



Spring 2018 Graduate Course

OR531

Analytics for Decision Analysis

Monday: 4:30 – 7:10pm, Founders Hall 210

Syllabus

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Office hours: By appointment

Overview

Greetings! I'm excited to offer this course on analytics for decision analysis. This course is designed to provide a solid grounding in the theory and practice of modeling using the most common tools available: Microsoft Excel spreadsheets.

Unlike other, more complicated methods such as system dynamics models or discrete-event simulations, spreadsheets are often believed to be simplistic in their ability to support decisions for a large enterprise. In reality, you will learn that most important analytic methods can be implemented in a spreadsheet. There are drawbacks, of course. Spreadsheets become unwieldy with large data sets. And, even if a spreadsheet can handle the data (Excel worksheets have 1,000,000 lines by default!), the process of manipulating, visualizing, and evaluating the data can become quite cumbersome. This creates a market for large-scale statistical packages (SAS, SPSS, MiniTab, S-plus, etc.) in the commercial and government sector and purpose-built open-source statistical software (R) in the academic world.

Excel has one advantage over the purpose-built analytic packages, however: it is installed on every computer that has Microsoft Office. Thus, every laptop and desktop across the institution can load and manipulate an analytic program in Excel. And, even if an enterprise has licensed the large-scale packages, the licenses may be limited and may not be available to you as an analyst in a reasonable time frame. An answer to the decision-maker's question is far more valuable before the decision than after it!

The focus of this course is the *decision*. It is important to understand, even in the field of data analysis and data engineering, that the underlying purpose of advanced data analytic techniques is to support and justify a decision. Many practitioners of data analysis lose sight of this endgame. Every problem we will work will be focused on the allocation of resources or some other important decision that might be experienced in the course of business, industry, or government operations. Some examples are:

- If I'm offered additional resources, how much should I pay for them?
- What is the mix of production decisions that maximizes profit?
- What sequence should I use for a multi-step process?
- How much should I save to ensure an 80% chance of having a set sum at retirement?

I will also expect you to do more than Excel calculations. In order to receive proper credit, you will need to properly interpret your results. You can help yourself by re-reading the question before you submit your answer. Otherwise, I have no confidence that you understood the purpose for the calculation or the model.

Issues

Modeling and Software. This is a course in which you will practice building a variety of models in Excel spreadsheets. I will present various data sets and ask you to use these to answer questions that are highly typical of managerial problems. In the past, answering these questions required several courses in theory and extensive mathematical treatment. Nowadays, software (when properly applied!) can provide a short cut to getting the answers.

We will also be using a student edition of an Excel-based analytic package called *Analytic Solver Platform for Education* or *ASPE*. Note that this is often referred to by the name of the commercial products, *Analytic Solver Platform* or *Risk Solver*. The two packages are slightly different, and you will be working with the educational trial version of the Analytic Solver package. NOTE: FOLLOW THE

DIRECTIONS CAREFULLY IN INSTALLING THE SOFTWARE. I have learned from experience that getting the wrong “trial version” is a complicated error to recover from!

You should also know that Analytic Solver is not the only data manipulation package. Your company might have licensed software from other vendors (MATLAB, SAS, or SPSS are common), or the company may have developed some of these analytic capabilities in a home-grown application. The *techniques*, however, remain universal.

Textbook. I will use *Business Analytics, The Art of Modeling with Spreadsheets, 5th Edition*, (2017) by Stephen Powell and Kenneth Baker. You will need to purchase a copy of the book in order to get the software codes to install ASPE. If you have access to the fourth edition, the problems and software remain the same, but the page numbers are different.

Course Organization and Grading

Students are expected to keep up with all assigned readings in advance of classroom discussions, and to explore the example problems before the class. Only when you work through the problems, view the videos, and experiment with your hands on the keyboard will you discover misunderstandings and mistakes.

There will be eight projects assigned during the course. You will have three weeks from the assignment date to complete the project. They are due in Blackboard by midnight on the class day (Monday). The projects count for eight points each, and the lowest grade will be dropped. An optional project will be available in the last two weeks, and can be used to replace your next lowest grade.

Points for projects: 56.

There will be a *mid-term exam* (16 points) and a *final exam* (28 points).

A *final exam* will be administered on the scheduled final exam day (May 14).

Resubmission. I will look at any homework you have submitted ahead of the due date and correct it. I will offer some comments and try to guide you to a solution. You are welcome to resubmit the homework prior to the due date for a grade up to full credit. After the due date, I will comment on your homework and guide you to the right answer, but you can't improve your grade. Late homework will lose a half-point a week.

Communication

I plan to make use of Blackboard for this course. About 70% of Mason's courses use Blackboard to communicate academically. This number is likely to grow as more features are added. Please post your assignments to Blackboard and submit the final project documentation there as well. You will also be able to view interim and final grades (yours, of course!).

Inclement Weather

The university will not reschedule a class if only one class session is missed due to snow. But, if more than one session is canceled, the university typically extends final week. This can be very disruptive: in the spring of 2014 the university was holding final exams on the day before graduation!

I plan to avoid this mess by using the Blackboard 'collaborate' option. I will attempt to create a session on line and work through the problems assigned for that course. Your audio will be conferenced in, you will see my screen. I will record the session so that you can view it later. This is not ideal, but it keeps us from being forced into make-up sessions.

Academic Honesty and Collaboration

The integrity of the University community is affected by the individual choices made by each of us. GMU has an Honor Code with clear guidelines regarding academic integrity. *Unless otherwise noted, all assignments are to be completed on an individual basis, with no communication or discussion with any member of the class, or anyone else, other than the instructor or the teaching assistant.*

This course presents unique challenges for students to maintain academic integrity. You must learn to set up the problem, solve it, and interpret the results on your own. I need to be certain that I am grading you on your own work, and not the work of others in the class, tutors, friends, and colleagues. The limits of collaboration apply to the eight problems assigned. In the book there are dozens of problems that require the use of the same techniques, and you are free to work those in collaboration. Likewise, a tutor can help you with problems similar to the homework. To be clear: *it is a violation of academic integrity to ask a tutor to solve the homework problem.* Both the student and the tutor will be found in violation of the Honor Code.

Our grading process is designed to help you with this. You can submit your "best guess" for the homework at any time, and I or the TA will guide you to the correct solution. You can resubmit many times before the deadline with no penalty.

You are reminded that the exams are proctored in the classroom. Thus, you should be using the homework problems to understand how to set up and solve these problems so that you can do so on the day of the exam.

Privacy Restrictions

The university, in order to conform to the requirements of federal law (FERPA), now requires that all communications with respect to an academic course be conducted *to and from a George Mason e-mail account.* Thus, I must ask that if you send me an e-mail, you send it from your GMU account. This can be done via the web-mail application. I will try to observe this policy as well.

Disability Statement

If you are a student with a disability and you need academic accommodations, please contact the Office of Disability Services (993-2474; <http://www.gmu.edu/student/drc/>). All academic accommodations must be arranged through the ODS.