

**MGT 550F Critical Thinking Processes and Modeling  
for Effective Decision Making  
Spring 2010**

*Basic Course Information*

**Instructor Information**

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**Professor:** Tava Olsen (primary contact)  
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**Office:** Simon 232, 935-4732  
**Office Hours:** MW 1:30 – 2:30

**Professor:** Jackson Nickerson  
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**Office :** Simon 261, 935-6374

**TA Information**

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The TAs for the course and their contact information will be listed on Blackboard. Feel free to contact any of them for assistance. They are available for tutoring help on a time-available basis.

**Text Books**

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MGT 550F Course Packet

*Critical Thinking@Olin* Booklet, (you received a copy during the GO! Program)

*Smart Thinking for Crazy Times*, by I. Mitroff, available on Blackboard

*Management Science: The Art of Modeling with Spreadsheets (Second Edition, Excel 2007 Update)* by Steve Powell and Ken Baker

Note that we will be using the software from this text, while the readings from the first edition and the non-updated second edition are similar, you will need the updated software (that comes with the version of the text with the **green cover**).

**Handouts**

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The Blackboard site for the course will contain all handouts, which will also be handed out in class. There is no need to print the handouts ahead of class, although you may choose to print the slides in a larger format than the six slides per page format that will be handed out.

## **Help Sessions**

We have two optional weekly help sessions/labs scheduled for the course. They will be run by the TAs and will be held:

Thursday	4:00 – 5:30	room 104
	6:00 – 7:30	room 120

No lab will be held on 2/25 or 4/29.

The labs are designed to review material covered in class and give further hands-on experience with the class tools. Modeling exercises for the lab will be posted on Blackboard at least 24 hours in advance. Solutions will also be posted – it is recommended that you look at these *after* the lab.

Attendance at these lab sessions will be taken by the TAs and each lab attended will count as one “safety point” (see below). There is no penalty for not attending.

## **Course Background and Goals**

Critical thinking is the cornerstone of effective decision-making. This course will introduce students to a variety of tools that will enhance their critical thinking skills and ultimately their ability to make effective decisions. Students will gain practice in assessing critical thinking by others, which will help them develop a plan for ongoing advancement of their own critical thinking skills.

The course has the following objectives: (a) to introduce students to the science of fact based, data driven, decision making; (b) to expose students to different approaches, support tools, and analytical methods for decision making; (c) to enhance and reinforce students’ critical thinking skills and their ability to intelligently use information; (d) to develop, integrate and reinforce students’ modeling skills (often based on spreadsheet usage) by using such skills in a variety of decision-making-oriented applications; and (e) to introduce students to a process for team decision making. These objectives will be facilitated through the three key quantitative modeling tools taught in this course, which are:

- 1) Decision analysis;
- 2) Simulation for risk-analysis and modeling uncertainty; and
- 3) Optimization tools and constrained resource allocation.

We will review the eight elements of critical thinking and how these elements relate to various intellectual standards. Students will gain experience in the practice and process of critical thinking by discussing a variety of open-ended cases. In four of the sessions students will present their solutions to open-ended cases. Students also will review how to use decision maps to structure their thinking as well as learn to use tools that can assess the robustness of decisions.

Decision modeling is a core competency in today's competitive business environment. The course's specific quantitative modeling toolset is fundamental for the following reasons. Decision analysis allows students to make structured decisions, it promotes logical and analytic thinking, and it reinforces students' understanding of probability and randomness. Simulation is widely used in many fields such as operations and finance. Simulations are present as part of marketing analyses and behavior models. With the prominence of computers in today's society the current explosion in the use of simulation is only likely to increase. Finally, optimization is a key methodology that is now easily accessible through the use of Excel Solver. However, without understanding of what Solver's answers mean, students become extremely risky consumers of the software.

To be of value after graduation any tools introduced in the course must be widely accessible. Thus Excel and its add-ins are the primary application of choice. Students will be expected to build on tools learnt in the Excel boot camp taken prior to the first semester as well as being introduced to new techniques. However, not to be underemphasized is the importance of understanding what answers from said tools imply. Specific examples illustrating how such tools can be misused are given in the course. The course explicitly discusses when the tools can be relied on and when they cannot. It is not sufficient to just know how to use Excel Solver or run a simulation; a manager *must* understand what the answer means and what it does not mean (e.g., an optimal solution in Solver is a local optimum only and the output from a simulation is one sample only; the implications of not understanding these concepts can be vast).

## **Critical Thinking**

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Recruiter's most common criterion for evaluating MBA candidates is advanced skill in critical thinking. Moreover, advanced critical thinking skill is most commonly mentioned among the top three criteria by recruiters, often taking the top position.

*Critical thinking @ Olin* is designed to help you advance your skills so that you can compete with the most successful MBAs for top employment positions. Olin and its faculty create an environment in which you can learn content and advance your critical thinking skills. That said, critical thinking and its continuous advancement is your responsibility—not Olin's, not the faculty's responsibility. Elder and Paul (2006) assert that critical thinking is self-directed, self-disciplined, self-monitored, and self-corrective thinking.

## **Laptops**

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Many classes will contain exercises for you to do in class on your laptop. However, some students learn better without the distraction of a laptop and prefer to just sit and listen (trying out the tools learned in class at a later time). If your learning style fits this less active category then feel free to leave your laptop at home. If you have your laptop with you please only have it open if it is needed for the class material and always only have

course-relevant material open (no email or web checking please). You will need your laptop to complete in-class peer review exercises (see the syllabus for each day).

## **Required and Recommended Reading**

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Two types of reading will be assigned – required and recommended. It is expected that you will do the required reading *before* coming to class. Recommended reading will be assigned from the text and coursepack as background. It is not necessary to do this reading before class, rather it is provided as an added resource to explain the material covered in class. Some material will be covered in class that is not in the text so students are expected to get class notes from friends if classes are missed. Nothing that is not covered in class is examinable.

## **Safety Points**

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Throughout the term ten “safety points” will be available for students concerned about passing the class. These points will *only* be used to distinguish between P, LP, and NP (or between B/C/D for those on letter systems) so students who are not struggling should not worry about accumulating these points. These points come through attendance of the optional labs (see above).

## **Extra Credit**

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Throughout the term, forty points of extra credit will be available. This work is designed to extend students who find the course straightforward. It is not expected that students just interested in receiving a pass in the course will complete any of the extra credit work. The points will only be used to distinguish HP's from P's (and A's from B's).

Fifteen points of assignment extra credit will be assigned. This is individual work only. However, so that you don't feel like you need to complete it all, up to a maximum of ten points of this will count towards your final grade. The extra credit work will be of two sorts: theory exercises and more complex modeling exercises.

There will be a ten point extra credit question on both of the midterm and final exam, which will be necessary to attempt to receive a high pass in the course.

Groups will have the opportunity to earn up to ten points by writing a business case. The instructors will identify a company and a question. The completed case must be approved by faculty by the end of the semester and copyrights must be assigned to Olin.

Because the extra credit is designed to extend you, the TAs will not provide assistance on it. All questions should be directed to the instructor who will only provide limited help.

Students on A/B/C grading schemes should complete extra credit if they are interested in receiving an A of some kind.

## Course Outline

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<i>Class</i>	<i>Date</i>	<i>Instructor</i>	<i>Topic</i>	<i>Hand-in Due</i>
1	Jan. 19	Olsen	Introduction to course and modeling	
2	Jan. 21	Olsen	Critical thinking and decisions under uncertainty	
3	Jan. 26	Nickerson	Group decision making part 1	
4	Jan. 28	Nickerson	Group decision making part 2	
5	Feb. 2	Nickerson	Team modeling presentations	Group case
6	Feb. 4	Olsen	Decision trees	
7	Feb. 9	Olsen	Introduction to simulation	ICI case (group) Individual decision trees case
8	Feb. 11	Olsen	More simulation	
9	Feb. 16	Olsen	Sensitivity analysis; categories of spreadsheet analysis	Individual simulation case
10	Feb. 18	Olsen	Team modeling presentations/Spreadsheet design; verification and validation	MediDevice case (group)
11	Feb. 23	Olsen	Hedge case	Hedge case (group)
12	Feb. 25	Olsen	Simulation wrap-up; midterm review	
13	Mar. 23	Olsen	Introduction to optimization	
14	Mar. 25	Olsen	More optimization; formulation and modeling	
15	Mar. 30	Olsen	How solver works; more sensitivity analysis	Individual opt. assignment
16	Apr. 1	Olsen	Optimization wrap-up	
17	Apr. 6	Olsen	Team modeling presentations	Skiway case (group)
18	Apr. 8	Olsen	Optimization in simulation	
19	Apr. 13	Olsen	Optimization in simulation continued	Individual opt/sim assignment
20	Apr. 15	Olsen	Fitting distributions	
21	Apr. 20	Olsen	Casterbridge bank	Casterbridge bank (group)
22	Apr. 22	Olsen	Tool wrap-up	Individual distributions assignment
23	Apr. 27	Olsen	Team modeling presentations and discussion	Draft commercials (group)
24	Apr. 29	Olsen	Class wrap up – putting it all together	

More detailed information on each class is presented on the syllabus for that day, which can be found at the end of this document.

### **About the In-Class Participation**

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In-class participation requires you to be active and participate in class. Further, such participation should be value-added; adding noise but not content does not count for much, in fact it may negatively impact your grade. *You must display your name cards at each class so that the TAs and I can judge participation. Also, please raise your hand before speaking so that all students get a chance to participate.*

In addition to actively participating in class discussion, you will also be asked to present your models and question each other on your models. The TAs will help me judge class participation during these question sessions.

### **About the Assignments and Case Write-Ups**

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Assignments and case write-ups will be collected in class. Spreadsheets are to be posted to Blackboard. Because answers will be discussed in class, no late exercises or cases can be accepted. There will usually be one assignment or case write-up due per week but it may be due on a Tuesday or a Thursday and it may be individual or group.

The individual assignments are designed to be short exercises to gain practice in the course tools. These exercises are to be done on an individual basis only; however, discussion of the questions with the professor or TAs is allowed.

The ideal group size is four but the cases may be done in groups of between three and five people. Please hand in one write-up per group. Working in groups across sections is not acceptable.

We have a number of classes where groups will be asked to present their models (more details will be given with the case assignments). The case assignments due in these classes will be more open-ended and unstructured than the typical weekly assignments and case write-ups. You will be expected to question each other on your assumptions and models, and the TAs will help grade class participation in the question period.

It is a violation of the Olin code of conduct to consult solutions from previous semesters, to consult outside (e.g., internet) sources, or to work in groups larger than those specified.

Because much of the course evaluation is based on group work, you will be asked to provide individual evaluations of your teammates.

## About the Exams

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As most of the class is model-based, an in-class exam does not seem reasonable. Therefore, both the midterm and the final exam will be take-home exams. The midterm will be handed out on class 12 (2/25) and will be due after six days at noon on Wednesday 3/3. The final will be handed out on class 24 (4/29) and will also be due after six days, at noon on Wednesday 5/5.

Both exams are to be done purely individually and no discussion regarding them with *anyone* other than the professor is permitted. Note that six days is given for each, not because the exams are designed to take that long, but to provide you with flexibility in scheduling your exam around your other classes. You should feel free to hand your exam in early.

*Warning:* We take collaboration on final exams extremely seriously and will be unlikely to just issue a warning should we find evidence of it. Further, collaboration on open-ended modeling exams (as this class's will be) is remarkably easy to spot as every question has a multitude of different ways that it could be approached so it is *very* unlikely that two people will approach the problem in the same way without collaboration.

## Course Grades

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Course grades are determined from performance on individual assignments, group cases, in-class participation, and take-home midterm and final exams. The weights for each are as follows.

<i>Component</i>	<i>Weight (%)</i>	
Individual assignments	15	
Group cases	35	
In-class participation	15	
Midterm	15	
Final	20	
Extra credit	40	(see above)
Safety points	10	(see above)

## Grading Policy

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The TA's will do most of the grading. If you have any issues with how their grading is conducted then please see me as soon as possible. If you have a regrade that consists of a simple error (e.g., miscount, section not graded, etc.) then please submit your work to me as soon as possible. However, if you believe that the grading scheme is in error then

please submit your work along with a write-up of your reasoning as to why you believe you should have received points. Regrades must be received within two weeks of work having been handed back.

## **Learning Objectives**

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On each day's slides and Blackboard site the learning objectives for that day will be outlined. These are the skills you are expected to be able to complete in exams and after you finish this class. Note that exam questions could combine multiple learning objectives so you have to really understand what you are doing and why you are doing it.

## **Olin Honor Code**

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Students are expected to be familiar with and comply with the Olin Honor Code. Any violations of the code (e.g., collaboration on individual assignments, inappropriate internet use, or use of prior semester's material) will be treated very seriously.

### **Classroom Expectations for All Olin Courses**

- **Attendance:** You are expected to attend each class session. If you must miss a session for any reason you should make every effort to notify the professor prior to the class meeting.
- **Punctuality:** You are expected to arrive and be seated prior to the start of each class session. You should display your name cards in all classes at all times.
- **Behavior:** Classroom interaction will be conducted in a spirited manner, but always while displaying professional courtesy and personal respect.
- **Preparation:** You are expected to complete readings, case preparations and other assignments prior to each class session and be prepared to actively participate in discussion.
- **Distractions:**
  - *Exiting and Entering:* You are expected to remain in the classroom for the duration of the class session unless an urgent need arises or prior arrangements have been made with the professor.
  - *Laptop, PDA, and Other Electronic Device Usage:* You are expected to use laptops, PDAs, and other electronic devices only with the professor's consent and for activities directly related to the class session. Accessing e-mail or the Internet during class is not permitted as this can be distracting for peers and faculty.
  - *Cellular Phone and Pager Usage:* You are expected to keep their mobile phones and pagers turned off or have them set on silent/vibrate during class. Answering phones or pagers while class is in session is not permitted.

## **Tuesday, January 19 (Class 1)**

### **Topics/Activities**

Introduction to the course

Introduction to the science of decision-making

Introduction to the craft of modeling

### **Laptop Required?**

Yes

### **Software Installation**

Please install both Crystal Ball and the Premium Solver (in that order) from the text instructions prior to class. Please do not install the sensitivity toolkit at this time.

### **Required Reading**

The Rise of Strategic Analytics

Competing on Analytics

A Better Way to Size up Your Nest Egg

Just Modeling Through: A Rough Guide to Modeling

### **Recommended Reading**

Chapters 1 and 2 of Text

### **Hand-Ins Due**

None

## **Thursday, January 21 (Class 2)**

### **Topics/Activities**

Review of critical thinking elements and tools  
Spreadsheet design  
Analytic decision making  
Introduction to decision making under uncertainty  
Review of basic distributions

### **Laptop Required?**

Yes

### **Software Installation**

Please work with computer support to ensure that both Crystal Ball and Premium Solver are working on your laptop. After they are working, install the sensitivity toolkit.

### **Required Reading**

Making Better Decisions  
So You Want to Be a Decision Analyst

### **Recommended Reading**

Inside HP  
How Operations Research Drives Success at P&G  
Chapter 3 of Text  
Text Appendix

### **Hand-Ins Due**

None

## **Tuesday, January 26 (Class 3)**

### **Topics/Activities**

Group decision making with Professor Nickerson

### **Laptop Required?**

No

### **Required Reading**

Smart Thinking for Crazy Times: Chapters 1, 2, 3 (Available on Blackboard)

Case: Rennesen (Available on Blackboard)

### **Recommended Reading**

Smart Thinking for Crazy Times: Chapters 4-7 (Available on Blackboard)

### **Hand-Ins Due**

None

## **Thursday, January 28 (Class 4)**

### **Topics/Activities**

Group decision making with Professor Nickerson

### **Laptop Required?**

No

### **Required Reading**

A theory of strategic problem formulation (Available on Blackboard)

### **Recommended Reading**

None

### **Hand-Ins Due**

None

## **Tuesday, February 2 (Class 5)**

### **Topics/Activities**

Group presentations of group decisions case

### **Laptop Required?**

No

### **Required Reading**

None

### **Recommended Reading**

None

### **Hand-Ins Due**

Group decision making case

## **Thursday, February 4 (Class 6)**

### **Topics/Activities**

Tornado charts

Decision trees

### **Laptop Required?**

Yes

### **Required Reading**

None

### **Recommended Reading**

Decision Analysis reading from coursepack

Text Chapter 14

### **Hand-Ins Due**

None

## **Tuesday, February 9 (Class 7)**

### **Topics/Activities**

Research and Development at ICI: Anthraquinone case discussion  
Introduction to simulation

### **Laptop Required?**

Useful for following along with in-class demonstration

### **Required Reading**

Research and Development at ICI: Anthraquinone

### **Recommended Reading**

Text Sections 15.1 – 15.4  
Uncertainty and Risk Analysis reading from coursepack  
Crystal Ball Users' Manual from coursepack

### **Hand-Ins Due**

Individual decision trees exercise  
ICI Group case

## **Thursday, February 11 (Class 8)**

### **Topics/Activities**

Simulation continued

### **Laptop Required?**

Useful for in-class exercises

### **Required Reading**

None

### **Recommended Reading**

Text Sections 15.5 – 15.11

### **Hand-Ins Due**

None

## Tuesday, February 16 (Class 9)

### Topics/Activities

Sensitivity (what-if) analysis  
Types of spreadsheet analysis

### Laptop Required?

Useful for in-class exercises

### Required Reading

None

### Recommended Reading

Text Chapter 6

### Hand-Ins Due

Individual simulation exercise

## Thursday, February 18 (Class 10)

### Topics/Activities

Spreadsheet design  
Verification and validation  
MediDevice case presentations

### Laptop Required?

Yes

### Required Reading

MediDevice case  
"Spreadsheet Risk," *Harvard Business Review*

### Recommended Reading

Spreadsheet Errors: What We Know. What We Think We Can Do.  
The Secret of Accreditation  
Text Chapter 5

### Hand-Ins Due

MediDevice case write-up

## **Tuesday, February 23 (Class 11)**

### **Topics/Activities**

Hedge case discussion  
Decision variables  
CB Sensitivity Tables

### **Laptop Required?**

Useful for following along with in-class demonstration

### **Required Reading**

Hedge case

### **Recommended Reading**

Text Sections 16.1 – 16.2

### **Hand-Ins Due**

Hedge case

## **Thursday, February 25 (Class 12)**

### **Topics/Activities**

Simulation wrap-up  
Process/system/discrete event simulation

### **Laptop Required?**

Useful for in-class exercises

### **Required Reading**

None

### **Recommended Reading**

None

### **Hand-Ins Due**

Midterm exam distributed and due Wednesday Mar. 3 at noon

## **Tuesday, March 23 (Class 13)**

### **Topics/Activities**

Introduction to optimization

### **Laptop Required?**

Useful for following along with in-class demonstration

### **Required Reading**

Nissan drives down costs with optimization software - coursepack

### **Recommended Reading**

Text Chapter 10

### **Hand-Ins Due**

None

## **Thursday, March 25 (Class 14)**

### **Topics/Activities**

Optimization continued

Model formulation

Sensitivity analysis

### **Laptop Required?**

Useful for in-class exercises

### **Required Reading**

None

### **Recommended Reading**

Text Chapters 11, 13

### **Hand-Ins Due**

None

## **Tuesday, March 30 (Class 15)**

### **Topics/Activities**

Optimization exercise and reading discussion  
How does Solver work?

### **Laptop Required?**

Useful for in-class exercises

### **Required Reading**

None

### **Recommended Reading**

None

### **Hand-Ins Due**

Individual optimization exercises

## **Thursday, April 1 (Class 16)**

### **Topics/Activities**

Optimization wrap-up

### **Laptop Required?**

Useful for in-class exercises

### **Required Reading**

None

### **Recommended Reading**

None

### **Hand-Ins Due**

None

## **Tuesday, April 6 (Class 17)**

### **Topics/Activities**

Skiway case group presentations

### **Laptop Required?**

Yes

### **Required Reading**

Skiway case

### **Recommended Reading**

None

### **Hand-Ins Due**

Skiway case

## **Thursday, April 8 (Class 18)**

### **Topics/Activities**

Optimization in simulation using OptQuest

### **Laptop Required?**

Useful for in-class exercises

### **Required Reading**

None

### **Recommended Reading**

Text Sections 16.3 – 16.5

### **Hand-Ins Due**

None

## **Tuesday, April 13 (Class 19)**

### **Topics/Activities**

Optimization in simulation using OptQuest continued

### **Laptop Required?**

Useful for in-class exercises

### **Required Reading**

None

### **Recommended Reading**

None

### **Hand-Ins Due**

Individual optimization in simulation exercises

## **Thursday, April 15 (Class 20)**

### **Topics/Activities**

Fitting distributions

### **Laptop Required?**

Useful for in-class exercises

### **Required Reading**

None

### **Recommended Reading**

None

### **Hand-Ins Due**

None

## **Tuesday, April 20 (Class 21)**

### **Topics/Activities**

Casterbridge Bank case discussion  
Decision making summary

### **Laptop Required?**

Useful for following in-class demonstration

### **Required Reading**

Casterbridge Bank

### **Recommended Reading**

None

### **Hand-Ins Due**

Casterbridge bank

## **Thursday, April 22 (Class 22)**

### **Topics/Activities**

Tool wrap-up  
Excel macros

### **Laptop Required?**

Useful for in-class exercises

### **Required Reading**

Smart Thinking for Crazy Times: Chapters 4-7 (from Blackboard)

### **Recommended Reading**

None

### **Hand-Ins Due**

Individual distributions assignment

## **Tuesday, April 27 (Class 23)**

### **Topics/Activities**

Draft commercials group presentations

### **Laptop Required?**

Yes

### **Required Reading**

Draft commercials case

### **Recommended Reading**

None

### **Hand-Ins Due**

Draft commercials case write-up

## **Thursday, April 29 (Class 24)**

### **Topics/Activities**

Class wrap-up – putting it all together

### **Required Reading**

Making better decisions faster - Coursepack

### **Recommended Reading**

None

### **Hand-Ins Due**

None. Final exam handed out and due Wednesday May 5 at noon.

