The University of Chicago
Booth School of Business
36106 Managerial Decision Modeling
Winter, 2013 (Version October 19, 2014)

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Office Hours: Monday 1:30 PM - 3:00 PM, Tuesday 1:45-2:30 PM or by appointment.

Chalk Website: https://chalk.uchicago.edu/
Course Website: http://faculty.chicagobooth.edu/kipp.martin/root/htmls/coursework/36106/36106.html

Required Reading


2. Course Packet. See the XanEdu Course Pack link at the Chalk Site.

Required Software


2. The Palisade Corporation product DecisionTools Suite. This includes the Excel add-ins: Precision Tree, @RISK, and RiskOptimizer. See http://www.palisade.com/academic/students.asp. The cost is $50 for a one-year license. This software may prove useful in other Booth courses.
Hardware and Software Issues

1. You must have a laptop for this course. It is essential to bring your laptop to class every week.

2. As a Mac lover and user, I find this bullet point painful. You must be Windows compatible. The Decision Tools Suite is not compatible with the Mac version of Microsoft Office. If you are a Mac user I recommend installing and using VMWare Fusion. I do not own a Windows machine and I use VMWare Fusion to develop the cases and examples for this class. Therefore Mac users should be safe with this option.

Course Learning Objectives

1. Learn how to structure decision problems. In industry many extremely important decisions are made without clearly identifying the decision alternatives and relevant costs. In this class we will learn how to add structure to a problem by clearly identifying relevant variables, parameters, and sources of uncertainty.

2. Learn how to move from structuring a problem to actually building a mathematical model. Identifying the relevant variables, parameters, and sources of uncertainty is critical, but once this is done it is necessary to put this structure into an appropriate mathematical model. In this class we will learn about optimization models, decision tree models, and simulation models.

3. Learn how to incorporate uncertainty into the model. Virtually every decision problem involves uncertainty to some degree. It is important to understand which parameters can be treated as deterministic and which must be modeled using stochastic tools.

4. Learn how to analyze the model solution. Examine how robust the solution is, and how sensitive the results are to the model inputs.

5. Learn to use Microsoft Excel as the platform for model building, solution, and analysis. Microsoft Excel is one of the most widely used modeling and data analysis tools. In addition to standard Excel tools such as Goal Seek and Data Table, you will use learn to use important Excel add ons such as Solver, Precision Tree, @RISK, and RiskOptimizer. These tools can also be used in other Booth classes.
6. Learn how to apply spreadsheet modeling to important application areas such as finance, resource allocation, risk analysis, operations, marketing, and economics.

Midterm and Final Review Sessions

1. Saturday, February 9: 1:00-3:00 PM, Harper Center C04
2. Monday, February 11: 6:00-8:00 PM, Gleacher Center 422
3. Saturday, March 16: 1:00-3:00 PM, Harper Center C04
4. Monday, March 18: 6:00-8:00 PM, Gleacher Center 422

Course Prerequisites

Previous or concurrent exposure to statistics at the level of 41000, to financial accounting at the level of 30000, and microeconomics at the level of 33001 is helpful, but not required. Although the example models discussed in this class cross many functions of business, little background in those areas is required. Some basic financial and statistical concepts such as NPV (Net Present Value), mean/variance of random variables, cash flow and income statement, etc. are used in examples and assignment problems in the class. I will briefly review these concepts when necessary, and more importantly, I will demonstrate how these concepts are used in Excel. If you are not familiar with these concepts, you must be willing to put in extra effort.

I assume that you have some familiarity with Excel 2010. However, one does not have to be an Excel expert to benefit from the course. Knowing how to enter and copy simple formulas involving relative and absolute cell addresses, how to use general-purpose Excel functions (for example, the If() function) and how to draw different types of graphs in Excel is sufficient. To insure that your Excel skills are sufficient for the class, please review the following chapters in the Powell and Baker textbook before the first day of class. I will also cover some of this material in class (especially Chapter 5) throughout the quarter.

Review Material from Powell and Baker:

- Chapter 3
- Chapter 4, Sections 4.1-4.6
• Chapter 5 (actually, not really review, we will cover “spreadsheet engineering” throughout the quarter)

Reading Outline

Week 1 (January 9) Course policies, followed by a course overview and discussion of course relevance. Introduction to Spreadsheet Modeling. Introduction to Optimization.

• Spreadsheet engineering
• Excel Scenario Manager
• Breakeven analysis and Excel Goal Seek
• Excel Data Table
• NPV
• Josh Hamilton the 125 million dollar man
• Install Solver
• Introduction to Optimization

Reading (for class):
• Chapter 1, Sections 1.1-1.3
• Chapter 2, Sections 2.1-2.2
• Chapter 6, Section 6.3.2, Sections 6.4-6.6
• Chapter 11, Sections 11.1 and 11.2

Week 2 (January 16) Linear Optimization Models

• Cash Flow Matching
• Resource Allocation
• Sensitivity Analysis
Reading: Chapter 11, Sections 11.3-11.6, 11.8, Appendix 11.1

Week 3 (January 23) Network and Integer Programming Models

- Network Flow Models
- Supply Chain Management
- Integer Programming Models

Reading:

- Chapter 12
- Chapter 13, Sections 13.1-13.3

Week 4 (January 30) Integer Programming Models Continued

- Facility Location
- St. Bernard Municipal Bond
- Bundle Pricing Models

Reading: Chapter 13, Sections 13.4-13.6

Week 5 (February 6) Nonlinear Models

- Basic concepts
- Portfolio optimization
- New product introduction
- Corporate Average Fuel Economy (CAFE) Regulations

Reading: Chapter 10.

Week 6 (February 13) Midterm Week

- Midterm Week

Week 7 (February 20) Sequential Decision Making under Uncertainty
• Install the Palisade Corporation product DecisionTools Suite.
• Decision Making under Uncertainty
• Sequential Decision Making
• “Decision Analysis” by George Wu

Reading:
• Chapter 15, Sections 15.1-15.6
• “Decision Analysis” by George Wu (See Packet)

Week 8 (February 27) Monte Carlo Simulation
• When are expected values sufficient in a spreadsheet?
• Using @RISK
• Generating distributions
• Option pricing
• Net present value revisited
• Risk management

Reading: Chapter 16

Week 9 (March 6) Monte Carlo Simulation Plus Optimization
• How to marry optimization with simulation

Reading: Chapter 17

Week 10 (March 13) VBA
• Incorporating VBA into the modeling process

Reading:
• Chapter 4, Section 4.7
• Handout
Homework Assignments

1. A hard copy of the homework is due at the start of the class on the homework due date.

2. An electronic copy of the homework must be submitted to the Chalk site a minimum of 15 minutes prior to the start of class.

3. No late homework is accepted. If you request to be exempt from this policy for any reason (other commitments, travel, broken Internet connection, crashed hard drive, etc.) I will reply with the email: “I realize this is going to make you understandably unhappy, but I have to establish a deadline and I have to treat everyone the same regardless of reason for homework being submitted late. Unless the deadline is enforced then it becomes meaningless. In other words, no.”

4. Group work is encouraged. You may work in a group up to size four. You may form a group across sections. However, assignments must be turned in for the afternoon session (section 01) if any group members are in the afternoon section.

5. You may not discuss the homework assignment with anyone not in your group. You may not transmit any written or electronic information to other students not in your group.

Grading

There is a midterm, homework sets, and a final exam. These components have the following weights.

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Midterm</td>
<td>30%</td>
</tr>
<tr>
<td>Homework</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>40%</td>
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</tbody>
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The midterm will be given in Week 6 (Wednesday, February 13, 2013). The midterm will be given in the first half of the class. The final exam is Wednesday, March 20 from 11:30 AM - 2:30 PM for Section 01 and Wednesday, March 20, 6:30-9:30 PM for Section 81.

The exams are closed book. You may bring one page (front and back) of notes for the midterm. You may bring two pages (front and back) of notes for the final. Please do not ask to have the midterm rescheduled
or taken at another time. You may not take the midterm later in the class period. You must take the midterm promptly at the beginning of class. If you miss the midterm the weight is added to the final (i.e. the final counts for 70% of your grade). I strongly suggest you do not miss the midterm. This is a very dangerous option.

**Attendance:** Class attendance is extremely important. To master the material and apply these techniques in the real world requires full participation in class and goes beyond what is covered in homework and exams. You are permitted to miss one class with no penalty. For each missed class thereafter you grade will be reduced by 2%.

Your grade is determined using the percentages given above and is final. There is no opportunity for extra credit projects, etc. for raising a grade you do not find satisfactory.

**Regrading Policy**

If you feel that your exam/homework was not graded correctly and wish to submit your work for regrading the following procedures must be followed.

1. All work must be submitted for regrading within two weeks from the date that it was returned.

2. You must indicate which questions you feel were graded incorrectly and clearly explain why you feel your answer is correct. This must be communicated in writing, not verbally.

3. Your entire exam/homework will be regraded with special emphasis on the questions you feel were not correctly graded. Thus, something that was overlooked before may now be discovered and your new adjusted score could be lower than before.

4. The amount of partial credit awarded on a question is a judgment call. As in baseball, judgment calls cannot be protested. Therefore you may not resubmit your work for the purpose of obtaining more partial credit.

**Other Issues:**

1. Students in this class are required to adhere to the standards of conduct in the Booth Honor Code and the Booth Standards of Scholarship. The Booth Honor Code also requires students to sign the following
Booth Honor Code pledge, “I pledge my honor that I have not violated the Honor Code during this examination,” on every examination and homework.

2. The Booth has established that the upper bound for a class grade point average is 3.33. Please note that this is an upper bound, not a lower bound. Many students expect this 3.33 to be a lower bound also. It is not in this class.

3. This course may not be taken pass/fail. Audits are not allowed.

4. I will address you by your first name, please feel free to address me by my first name. If you do not feel comfortable with that, Professor Martin also works.

5. Attending class is important. If you have to miss more than two classes you should consider taking this course when you have more time.

6. Provisional Grades: if you are graduating this quarter and are making reasonable progress, I will assign a D for an early grade. You are required to take the final exam. After you take the final exam, I will adjust your grade. If you are graduating early you must take the midterm.

7. You must attend the section for which you are registered. If an important conflict arises such as job interview, I will make an exception, but you must notify me ahead of time.

8. Yes, I know you want to start Spring break early. However, do not schedule a flight out of Chicago on or before the exam! You cannot take an early exam in order to start your Spring break early.

9. Material covered in Week 10 will be on the final exam. Week 10 is 10% of the quarter.

10. Cell and Smartphone Use: You are kidding me, right? Don’t even think about using one in class. Not once, not ever. Don’t check your voice mail, don’t text, and don’t do whatever else you can do with those crazy, idiotic, ridiculous devices! The best place for all mobile phones is at the bottom of Lake Michigan. Okay, got it, no ***** cell phones! Same thing for Blackberry, iPhone, Droid, and other similar devices.
Additional Reading

Title: Competing on Analytics: The New Science of Winning
Author: Thomas H. Davenport, Jeanne G. Harris
Edition: First edition
Publisher: Harvard Business School Press
ISBN: 978-1-4221-0332-6

Title: Super Crunchers: Why Thinking-by-Numbers is the New Way to be Smart
Author: Ian Ayres
Publisher: Bantam Books
ISBN: 978-055384734

Title: The Flaw of Averages: Why we Underestimate Risk in the Face of Uncertainty
Author: Sam Savage
Publisher: Wiley

Title: The Numerati
Author: Stephen Baker
Publisher: Houghton Mifflin Company
ISBN: 978-0-618-78460-8

Title: Microsoft Office Excel 2010: Data Analysis and Business Modeling
Author: Wayne L. Winston
Edition: Third edition
Publisher: Microsoft Press
ISBN: 978-0-7356-4366-9

Title: Financial Modeling
Author: Simon Benninga
Edition: Second Edition
Publisher: MIT Press
ISBN: 0-262-02482-9

Title: Practical Management Science
Author: Wayne Winston and S. Christian Albright
Edition: Fourth
Publisher: South-Western Cengage Learning