Spring, 2021: 90-760A, B
Management Science II: Decision & Risk Modeling

All sessions are virtual.
Section A: Tuesday, Thursday 8:30 – 9:50 AM
Section B: Tuesday, Thursday 1:30 – 2:50 PM
Recitation (for both sections):   Friday 10:10 – 11:30 AM

Optional problem-solving recitations: Monday & Wednesday 11:45 – 1:15 PM
No Monday evening recitations this mini.

Instructor: Jon Caulkins, caulkins@andrew.cmu.edu

Office Hours:
"Closed door" 15-minute private meetings by appointment: Wednesday 10 AM – 11:30
        AM and outside that time as needed.
"Open door" drop-in hours (no waiting room/privacy): Thursdays 11:30 AM – 1 PM. You
        can ask almost anything during these Friday office hours, including just shooting
        the breeze about careers, COVID, etc. (just not politics please).

Wednesday by-appointment meetings are to address matters like academic accommodations. Friday open-door hours are to talk about anything under the sun. The problem-solving recitations are a good time to ask questions about concepts, textbook problems, and the like, as are TA office hours.

TA's:
Alexandra Allen sydneya@andrew.cmu.edu; Justin Bender jmbender@andrew.cmu.edu; Maria Didonato mdidonat@andrew.cmu.edu; Thomas Hurley twhurley@andrew.cmu.edu; Karunya Manoharan kmanohar@andrew.cmu.edu; Osama Mohamed omohamed@andrew.cmu.edu; Erika Montana emontana@andrew.cmu.edu; Michael Rath mjrath@andrew.cmu.edu; Jeffrey Scanlon jscanlo2@andrew.cmu.edu; Sinduja Sriskanda ssriskan@andrew.cmu.edu; Sormeh Yazdi sormehy@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.

Remote format
This is a large class, so it has to be remote. That forces a host of changes. Please be patient, and also be professional in your approach to those challenges. What I mean by that is to recognize that the stresses of distance education are real, but they are no more daunting than the challenges you'll confront and surmount throughout your careers. So, I will expect of you, and you should expect of yourselves and your classmates (and of me), professionalism at all times. (E.g., I expect you to have your video turned on during Zoom sessions, unless there is a compelling reason not to.)

Normally this course has two 80-minute lectures per week, but this year I'm going to deliver some of the lectures via pre-recorded asynchronous videos you're required to watch *__before__* class; they are like required readings. Class time will be shortened correspondingly, with the tail end of some classes spent working in small groups on small, low-stakes assessments that will be turned in at the end of that class time. (In response to multiple requests, I will go back to having two exams, with the one during finals week being longer, and there will still be regular, weekly homework assignments.)

Details will vary depending on the week. There will be one or two 30-40 minute asynchronous videos per week and usually one 30-40 minute "in-class" assignment, with the remaining time being conventional Zoom class.

The end-of-class assignment-completing sessions will occur via Zoom's breakout rooms, but I'll call them "assignment working groups" (AWG's) to distinguish them from the usual in-class break out discussion rooms. When your AWG has submitted your assignment, you're free to exit Zoom.

In Mini III the AWG's were random, so you could meet more of your classmates, but for Mini IV you will form stable AWG working groups of up to five students, all attending the same session.

Note: Homework can be done individually or in groups of up to four students. Those groups are self-organized and are distinct from the AWG's.

You'll also be divided into discussion groups for (required) Canvas discussion posts. Details below. Those will be stable communities of about 20 people sharing ideas under the supervision of a TA.

AWG Breakout Groups:
Everyone in an AWG group has to attend class at the same time. Tell me who you would like to have in your breakout group by **Friday March 26th**. Note: After that, I'll assign remaining people to groups.

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. **Be sure to read the assigned readings and watch the asynchronous lectures before attempting the homework. Learn first, then demonstrate that understanding on the homework. Don't try to do most of your learning while doing the homework. That will result in shallow learning and the homework taking longer than it needs to.**

Text:

Required: Cliff T. Ragsdale's *Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Business Analytics, 8th edition*, which you can order from Cengage. You can get by with the 6th or 7th editions, although the text does evolve and problem numbering changes, so be careful about that.

I supplement Ragsdale's text with some of additional chapters that I wrote. 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.

Canvas:

Canvas will be used extensively for distributing course materials, posting videos, conducting discussions (some graded), submitting homework and exams, etc. You should monitor it daily.

<u>Piazza:</u>
This term we will use Piazza for class discussion other than the graded discussion posts (explained below). The system is designed to get you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions to the teaching staff, I encourage you to post your questions on Piazza.

Find our class page at: https://piazza.com/cmu/spring2021/90760
The passcode is 752956109

<u>Recitations:</u>
The midterm will be given during Friday recitation on April 23rd so attendance that day is required. (No makeup exams will be given. If you miss a test, you will receive a zero.) The remaining Friday recitations are recommended but not graded or required.

I will also hold optional problem-solving recitations on Monday & Wednesday 11:45 AM – 1:15 PM. I will field general questions and work end of chapter problems, typically at a slower pace than material is covered in class.

<u>Grading</u>:
Homework (20%), AWGs (15%), Canvas discussions (15%), 35-minute midterm exam on April 23rd (15%), final exam during final exams week (35%).

I will drop one (the lowest) of the five homework grades and one (the lowest) AWG to allow for all manner of external challenges including illness, family obligations, job interviews, etc. **You do not need to tell me about those circumstances; the drop will be automatic. I will not drop more than one**.

I have not worked out yet exactly when the AWGs will be. Most likely it will be five, but whatever the N, your grade is based on the best N-1 of those.

Homework will be submitted online via Gradescope. Late assignments will not be accepted and will receive a 0.

All but one HW will be due on Wednesday evenings at 10 PM, except HW #3 will be due Sunday April 18th also at 10 PM (both so there is time to study from the solution before the midterm and because there is no HW due the preceding week).

The HW can be done individually but I suggest working in groups of two to four (max), and homework group members do not all need to be in the same course section. 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, come directly to me if you have any concerns about the grading of an exam problem.

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
I will record the Zoom sessions and post those videos to Canvas, but you may not record them privately unless you have a disability accommodation that permits it; some people are personally or culturally uncomfortable with being recorded and I do not want to suppress free participation.