Spring, 2017: 90-760A, B, & C
Management Science II: Decision & Risk Modeling

Lecture Section A: Tuesday, Thursday 10:30 – 11:50 AM in HbH 1202
Lecture Section B: Tuesday, Thursday 1:30 – 2:50 PM in HbH 1206
Lecture Section C: Tuesday, Thursday 3:00 – 4:20 PM in HbH 1206
Recitation: Friday 9:00 – 10:20 in HbH A301

The A, B, & C sections will cover the same material but may have their own exams and be graded on separate curves, so please attend your assigned section. If you have a compelling reason for needing to switch see me ASAP and we’ll try to find someone who wants to switch sections in the opposite direction.

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Office Hours: Weds 4 – 4:30, Thurs 12:00 – 12:30 PM, Fri. 11:30 AM – 3 PM, and by apt.

TA’s: Momin Abrar Ghalib mghalib@andrew.cmu.edu; Krishna Dalal kddalal@andrew.cmu.edu; Thomas Goldring tgoldrin@andrew.cmu.edu; Yutian Guo yutian@andrew.cmu.edu; Samantha Levinson sglevins@andrew.cmu.edu; Joseph Marren jjmarren@andrew.cmu.edu; Mallory Nobles mnobles@andrew.cmu.edu

Note: TA’s work specific hours. Outside those hours, they are just students like you, with their own deadlines and classes to worry about. Do not expect TA’s to be “on duty” whenever and wherever you see them.

Prerequisites:
Ability to work with concepts from probability is required (Binomial and Normal random variables, distributions more generally, computation of mean & standard deviation, event probabilities, Bayes Rule, etc.). Some concepts in 90-760 are easier to grasp if one knows regression, but regression per se is not a prerequisite.
The course uses Excel intensively. If you have not already taken 90-722 or become proficient with Excel in some other way, you should work through some Excel tutorials before the course begins.

Course Objectives:
This course, along with its companions (90-722 Management Science I: Optimization, 94-833 Decision Analysis and Multi-Criteria Decision Making, and 95-760 Decision Making Under Uncertainty) are introductory courses in analytics and management science that survey a variety of hands-on quantitative and modeling methods useful to managers and analysts.
Normally Heinz PPM, HCPM, MBTM, and MEIM students take 90-722 & 90-760, whereas MISM students take 95-760 which pulls examples from the information systems context. Both tracks feed into 94-833, although students with a strong quantitative background can take 94-833 in the first year; none of the other courses are actually a prerequisite for 94-833.

These courses have four objectives, listed in order from least to most important.

First, you should become as comfortable working with spreadsheets, spreadsheet tools, and various add-ins as you already should be with word processors. By the end of the course, firing up Excel to model and solve a quantitative problem should be second nature. This skill will be a significant asset on the job market and in your career.

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

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

Fourth, 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 and perspective 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.

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.

Text:

Required: Chapters 10, 13, and 15 from Cliff T. Ragsdale’s *Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Management Science, 6th edition*, which you can order from Cengage by the chapter or the entire book. The 7th edition is also OK, although its Chapter 10 is much longer and covers things I will not.

I used to assign the entire text (~$250), but many students did not buy it. This caused substantial disruption as people juggled different editions and many did not obtain copies that came with the software. I have given up on our all being able to use the specialized software; we will work in “straight” Excel.

To save money for those buying by the chapter, I wrote my own versions of topics Ragsdale covers in other chapters. This is work in progress so please (1) forgive the odd chapter numbering scheme and (2) give me feedback on typos, poorly worded passages, etc.

There are many other textbooks that cover many of the same topics. If you have trouble understanding, Ragsdale’s presentation, check out another of these introductory management science textbooks (many available at the engineering library in Wean): Christian Albright et al. *Data Analysis and Decision Making with Microsoft Excel*, Anderson et al. *Introduction to Management Science*, Wayne L. Winston’s *Operations Research: Applications and Algorithms*; Lawrence L. Lapin’s *Quantitative Methods for Business Decisions*; Thomas M. Cook and Robert A. Russell’s *Management Science*, Frederick S. Hillier and Gerald J. Lieberman’s *Introduction to Stochastic Models in Operations Research*.
If you enjoy the course and want to learn more, I recommend the professional magazines Analytics (http://www.analytics-magazine.com/) and OR/MS Today (http://www.informs.org/ORMS-Today/) and the academic journal Interfaces which specializes in describing successful applications (http://www.interfaces.smeal.psu.edu/).

It is good to complement an equation-oriented treatment of decision making with books about human limitations of decision making. Examples include Daniel Ariely’s Predictably Irrational: The Hidden Forces that Shape Our Decisions; Richard Thaler and Cass Sunstein’s Nudge: Improving Decisions about Health, Wealth and Happiness (on libertarian paternalism); Daniel Kahneman and Amos Tversky, Choice, Values, Frames; Ralph Keeney, Value-Focused Thinking: A Path to Creative Decisionmaking; Peter Miller, The Smart Swarm: How Understanding Flocks, Schools, and Colonies Can Make Us Better at Communicating, Decision Making, and Getting Things Done; Daniel Kahneman’s, Thinking, Fast and Slow, Davenport, Harris, and Morrison Analytics at Work.

Blackboard:
Course materials will be posted to Blackboard (www.cmu.edu/blackboard). You should monitor it for announcements (e.g., changes to assignments).

Recitations:
I conduct Friday recitations myself unless I am out of town. I’ll answer any questions and work any (non-HW) problems you request. You can also ask questions about how the materials play out in real world applications, new trends in the field of analytics, etc.

Grading:
Course grades will be based on: homework (15%), class participation (not just attendance) (15%), midterm on Friday April 21st (30%), and the final exam (40%).

I do not give make up exams. If you miss an exam you can take a 0 on the test or an incomplete in the course and fill in the score from next year’s exam.

I will drop one (the lowest) homework grade to allow for illness, job interviews, etc. I will not drop more than one even if you are lucky enough to have lots of job interviews.

Homework can be hand-written. (Typing formulas can be time consuming, but is of course acceptable.) HW must be neat though! TA’s cannot give points to things they cannot read. HW should be submitted in hard copy, not through the digital drop box. Late assignments will not be accepted and will receive a 0.

The HW can be done individually but I suggest working in groups of two or three (max). Submit one HW for the group and everyone in the group will receive the same grade. Within a group you may collaborate in any way you choose, although it is a bad idea to divvy up the problems because you won’t be able to do that during tests. There should be minimal interaction across groups concerning homework problems. You are encouraged to discuss the readings, concepts, and problems that are not assigned as homework, but you should not collaborate on the problems assigned as homework. In particular, obtaining or providing a copy of another group’s answers or spreadsheet, is cheating and will be subject to sanction up to failure in the course and reporting of the incident to the Dean.
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. In contrast, see me if you have any concerns about the grading of an exam problem.

Exams dominate your course grade. They demand synthesis, integration, and higher-level conceptual understanding of the material than in weekly assignments, which are designed to reinforce the week-by-week learning.

**Academic Integrity:**
Cheating will be punished, typically by failure in and dismissal from the course as well as reporting the infraction to the Dean for consideration of further sanctions.

**Taping or Recording Classroom Activities**
One section’s lectures will be videoed, with a link to the recordings posted to blackboard.

No student may record any classroom activity without my written consent. If a student believes that he/she is disabled and needs to record classroom activities, he/she should contact the Office of Disability Resources.

**Study Tips:**
**You should read the assigned material before coming to class; failing to read ahead is the most common reason people fail the course.** It would be better to submit an incomplete homework than to not finish the next week’s reading before class

Repeated exposure is key to learning mathematics. It is hard to grasp concepts from one or two exposures, no matter how intense. Instead, work the material repeatedly, in small chunks and via different formats (reading the text, listening to lecture, doing HW, etc.).

Likewise, use active learning. Often mathematical material will “make sense” when you read or hear it, but you’ll only find out whether you’ve actually learned the material when you try to use it. 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.

Note, lecture is a terrible time to try to learn Excel mechanics. I will demonstrate things in Excel to give you a big picture understanding of what can be done, but your primary resources for learning Excel will be the textbook and online aids. If you Google or search on YouTube you’ll find lots of Excel guides. This is graduate school, so by now you should be an “independent learner” who can look up such tutorials on your own.

(Do not expect TA’s to debug your spreadsheets. They may be able to help explain Excel techniques during office hours if there are no other students with conceptual or mathematical questions. But, the textbook and online tutorials are your primary source for Excel help.)