Spring, 2020: 91-819 Optimization and Risk Modeling for Managers

Class Time and Location:
Monday 6:30PM – 9:20PM HBH A301
Recitation:
Saturday 9:00AM – 10:20AM HBH A301

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Course Objectives:

This course has four objectives besides learning a variety of spreadsheet skills.

First, you should learn about a variety of management science techniques, what they are capable of, and what their limitations are so that you can intelligently call upon specialists and consultants when the occasion arises.

Second, you should acquire sufficient proficiency with some of the techniques that you can use them as an end user modeler.

Third, you should learn how to approach, abstract, and analyze problems from a quantitative, analytical perspective. In short, you should be able to use the language of mathematical modeling. In most lectures we will work through a small case to help you connect the methods to a problem that is richer than the typical end of chapter problem.

Fourth, doing these things will prepare you to manage staff who are doing analytics projects. Walking a mile in their shoes (reflectively), will help you understand what they can and cannot do to create value for your organization. The course moves quickly; be careful not to fall behind. Unless I explicitly say otherwise, always read the assigned readings before the class in which they are discussed; failing to do so is the most common reason for failing the course.

Relationship to Other Courses: The course catalog lists no prerequisites for this class. However, topics such as regression analysis are not included in this course because they are covered in Statistical Methods for Managers. Data Mining and Decision Analysis are not covered here, as they are covered in Business Analytics for Managers.

Text: Cliff T. Ragsdale's *Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics, 8th edition*. You can probably get by using the 6th or 7th edition. However the text evolves, so some of the problem numbers have changed. See Amazon and Chegg for inexpensive options for purchasing the book, including used and rental.

Other books you might want to consult: Frederick S. Hillier and Gerald J. Lieberman's *Introduction to Operations Research*. That was the textbook I used for a class for undergraduates who wanted an introduction to the field as business students.

Handouts:
Course materials will be posted to canvas. You should monitor it for announcements (e.g., changes to assignments).

Recitations:
The TA will lead the recitations. She or he will use the class time to focus on working through problems.

Grading:
Course grades will be based on: class participation (15%), homework (25%), term project (20%), and the final exam (40%).

Class participation is important. I take attendance every class, and note students who are attentive and those who are not. Attending class, learning from your instructor and classmates are the valuable resources you can access through your enrollment at CMU.

The homework grade will be based on the best 5 of 6 assignments. One is dropped to allow for illness, job interviews, etc.

The HW can be done individually or in groups of two or three. If you work in a group: (1) you should submit one HW for the group and everyone in the group will receive the same grade on that HW; (2) you must identify all members of the group, and (3) more will be expected of group HW in terms of clarity of presentation and exposition, absence of arithmetic errors, quality of writing, etc.

Within a group you may collaborate in any way you choose, although it is a bad idea to let others do the work for you because they won't be able to help you during tests. There should be no interaction across groups concerning homework problems. You are encouraged to discuss the readings, concepts, and other problems that are not assigned as homework, including ones that parallel the homework assignment, but you should not collaborate in any way on the problems assigned as homework. It is never permissible for a person from another group to see your homework, drafts, calculations, spreadsheets, or other computer work. Likewise, you should avoid seeing the homework of any other group, and if it is offered, you should decline.

If there is a *substantial* error in grading of a homework, you may ask the TA's for a re- grade. Please do not worry about minor issues. Each individual homework problem counts for a modest portion of the course grade.

The project will be assigned with week 4 homework, and due with the week 5 homework. For the project you can plan to work individually, or with a partner or team of maximum 3 students. Like the homework, the expectations for your project output increase with the number of students participating. You will be asked to identify a real world problem, relevant to your professional areas of interest, and use the techniques learned in the course to make informed management decisions.

Taping or Recording Classroom Activities
No student may record or tape any classroom activity without my express written consent. If a student believes that they are disabled and needs to record or tape classroom activities, they should contact the Office of Disability Resources to request an appropriate accommodation. The university is taping the lectures, and they will be made available.

Study Tips:
The key to learning mathematics is repeated exposure. It is hard to grasp new concepts from one or two exposures, no matter how intense. It is usually more fruitful to work on the material repeatedly, in small chunks and via different formats (reading the text, listening to lecture, doing HW, etc.).

Likewise, it is important to use active learning. Typically mathematical material will "make sense" when you read or hear it, but it is only when you try to use it that you find out whether you've actually learned the material. So challenge yourself to work problems, explain concepts to friends or family members, and think about how you would apply the material outside the classroom, in professional or personal life.

Course Schedule:

Week 1, February 1: Chapters 1 and 2; Introduction to Modeling and Decision Analysis, and Introduction to Optimization and Linear Programming. Remote Only.

Week 2, February 8: Chapter 3, Modeling and Solving LP Problems in a Spreadsheet. Remote Only.

Week 3, February 15: Chapter 11, Time Series Forecasting (i.e. predicting the future). Remote and at HBH.

Week 4, February 22: Chapter 5, Network Modeling. Remote and at HBH.

Week 5, March 1: Chapter 6, Integer Linear Programming. Remote and at HBH.

Week 6, March 8: Chapter 8, Nonlinear Programming. Remote and at HBH.

Week 7, March 15: Final Exam during class period. Remote Only.

Homework will be due at the start of class, 6:30PM on Mondays.