Course Syllabus

MISM 95.760: Decision Making Under Uncertainty, Fall 2021 mini 1 sections A1 and B2

Important Information:

- There are two sections: TuTh 8:35am-9:55am, and TuTh 1:25pm-2:45pm. You may attend either lecture (either in-person or remotely via zoom), or you can watch the recording; attendance is encouraged but not required. NOTE: If there are not enough seats in the classroom for everyone who wants to attend, we will ask anyone who is from the other section to attend remotely via zoom.

- The midterm and final exams will be given on **Friday Sept 24** and **Friday Oct 15,** both at **1:25-2:45pm,** and both in **HBH A301.** This is the normal time and location for the review session. For now, the exams are **in-person only**. **You must attend on these days so that you can take the midterm and final.**

- The remaining review sessions are optional (and will be on zoom/recorded):
  - Sept 3: Review of linear programming
  - Sept 10: Review of network flow problems
  - Oct 1: Review of integer programs
  - Oct 8: Review of simulation

Instructor: David Choi, davidch@andrew.cmu.edu,
Office hours: Tu Th, 10am-10:30am, and Tu Th 2:45pm-3:15pm, either in person in conference room 2118F, or via zoom.

For quick questions, by far the best time to ask will right after each class (or even better, during class if your question is about the lecture material!)

Co-instructor: Kai Wang, wangk@andrew.cmu.edu
Office hours: Fri 3-4pm, HBH 2118F
Leading review session on Oct 8

Teaching Assistants
Qifan (Sky) Zhang, qifanz@andrew.cmu.edu
Office hours: Tue, 5-6pm, on zoom: https://cmu.zoom.us/my/skyzhangsix
Leading review sessions on Sept 3 and Oct 1

Xiaobing Su, xiaobing@andrew.cmu.edu
Office hours: Wed 4-5pm, HBH1109
Leading review session on Sept 10

Graders
Tess Niewood, tniewood@andrew.cmu.edu
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Office hours will begin in week 2, unless announced otherwise by the TA on canvas.

If there are any changes to the office hours schedule, we will post an announcement on canvas, and also a corrected version of the syllabus on canvas as well.

Course objectives:

1. Become facile with Excel. This helps you get a job.

2. Survey many optimization and decision science methods. This helps you hire consultants intelligently, should you need to.
3. Learn some analytical methods. This helps you solve smaller problems yourself.
4. Learn how to make a mathematical model. This helps you think clearly and precisely.

All skills will be assessed by your performance on the homework sets and exams

Course Materials, Textbook: *Spreadsheet Modeling and Decision Analysis*, by Cliff T. Ragsdale, 6th edition or 7th edition

The numbering of the homework problems may change slightly (i.e., if we ask you to do problem #23 in the 6th edition, it may be #25 in the 7th), and we will include enough information in the homework handout for you to find the correct problem in either edition.

We are currently working on making copies (may be physical or digital) of the textbook available on reserve at the library

Other Course Materials: The last unit of the course uses Analytic solver, a plug-in for excel which has been installed within excel on the Heinz virtual lab (or vlab?). You will need to log in remotely to access this software. (If you are not a student in Heinz college, you may need to ask Heinz IT staff for access)

Instructions at: https://www.heinz.cmu.edu/current-students/computing-services/virtual-labs

Or just log in: https://virtual.andrew.cmu.edu/

(After you log in, you will have a choice of servers – select "Heinz vlab" and then when you access excel it should have Analytic solver already installed. You can upload or download files by emailing them to yourself through web-based email such as gmail)

Homework: There will be 4 homeworks.

Homeworks should be submitted electronically, via canvas. Submit a single PDF file. Many of the problems will require you to construct a spreadsheet. In these cases, you should copy a screenshot of the spreadsheet into the PDF that you submit, and also document the formulas that you used (there will be examples you can follow). If you need to draw a picture, you can draw it by hand, and then either scan or take a picture of it, and copy it into the PDF that you submit.

Homeworks can be done in groups of up to 4 students, if desired. The homeworks are probably too long to finish in a single group meeting. However, we strongly discourage you from dividing the homework between group members, so that each member does only 25% of the homework, as you probably will do much worse on the exams this way. A better strategy would be to attempt each problem on your own, asking group members for help whenever needed, and then compare answers to understand any differences that arise.

Exams: Exams will be pencil and paper, in-person, closed notes/closed books/closed computer. We will give you a formula sheet to print out, and you can add your own handwritten formulas to the sheet as well. Seating will be randomized. Exams are done individually (not in groups).

You should expect the exams to test your mathematical knowledge using pencil and paper, while the homeworks will test your ability to implement solutions on a computer. These are complementary skills and both are important. Expect at least one of the questions on each exam to be conceptually challenging in that you won't be able to simply follow recipes from lecture. Instead, you will need to think about why the question is a little different and decide how to adapt what you have learned.

Final Grades: HW, quizzes, and exam scores will be combined with the following weights:

HW: 40%
Midterm: 25%
Final exam: 35%

Grades will be curved to conform to Heinz college standards. Typically, the curve results in most of the grades being roughly evenly divided between A, A-, B+, and B, with a few exceptions (both high and low). However, performance of past classes may not be predictive of future ones!

Attendance: There are two sections (TuTh 8:35am-9:55am, and TuTh 1:25pm-2:45pm). You may attend either lecture (either in-person or remotely via zoom), or watch the recording. Attendance is not required, nor part of your final grade. However, the course moves quickly and it can be hard to catch up if you fall behind.

Email Policy: Please cc the TAs on any email that you send to me, especially for questions regarding how the HW was/will be graded. The TAs (who are grading the HWs) will be more knowledgeable than I will be on this issue.

Academic Integrity:

The rules and the academic integrity standards outlined in your student handbook will be strictly enforced. Violations of these rules or standards are considered a fundamental breach of trust and will result in failure of the course.

Collaboration on homework is not permitted in this class. Cheating will be treated very seriously. **You should only take credit for work which you have done yourself – always cite your sources (including webpages) and give credit where credit is due.** In the working world, managers who steal credit for the work of others or the ideas of others are a serious problem to the morale and health of a company, and the pressure to do so will be much higher than it is here.

The following are OK:

1. Discussing the requirements of a homework problem as long as no specific solution is discussed
2. Discussing general approaches to solving a problem as long as no specific solution is discussed
3. Using Excel samples from the textbook and class handouts.

The following are considered cheating (except with people in your own group on group assignments)

1. Discussing specific math or Excel formulations
2. Showing anyone your Excel spreadsheet
3. Looking at anyone else's Excel spreadsheet
4. Having anyone else produce an Excel spreadsheet for you
5. Having anyone else correct your Excel spreadsheet for you
6. Copying any Excel spreadsheet you find on the web
7. Using solutions from past courses or the solutions manual

You are not permitted to be in possession of any assignments, quizzes or exercises from another student either from the current semester or from past semesters whether they are electronic or paper. Possession of or sharing such files constitutes an infraction of the academic integrity policies of this course.

The midterm and final exams must be done alone, with no help from others.

There are unscrupulous book sellers on the Internet who will sell you a copy of the Solutions Manual for our text book. This is illegal in the U.S., and our book publisher actively seeks out, and sues, such vendors and sometimes those who buy these illegal books. I cannot prevent you from buying an illegal book. However, using such a book usually results in great homework scores and really bad exam scores. Since the

exam scores are much more heavily weighted in this course, your best plan for a good final grade is to work all of the homework problems yourself. Also, there are often errors in the solutions manual, some of them placed there on purpose by the author, "designed" to let us discover who is cheating in this way.

Schedule of topics:

Week 1:
Lec 1: Linear optimization
Lec 2: Linear optimization
Friday: Review session on linear optimization

Week 2:
Reminder: HW 1 (linear optimization) due 6pm EST Thu on canvas
Lec 1: Network Flow Problems
Lec 2: Network Flow Problems
Friday: Review session on network flow problems

Week 3:
Reminder: HW 2 (network flow problems) due 6pm EST Thu on canvas
Lec 1: case study and 2-stage (or stochastic) LPs
Lec 2: Review for midterm
Friday: no review session

Week 4:
Lec 1: Integer Programs
Lec 2: Integer Programs
Friday: **midterm: covers weeks 1-3 (Linear Optimization, Network flow models, and 2-stage LPs)**

Week 5:
Lec 1: finish and "review session" for Integer Programs
Lec 2: Simulation
Friday: Review session on integer programs

Week 6:
Reminder: HW 3 (integer programming) due 6pm EST Tue on canvas
Lec 1: Simulation
Lec 2: Simulation (if necessary)
Friday: Review session on simulation

Week 7:
Reminder: HW 4 (simulation) due 6pm EST Tue on canvas
Lec 1: Review for Final Exam
Friday: **final exam: covers weeks 3-7 (2-stage LPs, Integer Programs, and Simulation)**