

Systems Optimization

Course Faculty

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Course Description

This course is a computational and application-oriented introduction to the modeling of large-scale systems in a wide variety of decision-making domains and the optimization of such systems. Application domains include production planning, product mix, portfolio optimization, bidding, among others.

We will cover the basic elements of modeling -- how to formulate a model and how to use and interpret the information a model produces. The aim of the course is to help students become intelligent consumers of optimization models and provide students tools for interpreting and analyzing model-based solutions.

I recommend the following books (not mandatory) for the course:

- Winston and Albright, 2001, Practical Management Science: Spreadsheet Modeling and Applications, 2nd Edition (W&A).
- John F. Barlow, 2005, Excel Models for Business and Operations Management, 2nd Edition.

Computer Software

We will use excel spreadsheets extensively throughout the course. More specifically, we will explore the extensive optimization capabilities built in the spreadsheet.

Assignments & Exam

There are four assignments to be done individually, which requires calculations on all accounts (e.g., modeling). During many of the class sessions, you will be asked to present your results in class and may receive bonus points for the assignments, depending on your performance. There is an open-book exam for this course.

Grading

Your final grade will be determined according to the following components (see the table below). **Your final score needs to be at least 5.5 (on a scale of 10) in order to pass the course. In**

addition, you need to score at least 5 in each component to pass the course.

	Weight
4 Individual Assignments	40%
Class Participation	20%
Exam	40%

Course Schedule

Lecture 1:

- Course overview.
- Introduction to decision models: scale and complexity.
- Linear programming formulation.
- Demonstration of the spreadsheet optimization method.
- Product mix
- Transportation planning

Lecture 2:

- *Shelby Shelving* case
- Understanding the solver sensitivity report
- Bidding/assignment problems

Lecture 3:

- Project scheduling
- Multi-period planning
- Cash flow matching LP
- Multi-period revenue management problem

Lecture 4:

- Purchasing television ads
- Estimating a response function
- Portfolio optimization

Lecture 5:

- Portfolio optimization (cont.)
- Options
- Hedging

Dates for Assignments

Assignment I: assigned after Lecture 1, due date TBA.

Assignment II: assigned after Lecture 3, due date TBA.

Assignment III: assigned after Lecture 4, due date TBA

Assignment IV: assigned after Lecture 5, due date TBA