in the steel industry:

"Strategic and Operational Management with Optimization at Tata Steel," by Sinha, et al., Interfaces 25 (1995), pp. 6-19.

3. Basic network models and algorithms

Supplemental papers and videos, with applications to transportation and logistics:

"Coldstart: Fleet Assignment at Delta Air Lines," by Subramaniam, et al., Interfaces 24 (1994), 104-120.

"Blending OR/MS, Judgment, and GIS: Restructuring P&G's Supply Chain," by Camm, et al., Interfaces 27 (1997), pp. 128-142.

4. Overview of dynamical systems

Supplemental paper and video, which illustrate an application to public policy associated with health:

"Let the Needles Do the Talking! Evaluating the New Haven Needle Exchange," by Kaplan and O'Keefe, Interfaces 23 (1993), pp. 7-26.

5. Nonlinear programming: basic theory and applications

Supplemental paper and video, with application to transportation network design:

"Interactive Optimization Improves Service and Performance for Yellow Freight System," by Braklow, et al., Interfaces 22 (1992), pp. 147-172.

6. Inventory theory: basic models

7. Stochastic modeling: decision theory

Supplemental papers and videos, with application to treasure discovery and asset and liability modeling in insurance, respectively:

"Search for the SS Central America: Mathematical Treasure Hunting," Stone, Interfaces 22 (1992), pp. 32-54.

"The Russell-Yasuda Kasai Model: An Asset/Liability Model for a Japanese Insurance Company Using Multistage Stochastic Programming," Carino, et al., Interfaces 23 (1994), pp. 29-49.

8. Fundamentals of queuing theory

Supplementary paper and video with application to optimization of telemarketing deployment:

"Allocating Telecommunications Resources at L. L. Bean. Inc." by Quinn, et al, Interfaces 21 (1991), pp. 75-91.

9. Simulation

Supplemental paper and video with application to the use of operations research in the forest industries:

"Use of OR in the Chilean Forest Industries," by Epstein, et al., Interfaces 29 (1999), pp. 7-29.

The final paper and video will illustrate a combination of imanagement science techniques:

"Schedule Optimization at SNCF: From Conception to Day of Departure," Ben-Khedher, et al., Interfaces 28 (1998), pp. 6-23.

There is no required reference. However, the following book is on reserve in the SOM library for additional reading and background. The book is: "An Introduction to Management Science: Quantitative Approaches to Decision Making," eight edition, D. R. Anderson, D. J. Sweeney, and T. A. Williams, West Publishing Company, 1994.

Requirements: There will be regular homework assignments given out in class that will be graded and returned. No late homeworks are accepted. In addition, there will be exams and a class project, to be discussed further in class. The students are required to attend the classes and to participate in class discussions. The research papers will be distributed to the students in class. The videos will be shown in class.

Grading:

Homework: 25%

Midterm : 25%

Class project and presentation : 20%

Final exam: 30%