

**STUART SCHOOL OF BUSINESS**  
**Illinois Institute of Technology**  
MBA 561: Models for Decision Making  
**Fall Semester, 2008**

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Class, Time, & Location	MBA 561: Models for Decision Making, Fridays 6:00-8:30 PM, Room 401 (DTC)
OFFICE HOURS:	Wednesdays: 4:30-5:30PM, 8:30PM-9:30PM (DTC, Room 455); Fridays: 4:30-5:30PM, 8:30PM-9:30PM (DTC, Room 455); Also by appointment; open-door policy. Please email if you plan to attend office hours.
REQUIRED TEXT:	1. Hillier, F.S., and M. S. Hillier, <i>Introduction to Management Science: A Modeling and Case Studies Approach with Spreadsheets</i> , Third Edition, 2008, McGraw-Hill Publishing Company.

**Optional Readings:**

1. Bryan, Gene and D. McDougall, (September 98), "Optimize your supply chain for best-possible operations" *Wood Technology*, Vol. 125 Issue 7, p35.
2. Depotis, D.K. (2002), "Improving the Discriminating Power of DEA: Focus on Globally Efficient Units," *Journal of the Operations Research Society*, Vol. 53, PP 314-323.
3. Green, Linda, Peter Kolesar, 2004. "Improving Emergency Responsiveness with Management Science." *Management Science*, Vol. 50, No.8, August 2004, pp. 1001-1014
4. Hesse, R., (July 2001), "Assignment Models and Degenerate Reports, " *Interfaces*, Vol. 32, No. 4, PP. 810.
5. Jacob, F. R., and D. C. Whybark, (2000), *Why ERP? A Primer on SAP Implementation*, McGraw-hill Higher Education.
6. Koltai, T; and T. Terlaky, (May 2000), The difference between the managerial and mathematical interpretation of sensitivity analysis results in linear programming, *International Journal of Production Economics*, Vol. 65 Issue 3, p257.
7. Mabin, V. J. and J. Gibson, (1998), "Synergies from Spreadsheet LP used with theory of Constraints-a case study", *Journal of the Operational Research Society*, PP. 918-927.
8. Meimand, M., RY Cavana, and R. Laking (2002), Using DEA and Survival Analysis for Measuring Performance of Branches in New Zealand's Accident Compensation Corporation," *Journal of the Operations Research Society* Vol. 53, PP 303-313.
9. Pidd, Michael, (March/April 1999), Just Modeling Through: A Rough Guide to Modeling, *Interfaces*, Vol. 29, No. 2, P. 118.
10. Trinivas Talluri, (May 2000), Data Envelop Analysis: Models and Extensions, *Decision Line*, Pages 8-11.
11. Eliyahu, M. Goldratt and Jeff Cox, *The Goal, A Process of Ongoing Improvement*, Third Revised Edition, 2004, The North River Press Publishing Corporation.
12. Thomas Friedman, *The World Is Flat, Expanded Edition A Brief History of the Twenty-First Century*, Farrar, Straus and Giroux, April 2006.
13. Wayne Winston and Albright, *Practical Management Science*, Revised Third Edition, 2008, Cengage.
14. Cliff Ragsdale, *Spreadsheet Modeling and Decision Analysis*, Revised Fifth Edition, 2008, Cengage.

## **OVERVIEW OF THE COURSE**

The purpose of the course is to provide students with a sound conceptual understanding of managerial decision-making models in various functional fields including finance, marketing, and operations. Applications include media selection, capital budgeting, portfolio selection, advertising effectiveness, plant location, distribution planning, and production planning. The focus of the course is building models and using software to aid in decision-making. The prerequisite is MBA 507.

### **LEARNING OBJECTIVES:**

At the end of the semester students in this course are expected to be able to:

- Describe the field of management science and its applications in business & managerial decision making.
- Describe the components of a management science model.
- Build models. Understand when a model is a Linear Programming (LP) model, Non-Linear Programming (NLP) model, Integer Programming model, Mixed-Integer Programming model, etc. Formulate problems in terms of these models. Understand how to solve these types of problems.
- Be able to identify an objective function and decision variables in any business and managerial decision making scenario.
- Understand the modeling process: defining the decision making scenario and the problem, collecting data, formulating the model, verifying the model and using it for prediction, selecting a suitable alternative, presenting the results, and implementing and evaluating recommendation.
- Solve LP models graphically, algebraically, and via spreadsheet modeling.
- Have intuition for binding and non-binding constraints in any scenario and their economic and managerial implications.
- Analyze sensitivity of decisions to various changes in the model parameters (availability of resources, market conditions, technological coefficients) and interpret their economic and managerial meaning in terms of shadow prices and opportunity costs.
- Have a general understanding of duality, primal program, dual program, and the economic meaning of dual variables and constraints. Sensitivity analysis and duality, and their economic and managerial implications
- Understand a Transportation model, its general elements, its balanced model, and various applications, the solution of transportation models, economic and managerial meaning of shadow prices and their implications in resource allocation.
- Understand goal programming and how multiple objectives in a business and managerial decision making environment can be combined via a goal programming model.

- Understand preemptive goal program and how to formulate a problem that assigns higher priority to more important objectives.
- Understand the differences between a nonlinear programming model and a linear programming model.
- Understand how to formulate network models for various types of network optimization problems: maximum flow, shortest path, and minimum spanning-tree.
- Use the tools (PERT/CPM) to analyze project scheduling and evaluation.
- Develop forecasting methods and their applications using various types of historical data and seasonal patterns.
- Understand queuing models, their applications, and the key measures of evaluations.

**ASSIGNMENTS:** In addition to the reading assignments as tentatively scheduled, there will be some homework problems that will be assigned in each part of the course and are to be submitted prior to the class meetings on the due date.

**QUIZZES:** In order to keep up with the material covered in the class, a number of short quizzes will be periodically given to the class throughout the semester.

**PROJECT:** During the semester, you will have two projects to complete:

1. Article Review Report. You are to search periodicals and/or indexes (you may use EBSCOhost Database) such as Decision Science, Interfaces, Management Science, Harvard Business Review, Production and Inventory Management, Industrial Engineering, International Journal of Quality & Reliability Management, Omega, International Journal of Production Research, etc. for 2006 and 2007 to identify articles (at least one) worthy of consideration for recommended reading for this course. For each article, you are (in 2-3 pages) to summarize the major points and critically evaluate why the article should be considered. Submit your report, including a complete citation of, or a clean copy of, the article(s) (or electronic copy) by Friday, September 26, 2008.
2. You may choose one of the following options:
  - a) You are to do a project in which you use management science models, covered in the class, to analyze a real-world business and managerial decision making scenario. In other words, during the course of the semester, based on your own interest, working or business experience, you need to work on a project for an actual manufacturing/service organization, to define and to formulate a business and managerial decision making problem, to identify the necessary data for the problem, to apply an appropriate model, and to provide an analysis of the solution. You will take a consultant role in this project and assume that you are hired by the company to provide an objective opinion on one or more problems and to provide realistic recommendations to the company to decide. You are to submit a report (non-technical analysis supported by a well-defined model and its solution ), including the description of the scenario, your identification of decision variables, objective function, and constraints, as well as the dual program and sensitivity analysis, and economic and managerial implication of your recommendation. The report must be

neatly typed (double spaced) with no grammatical error. That is, you should make a major effort to make your report as professional as possible. The report will be graded not only on the basis of the written presentation of the scenario, identification of the decision variables, formulation of the model, computer printout of the solution, and economic interpretation and economic and managerial implications of your solution, but also on the basis of your writing style and how well you have professionally crafted your entire report. A polished and final version of the report is to be sent in via e-mail prior to class session, or turned in at the start of the class on Friday, November 21, 2008.

- b) Alternatively, one may work individually on a Term Paper, focusing on the state-of-the-art in one of the topics related to managerial decision making models and their applications. The term paper should be typically 15-20 pages (double-spaced) excluding figures, tables, and references. Topics may range from applications of resource allocation models, supply chain management, Enterprise Resource Planning (ERP) systems such as SAP/R3, Decision Support Systems, project management, quality management, to applications in finance or marketing. While it is expected that students frequently report their progress in identifying the topic, in drafting the outline, and providing first draft during the semester, a polished and final version of the report is to be turned in at the start of the class on Friday, November 21, 2008.

<b>EXAMS:</b>	<b>There will be two exams (including final) as follows:</b> <b>1. Friday, October 3, 2008 (Midterm Exam)</b> <b>2. Final Exam: TBD</b>
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**ATTENDANCE:** Students are required to attend all class meetings and to actively participate in the class discussion. Reading your assignment before class will facilitate your active participation. Problem situations do arise and every effort will be made to work with students to enable a successful completion of the class. However, students must realize that this course demands regular and on-time attendance, careful attention to management sciences applications and being up-to-date with class coverage. It is the student's responsibility to inform the instructor as to date conflicts before the date in question. He/she is responsible for all the reading and homework assignments for the date.

**ETHICAL STANDARDS AND ACADEMIC HONESTY:**

Organizations and managers are coming under an increasing scrutiny in terms of their professional and business ethics and social responsibility. Students must view their academic work as a preparation for meeting these ethical standards in their current/future careers. I expect all students to adhere to the highest ethical standards. Any act of unethical manner (e.g., plagiarism, cheating on exams, etc.) will have substantial consequences on the grade for this course. Students who are unclear about general policies on academic honesty should refer to the Student Handbook/Code of Ethics for further details. Student collaboration is viewed in many situations as a way of enhancing the learning experience. In fact, the homework assignments are designed as a learning tool and viewed as a way to prepare for the exams. Thus, in this class, collaboration is tolerated and encouraged in positive ways for understanding and completing the homework assignment.

**GRADES:**

Final grades will be based on the distribution of total weighted points of students as follows:

	<b>Grade Components</b>	<b>Percent of Grade</b>
1	Assignments	15%
2	Class participation	5%
3	Quizzes	15%
4	Article Review Report.	10%
5	Project Report/Term Paper	10%
6	Midterm Exam	20%
7	Final Exam	25%
	Total Grades	100%

Based on the total percentage of the grades, the following scale will apply:

<b>Total % of Grades</b>	<b>Letter Grades</b>	<b>Total % of Grades</b>	<b>Letter Grades</b>
98-100	A+	73-76.9	C
93-97.9	A	70-72.9	C-
90-92.9	A	67- 69.9	D+
87-89.9	B+	63-66.9	D
83-86.9	B	60-62.9	D
80-82.9	B	less than 60%	F
77-79.9	C+		

Please, feel free to ask questions and for help when you feel the material is becoming difficult. I am here to make sure you learn and succeed.

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**TENTATIVE SCHEDULE**

Week	DATE	TOPIC of READING	Homework Assignments Due
1	Aug.22	Introduction to the course, Management Science problems, applications, Linear Programming concepts, algebraic modeling, and solutions using the graphical and spreadsheet methodology. (Chs. 1 and 2)	
2	Aug.29	Modeling (building templates) with a spreadsheet and some guidelines for effective modeling. (Ch. 3)	Problems: 2.4, 2.5, 2.11, 2.20, <b><u>Case: 2.2</u></b>
3	Sep. 5	Linear Programming applications, their formulation procedure, and managerial analysis of the solution: Resource allocation problems, cost-benefit-tradeoff problems, and distribution network problems. (Ch. 4)	Problems: 3.1, 3.6, 3.12, 3.17, 3.24, and <b><u>Case # 3.2</u></b>
4	Sep.12	What-If (Sensitivity) analysis for LP problems, dual (shadow) prices, and managerial implications. (Ch. 5). Data Envelopment Analysis (DEA) and applications of dual prices.	Problems: 4.1, 4.6, 4.10, and <b><u>Case # 4.1</u></b> Handout
5	Sep.19	Network Optimization Models and their applications: Minimum-cost flow, maximum-flow, and minimum spanning-tree problems. (Ch. 6)	Problems: 5.6, 5.7, and <b><u>Case# 5.2,</u></b>
6	Sep.26	Transportation and Assignment Models, and their applications. (Ch. 15).	Problems: 6.4, 6.10, 6.12, and <b><u>Case# 6.2, Project 1 Due</u></b>
7	Oct. 3	<b><u>Review session and MID-TERM EXAM</u></b>	Problems: 15.4,15.10, 15.22, and <b><u>Case# 15.1</u></b>
8	Oct.10	Integer Programming Models and their applications. (Ch. 7).	
9	Oct.17	<b>FALL BREAK, NO CLASS</b>	

10	Oct.24	Some non-linear programming models (Decreasing Marginal Returns and separable programming). Binary Integer Programming Models and their application: Capital Budgeting with fixed investment proposals, facility location problems, designing a production & distribution network, dispatching shipment, airline applications. (Ch. 8)	Problems: 7.3, 7.6, 7.10, and <b><u>Case# 7.3</u></b>
11	Oct.31	Decision Making with Multiple Objectives and Goal Programming models. (Ch. 17).	Problems: 8.1, 8.6, 8.12, 8.15, and <b><u>Case# 8.2</u></b>
12	Nov.7	Decision analysis under uncertainty: Decision tree and spreadsheet solution. (Ch. 9)	Problems: 17.2, 17.5, 17.6 <b><u>Case# 17.2: Remembering September 11</u></b>
13	Nov.14	Project management with PERT/CPM, (using MS Project) scheduling projects and time-cost trade-off, evaluation of PERT/CPM from managerial perspectives. (Ch. 16)	Problems: 9.3, 9.7, 9.13, and <b><u>Case# 9.3</u></b>
14	Nov.21	Forecasting: Time series forecasting, and causal forecasting with linear regression. (Ch. 10)	Problems: 16.5, 16.11, 16.15, 16.24, 12.25, and <b><u>Case# 16.1, Project 2 due</u></b>
15	Nov.28	<b>THANKSGIVING DAY HOLIDAY, NO CLASS</b>	
16	Dec. 5	Queuing models: elements of the model, and measures of performance, various types of models and economic analysis of different scenarios. (Ch. 11)	Problems: 10.1, 10.9, 10.11, and <b><u>Case# 10.2</u></b>
16	Dec. 5	Computer simulations with Crystal Ball, and their managerial and business applications. (Ch. 12) Problems to be reviewed: 12.2, 12.3, 12.6, and 12.14. <b>Review session and discussion of cases.</b>	Problems: 11.1, 11.6, 11.8, 11.10, 11.15, and <b><u>Case# 11.2</u></b>
17	TBD	<b><u>FINAL EXAM</u></b>	