NEW YORK UNIVERSITY
NYU STERN
LEONARD N. STERN
SCHOOL OF BUSINESS

COURSE SYLLABUS: DECISION MODELS & ANALYTICS

(Subject to minor changes)
Summer, 2018

MEETINGS: Tuesdays and Thursdays 6PM – 9PM

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Teaching Assistant: TBA

COURSE DESCRIPTION

This course will show you how to analyze a wide array of business planning and decision problems involving data with the help of spreadsheet models. We provide a framework for quantitative decision-making, optimal design, effective resource allocation and economic efficiency. Our framework will be used in the center of many business-related disciplines, including marketing, finance, operations management, accounting, and economics. The class will focus both on modeling the decision problems and on implementing the designed models over the collected data. In the modeling approach, we seek to describe the essential structure of a decision problem in terms of objectives, decision variables, uncertainties, outcomes, choice criteria, and feasibility. Powerful and easy to use spreadsheet tools have been developed to assist in this process. Those covered here include: (1) Optimization tools (e.g. *Solver* add-in): extracting maximum value from resources and activities; exploring complex combinations of possibilities to achieve desired goals;

(2) Simulation tools (e.g. *Crystal Ball* add-in): valuing and managing complex portfolios of risks. This decision technology has enabled many companies to improve their routine activities, but also identify long-run decision opportunities and sometimes rethink the whole of their activities. In this sense, decision models have tactical *and* strategic value; they are an important factor of value creation. In this class, examples will be drawn from advertising planning, portfolio optimization, revenue management, production planning, and risk management, among others.

The material is approached from a managerial rather than technical perspective, that is, with a focus on how to apply decision technology, and how to interpret the results for guiding management action.

LEARNING OBJECTIVES

From this course, you should:

- become aware of the scope of management problems that can be addressed with models;
- be able to identify the essential conceptual structure of a decision/planning problems;
- recognize the types of modeling tools most adapted to a given situation;
- know how to assess the significance of model outputs for managerial insights and action.

PREREQUISITES

Since the course relies on spreadsheets as a platform for model building, basic familiarity with Microsoft Excel is assumed. These include developing and copying formulas with relative and absolute cell addresses, and using the function and chart wizards. We will augment Excel with add-ins for the different modules of the course. In each case, full instructions regarding software access and use will be provided at the opportune time.
Knowledge of basic algebra (including functions such as the quadratic, exponential, and logarithmic), simple logic (as expressed in an IF statement or the MAX function), and basic probability (distributions and sampling, for example) will usually suffice.
Finally, one should not be averse to analytical thinking and quantitative analysis in general.

WEBSITE/COURSE MATERIALS

A course-pack including all the problems and cases we use throughout the semester will be uploaded on the course website ((NYU Classes), and its hard copy will be distributed in the class.

Material, including Excel solution models, software, optional readings and lecture slides, will be distributed electronically through the course website, including:

- preparation material for the next lecture, and
- slides and solution files for the previous lecture.

Hard copies of lecture slides will be distributed in the beginning of each class.

RECOMMENDED TEXTBOOKS

The following books are very good references for this course. They are recommended, not required. My teaching will be in similar style as Winston and Albright's book (the first one).

Practical Management Science, by Wayne Winston and Chris Albright.
Management Science: The Art of Modeling with Spreadsheets, by Stephen G. Powell and Kenneth R. Baker.
Introduction to Management Science, by Frederick Hillier and Mark Hillier.

GRADING

Homework Assignments (45% - three assignments: 12%, 15%, and 18%). There will be three graded assignment studies, with the due dates indicated in the course schedule. You are asked to work individually on the assignments. One copy of the final report should be handed in before the beginning of the class on the due date. Also, all files should be submitted electronically before the class. The detailed instructions will be provided at the time.

Class Participation (15%). This fraction of the grade will be assigned on the basis of class participation and individual professional conduct. Class participation includes class discussions of assignments and cases, presentation of an exercise solution, as well as active participation in lectures. 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, they need to be communicated to me in advance.

Two Quizzes (20% and 20%). The quizzes are 45-60 minutes close-book exam that will be held in the class.

CLASS WORK

The process of modeling is the most important and difficult problem solving skill. It involves developing a structure to conceptualize, formalize and analyze a given problem. It seems deceptively simple to watch someone else do it, but the only way to learn this skill is by practicing it yourself. Therefore, this course involves a hand-on, in-class learning experience.

Attending each class and bringing a laptop computer to class are essential. Preparation for each class involves reading and thinking about the problems to be covered in class. The problems will be posted on the course website in advance. Excel files of the problems modeled and analyzed in class should be downloaded from the website before (not during) the class.

Classroom Norms

Cellphones, Smartphones and other electronic devices are a disturbance to both students and professors. All electronic devices (except laptops) must be turned off prior to the start of each class meeting.

Laptops: You are expected to bring a laptop to each class, unless otherwise instructed. But we will not use it throughout each class. Please close your laptop until you are asked to use it.

Ethical Guidelines: All students are expected to follow the **Stern Code of Conduct** (http://www.stern.nyu.edu/uc/codeofconduct). A student's responsibilities include, but are not limited to, the following:

- A duty to acknowledge the work and efforts of others when submitting work as one's own. Ideas, data, direct quotations, paraphrasing, creative expression, or any other incorporation of the work of others must be clearly referenced.
- A duty to exercise the utmost integrity when preparing for and completing examinations, including an obligation to report any observed violations.

Students with Disabilities: If you have a qualified disability and will require academic accommodation during this course, please contact the Moses Center for Students with Disabilities (CSD, 998-4980) and provide me with a letter from them verifying your registration and outlining the accommodations they recommend.

COURSE SCHEDULE (subject to minor changes)

	Topics	Turn in
Module 1	**Brief Course Introduction, Linear Models, Linear Programming, Solver**	
Module 2	**Linear Programming: Multi-period Models**	
Module 3	**Linear Programming: Sensitivity Analysis, SolverTable**	
Module 4	**Binary and Integer Programming, logical constraints**	Assignment 1
Module 5	**Goal Programming**	Quiz 1

Module 6	**Network Models and Optimization**	
Module 7	**Nonlinear Optimization**	
Module 8	**Highly Nonlinear Optimization, Evolutionary Solver**	Assignment 2
Module 9	**Decision Analysis: Decision Tree**	Quiz 2
Module 10	**Simulation: Crystal Ball, How to Choose Probability Distributions**	
Module 11	**Simulation and Optimization, I**	
Module 12	**Simulation and Optimization, II**	Assignment 3