Course Description - Urban Decision Models

This course provides an introduction to computer-based optimization and simulation models for decision-making for government officials and policy makers. The emphasis is on models that are widely used in diverse functional areas, including every day operations such as waste collection, policing and transportation to policy making on environment/climate change to sheltering the homeless. Applications will include resource allocation, workforce planning, revenue management, asset-liability management (public sector finance models), environmental policy modeling, pension and bonding planning, and political campaign management, among others.

The aim of the course is to help students become intelligent consumers of these methods. To this end, the course will cover the basic elements of modeling -- how to formulate a model and how to use and interpret the information a model produces. The course will attempt to instill a critical viewpoint towards decision models, recognizing that they are powerful but limited tools.

The applicability and usage of computer-based models have increased dramatically in recent years, due to the extraordinary improvements in computer, information and communication technologies, including not just hardware but also model-solution techniques and user interfaces. Twenty years ago working with a model meant using an expensive mainframe computer, learning a complex programming language, and struggling to compile data by hand; the entire process was clearly marked "experts only." The rise of personal computers, friendly interfaces (such as spreadsheets), and large databases has made modeling far more accessible to managers. Information has come to be recognized as a critical resource, and models play a key role in deploying this resource, in organizing and structuring information so that it can be used productively.

Recommended (not required)Text

Powell and Baker, *The Art of Modeling with Spreadsheets*, John Wiley & Sons, 2004.

Others to be suggested in the first class.

Course Web Page

The web page for the course can be found on NYU Classes. It contains the lecture notes, Excel files, and additional reading materials. The page will be updated as the course progresses.

Computer Software

A laptop computer is required for this course. We will use spreadsheets extensively throughout the course. In particular, we will utilize the Excel spreadsheet package for Windows. This package has optimization capabilities built in. The optimization software we will use is *Solver*. Solver is an Excel add-in that allows you to solve different types of optimization problems and is part of the standard Excel installation. For simulation we will use *Crystal Ball*, an add-in for Excel that makes it easy to run simulations in a spreadsheet.

To check whether you have the Solver add-in, choose the Tools/Add-ins menu option in Excel. We will discuss access to Crystal Ball when class begins.

Review Sessions

Review sessions will be offered. The time and place will be TBD. The review sessions will be used to answer questions and go over practice and homework problems.

Course Work

There will be several computer homework assignments and one project assignment. In addition to these assignments, there will be a midterm and a final exam.

Grading will be determined as follows:

Homework	30%
Project	10%
Midterm	30%
Final	30%

Regarding individual professional conduct, I expect all class participants to arrive to class on time and prepared, and to stay involved during class sessions. Every conceivable effort should be made to avoid absences, late arrivals, or early departures. In cases when these are unavoidable, you should communicate that to me in advance.

Practice Problems

A set of practice problems, solutions, and corresponding spreadsheets will be posted on NYU Classes. Many of these practice problems are based on past examination questions. None of these practice problems will be collected.

Exams

The exams will be open book and open notes. The *majority* of the points on the exam will be given for correct methods and analysis; correct numbers will only count for a small portion of the points.

Laptop Computers

As mentioned above, laptop computers will be used in this course. They will be required for the exams. Although students are not required to bring them to class, that is highly recommended. Download any session materials before class. The network connections in the classroom may be turned off during the class hours.

Course Schedule

Lecture #	Topic
Lecture 1	Introduction to Decision Models, Optimization using Excel
Lecture 2	Modeling Examples: Staffing, Transportation/Supply Chain, Production
Lecture 3	Sensitivity Analysis
Lecture 4	Multi-period Models
Lecture 5	Integer Models
Lecture 6	Non-linear Models: Portfolio Optimization
Lecture 7	Portfolio Optimization: Options
Lecture 8	Product Pricing, Retail Revenue Management
Lecture 9	Introduction to Simulation, Asian Options
Lecture 10	Yield Management, Optimization using Simulation
Lecture 11	Foreign Exchange Hedging
Lecture 12	Simulating Value at Risk