Decision Making Under Uncertainty
Spring Mini IV 2016, Pittsburgh

This is essentially a first course in Management Science or Operations research, but with a twist. In this course we will spend some time (1/5? 1/4? 1/3?) on the programming language that accompanies Excel: Visual Basic for Application (a.k.a. VBA). MISM students have already had a good dose of programming in Java (and perhaps other languages as well), so I feel that learning a language as basic as...Basic should be easy and hopefully enjoyable. Given that VBA is tightly coupled to the spreadsheet Excel (which itself is a major thrust of a modern DMUU course), seems all the more reason to look carefully at it. Most serious programmers tend to "look down" on VBA, sometimes for good reason, but I think you will find that it is a reasonably complete (non-object-oriented, but object-based) language worthy of a MISM student’s time.

First, a few specifics:

- Instructor: Stephen F. Roehrig
- Email: roehrig@andrew.cmu.edu
- Office: Hamburg Hall, 2101A
- Phone: (412) 268-8783
- Textbook:
  1. Spreadhseet Modeling and Decision Analysis, by Cliff T. Ragsdale, 7th edition. If you, or you and your friends, decide to buy the book, you should buy it ASAP. I know that MISM students tend not to buy books. But I suggest that if you buy even one book while you are a MISM student, this is the book you should buy!

The CMU bookstore may have copies available, possibly used copies of older editions. Older editions of the textbook are also suitable, but be sure to check the problems in the homework assignments to ensure you are solving the correct ones! The homework problem numbering will be from the 7th edition. Be warned!

- Classes will meet according to the schedule shown below, but there may be slight modifications. Any modifications will be announced to Blackboard. We have two sections (A and B), but I will consider them mostly indistinguishable. Thus I list topics and homework due dates that apply to both sections.
- Friday sessions: We generally won’t meet on Fridays, except for the quizzes and a make-up class when I have to be out of town. This time is reserved in case there is a special need; we might need it in case I need to be out of town, in which case I will hold a make-up lecture. Hold the Friday time on your schedule just in case.
• The quizzes and the final exam will be open book, open notes, and open computer. You will be expected to solve problems using Excel. You will probably want to have a copy of the book available when you take the quizzes/exam, so make provision for this. You will not be allowed to share books during these tests.

• Assignments, quizzes, and grading: There will be five homework assignments, two short quizzes, and a cumulative final exam. See the schedule below. The assignments and quizzes will constitute 50% of your grade. We will drop the single lowest of these seven scores. The final exam will count for 50% of your grade.

• Interaction with me: I want to be as responsive to you as possible. To this end, feel free to email me; I generally can respond quickly during my “business hours” (10:00 AM to 10:00 PM EDT), but surely within 24 hours maximum. Use the Blackboard system for communications that might be of interest to others, in particular, questions about the course material or homework. Email me with more personal business.

• In this course, you can work the homework problems in teams of up to three students, but no more than three. I won’t assign students to specific groups. You are on your own here. But your team can be smaller if you wish. Actually, I encourage you to work alone on the homework, you will learn more that way. Very few students take this advice, I’m afraid...

• Course goals, in increasing order of importance:
  – Become facile with Excel. This helps you get a job.
  – Survey many decision science methods. This helps you hire consultants intelligently, should you need to.
  – Learn some analytical methods. This helps you solve smaller problems yourself.
  – Learn how to model (mathematically). This helps you think rigorously. This is the most important goal.

A word about cheating: Just don’t do it. Please. It’s not worth it. 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 between homework teams is not permitted in this class. Cheating will be treated very seriously. The following are OK:

• Discussing the requirements of a homework problem as long as no specific solution is discussed.

• Discussing general approaches to solving a problem as long as no specific solution is discussed.
• Using Excel samples from the textbook and class handouts.

The following are considered cheating:

• Discussing specific math or Excel formulations

• Showing anyone your Excel spreadsheet

• Looking at anyone else’s Excel spreadsheet

• Having anyone else produce an Excel spreadsheet for you

• Having anyone else correct your Excel spreadsheet for you

• Copying any Excel spreadsheet you find on the Web

• Using any problem solution from a previous version of this course, or similar courses given at Heinz (or worldwide!).

A student who shares a solution with another student (in a different homework team) will be treated the same as the person who does the copying. That is, everyone in both groups will fail the course. Keep your own work safe.

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.

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 course 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. Be careful!

The TAs and I will be actively looking for cheating. You are in America, so will will strictly follow the American standards in this course. If you have any questions, please ask them immediately.
Week 1: Week of Mar. 15. No class on Friday, March 18.

- Topics: Introduction to modeling, introduction to linear optimization.
- Reading: Ragsdale chapter “Introduction to Optimization and Linear Programming”.
- Class notes on Blackboard:
  - DMUULecture1.ppt
  - PortfolioSelectionAndSpringer.pdf
  - VBA Basics.ppt
- Homework 1 (see Blackboard) is due by 2:45 PM on Thursday, Mar. 26, in hardcopy, submitted to the cardboard box outside my office door.

Week 2: Week of Mar. 21. No class on Friday March 25.

- Topics: Solving LP problems in a spreadsheet, network models.
- Reading: Ragsdale chapters “Modeling and Solving LP Problems in a Spreadsheet” and “Network Modeling”.
- Class notes on Blackboard:
  - DMUULecture2.ppt
  - DMUULecture3.ppt
  - Acme.xls
  - BlueRidge.xls
  - Portfolio.xls
  - RentADent.xls
  - TacoViva.xls
  - Weedwacker.xls
  - VBAII.ppt
- Homework 2 (see Blackboard) is due by 2:45 PM on March 29, in hardcopy, submitted to the cardboard box outside my office door.

Week 3: Week of March 28. No class on Friday April 1.

- Topics: Network problems in spatial analysis, and LP sensitivity analysis.
- Reading: “Network Problems in Spatial Analysis” by Jon Caulkins (of Heinz College), see Blackboard.
- Class notes on Blackboard:
  - DMUULecture3.ppt
• Short video: http://www.youtube.com/watch?v=dAyDi1aa40E&feature=related
• No homework this week.

**Week 4:** Week of April 4. No class on Friday, April 8.

• Topics: Forecasting
• Reading: Ragsdale chapter “Time Series Forecasting”.
• Class notes on Blackboard:
  - DMUULecture4.ppt
  - ElectraCity.xls
  - AnnualSales.xls
  - SCCAdditive.xls
  - WaterCraftDMA.xls
  - WaterCraftDataSeasonalRegression.xls
• Homework 3 (see Blackboard) is due by 2:45 PM on Apr. 14, in hardcopy, submitted to the cardboard box outside my office door.

**Week 5:** Week of April 11. There will be a quiz on Friday, April 15 at 3:00 PM in HbH 1000. Bring your laptop. More details as the time approaches.

• Topics: Queuing theory, simulation
• Reading: Ragsdale chapter “Queuing Theory”, Ragsdale chapter “Introduction to Simulation Using Risk solver Platform”. We will use the MISM-designed software Mi SIM for simulation.
• Download this from GitHub: /tt https://github.com/santhosh-kasa/MiSim/tree/327ccd00e7af634aba756cc33a678abd7497b28c

Class notes on Blackboard:

• DMUUQueuingTheory.ppt
• Fig13-3.xls
• Fig13-4.xls
• Q.xls
• Fig13-21.xls
• DMUUSimulation.ppt
• the following need to be re-worked to use Mi SIM
• DistributionExamples.xls
• SkiApparel.xls
• CallOption.xls
• MCC1.xls
• YakLineDeterministic.xls
• YakLineStochastic.xls
• Homework 4 (see Blackboard) is due by 2:45 PM on Apr. 23, in hardcopy, submitted to the cardboard box outside my office door.

**Week 6**: Week of April 18. There will be a quiz on Friday, April 30 at 3:00 PM in HbH 1000. Bring your laptop. More details as the time approaches. Topics:

- Integer optimization
- heuristics and biases in decision making
- Discriminant Analysis
- Reading: Ragsdale chapter “Integer Linear Programming”, also a handout, and
- Ragsdale chapter "Discriminant Analysis"

Class notes on Blackboard:

- DMUUIntegerLinearProgramming.ppt
- DMUU Heuristics and Biases.ppt
- Discriminant Analysis.ppt

Final homework: (see Blackboard) Due on April 28. Build a complete Excel/VBA application for Discriminant Analysis, details forthcoming.

**Week 7**: Week of April 27. Catch up, goal programming, other topics TBA.

- Topics: TBA.
- Reading: TBA.

Final Exam

- The final exam will be given at 10:00 am on May 4. Please do not book any airline flights before this date.
- There will **not** be any alternate dates for this exam.
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