Decision Science

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Objectives
This course provides an introduction to the concepts and methods of Decision Science, which involves the application of mathematical modeling and analysis to management problems. It also provides a foundation in modeling with spreadsheets. The primary goal of the course is to help you become a more skilled builder and consumer of models and model-based analyses. Another important goal is to encourage a more disciplined thinking process in the way you approach management situations. As a result of this course you will become more confident in understanding and using models, both in other courses and on the job. More specifically, the course will:

* Teach you how to use Excel spreadsheets effectively for business analysis. You will learn a comprehensive set of spreadsheet skills and tools, including how to design, build, test, and use a spreadsheet.

* Introduce you to the basic principles and techniques of applied mathematical modeling for managerial decision-making. You will learn to use some of the more important analytic methods, to recognize their assumptions and limitations, and to employ them in decision-making. These methods will be applied to problems arising in a variety of functional areas of business, including economics, accounting, marketing, operations, and capital markets.

* Sharpen your ability to structure problems and to perform logical analyses. You will practice translating descriptions of business situations into formal models, and you will investigate those models in an organized fashion.

* Expose you to settings in which models can be used effectively. You will apply modeling concepts in practical situations. You will learn to extract insight
from models, and to use those insights to communicate, persuade and motivate change.

**Requirements**

**Cases** provide descriptions of practical situations where modeling and analysis can play an important role. In this course, the cases provide you with opportunities to practice translating situations into problem structures and to consider the implications of your analysis for a particular situation. For many of the cases you will also be expected to present your ideas to an audience interested in the implications of your analysis.

**Software** for the course is Microsoft Excel 2002, along with the add-ins Premium Solver, and Crystal Ball 2000 Pro. Both add-ins are part of the standard Tuck software.

**Homework** exercises provide you with opportunities to practice the skills of modeling and analysis introduced in the course. Homework emphasizes the quantitative aspects of the course material and provides you with feedback on how well you are mastering analytic techniques. You should attempt each exercise on your own before discussing it with your team. Each individual will submit a homework paper when required. All work handed in for grading must be your own. You may use ideas suggested by members of your group, but you may not copy their work. Homework solutions should be handed in to Chase 308 by the required time on the assigned due-dates. Late homework will not be accepted. A schedule of assignments is attached.

**Materials**

**Readings.** The main text for this course is Spreadsheet Modeling and Decision Analysis (3rd Ed.) by Cliff Ragsdale. Several chapters in this book are assigned. In addition, some required readings have been selected from other sources and will be distributed separately. There are many textbooks in the library that contain alternative readings, examples and exercises for practice. Five of these have been placed on reserve:

Donald R. Plane, *Management Science: A Spreadsheet Approach*
Francis J. Clauss, *Applied Management Science and Spreadsheet Modeling*
Jeffrey D. Camm and James R. Evans, *Management Science: Modeling, Analysis, and Interpretation*
Wayne L. Winston and S. Christian Albright, *Practical Management Science: Spreadsheet Modeling and Applications*
Jeff Moore and Larry Weatherford, *Introductory Management Science*

**Policies**

**Attendance**

The general policies of the Tuck School apply. In part, this means that all students are expected to prepare for and attend class each day, in their assigned sections, except for optional sessions as designated by the instructors. Personal illness or
family emergency, but not placement activities, are considered grounds for excused absences. Penalties for unexcused absences will be reflected in the course grade.

Class Participation

Class participation will be evaluated subjectively. As instructors, we value attendance, punctuality, familiarity with the required readings, and classroom questions or comments that are relevant and insightful. Differences in technical background or skill are not a criterion. In general, we evaluate classroom participation on the basis of the extent to which you contribute to a positive and effective learning environment (for yourself and others). Demonstrating mastery of advanced topics at inappropriate times does not contribute to a positive learning environment. Correcting us when we make a mistake, however, or asking what may appear to be a naive question, quite often contribute positively. ("Dumb" questions, which rarely are that, are usually shared by many students, and asking one can keep the class on track.)

Honor Code

The Tuck Honor Code represents a contract among students and instructors about behaviors that are appropriate in the learning process. This course is structured to promote learning by a combination of individual and team efforts. This structure encourages certain group interactions because they enable you to use time efficiently or because they improve your understanding of the material.

Collaboration on daily preparation for class is always encouraged. On a number of days during the course, team preparation will be essential, because a team member will be expected to present the team’s analysis in class. Class discussion should be based on individual and team preparation, but not on the information produced by other sections of the course earlier in the day.

With respect to homework, some amount of discussion and sharing within the team is desirable, with the understanding that each student is responsible for learning all the material on the assignment. Each student is expected to attempt each homework exercise individually and to use the team mainly to help resolve open issues. While collaboration within a team is encouraged, discussions between teams should be limited to general concepts and should avoid the exchange of approaches or solutions to specific homework exercises. Conversations with second-year students about specific assignments before their due-dates are prohibited. It is also a violation of the Honor Code to use information from previous years’ homework in doing the assigned exercises. Finally, all work handed in for grading must be your own. You may use ideas suggested by members of your group, but you may not copy their work.

With respect to quizzes and exams, group preparation is permissible, but the work done during the quiz or exam must be done without the help of other students. Quizzes and exams will have set time limits.
If situations arise where the application of the Honor Code is unclear, students should seek the interpretation of the instructor or consult with a member of the Judicial Board.

**Grading**
Grades will be based on a midterm exam (30%); a final exam (55%); and homework (15%). Class participation may be used to determine grades for students at the borderlines (for example, between S+ and H). All exams are open notes/open book exams. Computers are used on all exams.

**Schedule**

**09/03/2002**
*Introduction to spreadsheet modeling*
*Assignments*
Preparation: *Buy the Business*. Build a spreadsheet for this situation and develop a recommendation.

**09/05/2002**
*Effective spreadsheet design*
*Assignments*
Preparation: *Advertising Budget Analysis*. Build a base case spreadsheet.

**09/06/2002**
*Analysis with spreadsheets*
*Assignments*
Preparation: Refine spreadsheet for Advertising Budget and perform sensitivity analysis.
Homework 1: due September 9

**09/09/2002**
*Data analysis using spreadsheets*
*Assignments*
Preparation: None.
Homework 2: due September 11

**09/11/2002**
*Advanced modeling tools*
*Assignments*
Preparation: None.

**09/13/2002**
*Application of spreadsheet modeling*
*Assignments*
Preparation: *Athens Glass Works*.

**09/13/2002**
*Exam*
2:00-5:00
11/06/2002
Introduction to optimization
Assignments
Preparation: Read Ragsdale 2.0-2.3, 8.0-8.5.
Optimization Using Solver

11/08/2002
Analysis using optimization models
Assignments
Preparation: Read Ragsdale 2.4-2.10, 3.0-3.6, skim 3.8-3.13.
Sensitivity Analysis in Optimization
Arnett Lumber Modeling
Homework 3: due November 13.

11/13/2002
Creating optimization models
Assignments
Preparation: Read problems 3-10, 3-21, and 3-28 in Ragsdale (pages 120, 125, and 128). For each problem, define in words the objective function, decision variables, and constraints.

11/15/2002
R&D project portfolio management
Assignments
Preparation: AgrEvo Canada, Inc.
Preparation for AgrEvo
Homework 4: due November 20.

11/20/2002
Modeling laboratory
Assignments
No Preparation

11/22/2002
Sales force sizing and allocation
Assignments
Preparation: Syntex Laboratories (A)
Preparation for Syntex Labs

12/02/2002
Introduction to simulation
Assignments
Preparation: Using Crystal Ball for Risk Analysis

12/04/2002
Simulation modeling and analysis
Assignments
Preparation: Read Ragsdale 12.0-12.10.
*Valuing the Initial Public Offering for Netscape Communications*
Homework 5: due December 6.

**12/06/2002**  
*Optimization in simulation*  
Assignments  
*Production Planning at Sport Obermeyer, Ltd.*

**12/09/2002**  
*Managing risk with insurance*  
Assignments  
Preparation: *Sigma Risk Management, Inc.*  
*Preparation for Sigma Risk Management*

**12/11/2002**  
*Competitive Bidding*  
Assignments  
Preparation: *Competitive Bidding for Medex Pharmaceuticals, Inc.*  
Homework 6: due December 13.

**12/13/2002**  
*Stock price dynamics and option pricing*  
Assignments  
No Preparation

**12/16/2002**  
Final Exam  
Final Exam, Monday, December 16th at 9:00 a.m.

Exam