

# 70-462: Stochastic Modeling and Simulation

Spring 2015  
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*Instructor:* John Gasper  
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*Course Time / Location:*  
Monday and Wednesday: CMUQ 2035

- Section W 15:00-16:20

*Office Hours:* Tuesday 2-4pm

In general, I have an open door policy: if my door is open and I'm not meeting with someone, you are welcome to come in and meet with me. If my door is closed, I am not available (out of the office, working, etc). On non-teaching days, I'm often quite busy with research and not available. I highly encourage you to **set up an appointment** to make sure I will be available.

*Required Materials:*

- *Applied Simulations Modeling* by Seila, Ceric, and Tadikamalla
- Various handouts given in class.

*Suggested Texts:*

- *Next Generation Excel* by Gottlieb (available in the CMUQ library)

## Course Description and Goals

This hands-on, application-driven, course on spreadsheet modeling and computer simulation of business, service, and manufacturing systems. We will take the perspective of a consultant whose job is to analyze stochastic decision problems by building a simulation model and using it to understand the behavior of the system and explore the effects of alternative decisions.

In the course we will develop models, both static and dynamic, that can be implemented as mathematical expressions in a spreadsheet. As such, we will be making extensive use of MS Excel and an add-in, @Risk from Palisade Corporation, to build and execute the spreadsheet simulations. Topics of the course will include simulation of cash flows, pro forma financial statements, project valuation, inventory analysis, and queueing models. Time permitting, we will also introduce Markov Chain models and introductory stochastic optimization.

Upon completion of the course students will be able to carry out the entire process of designing the model, implementing it as a spreadsheet model, executing the simulation, collecting and analyzing output data, and using the results of the analysis to evaluate alternative decisions.

## Attendance and participation

It is easy to take the attitude that your job (and mine) is accomplished with your mastery of the material of the course, and consequently that I need not bother with whether you show up for class. Realistically, we know that in general the vast majority of students who feel they don't need to come to class are mistaken, but only find that out, to their shock, as they do poorly on exams. *You learn these techniques by doing these techniques.* I will expect you in class and I expect you on time. This not an "easy" course and a large part of the lecture material will not come from the text. The exams will cover both sets of material.

I will also make an effort to get to know you. It is also fair to say that those who sit near the front and participate in class will get the benefit of the doubt when their grades are below a borderline. During the first week of class, I ask that you schedule an appointment with me and come by my office. On the second day of class I will pass around a sheet with available times. These meetings will probably only last about 10 minutes but I find them incredibly valuable. I feel that I can best present material to you only after I know about you.

## Cell phones and laptops

We will be in the computer lab the entire time this semester. However, that does not mean that you should feel free to use the computer for whatever you please (facebook, checking news, problem sets for other classes). This is disrespectful to me but more importantly to your fellow students. We'll be moving at a very fast pace and it's hard to concentrate and keep up if someone near you is doing something else.

I also ask that you turn off your cell phone during class. If there is an emergency and you might need to be contacted, please talk to me before class. Otherwise there should be

no reason to hear a phone ring or see someone send a text. Text messages and phone calls during class are very distracting and disrespectful to me and your other students. **If you are surfing the internet, texting, etc, during class you will be asked to leave.**

## Course Logistics

This course has both a Blackboard and a Piazza site. Both sites should set up and functioning. Handouts, problem sets, updated syllabi and announcements will be posted to Blackboard and you are responsible for checking the site regularly. I will maintain the Piazza discussion board. If you have any questions about the techniques, problem sets, etc, ask them on the discussion board. It has been my experience that one of the best ways to learn something is to try to explain it to someone else. So I will expect you to try to answer the questions that other students ask; doing so will aid the participation element of your grade, and, while unofficial, will aid you if you're near a borderline at the end of the semester.

I welcome questions during class: if you have a question or a comment, please let me know. I will generally pause after each slide and ask if there are any questions – please feel encouraged to raise questions during class. This will likely be a very small class. I would appreciate it if you feel comfortable interrupting me and asking questions as we go.

## Grades

Each student's grade for the course will be based on the following:

1. *Homework Exercises* 30% total
2. *Semester Exams* 20% each (total 40%)
3. *Final Project* 30%

The only way to learn the material is to do it. There will be roughly five to seven problem sets distributed over the course of the term. Each problem set will be worth an equal and substantial amount of the grade but they will vary in difficulty. In addition, there will be two take-home exams that will be given out during the semester. The exact timing of the take-home exams is currently in flux, but a rough schedule of these assignments and exams may be found on the last page of this document. Finally, there is a final project for this course instead of a final exam. You are encouraged to work with other students on the problem sets, but anything submitted for grading must be your own work and your own description of the results. The take home exams have a different policy than the problem sets; there should be no communication between students about the problem(s) on the exams although you may certainly ask me anything.

## Academic Integrity

You should feel encouraged to talk with your class mates about the problems on the problem sets, but do not copy even parts of someone else's work. ***While I highly encourage you to use the Piazza discussion site, if you speak with anyone else regarding the homework, I require that you list it.***

The CMU-Q policy on cheating and plagiarism has been updated and I would like to point out the following text: *In all academic work to be graded, the citation of all sources is required. When collaboration or assistance is permitted by the course instructor(s) or when a student uses the services provided by Academic Development, the Global Communication Center, and the Academic Resource Center (CMU-Q), the acknowledgement of any collaboration or assistance is likewise required. This citation and acknowledgement must be incorporated into the work submitted and not separately or at a later point in time. Failure to do so is dishonest and is subject to disciplinary action.*

I am very sensitive to cheating and plagiarism; my policy is that cheating of any kind will not be tolerated. My automatic penalty for any offense is a one letter grade reduction in your final course grade. If you have any doubt about your actions, please ask me. I strongly encourage you to review Carnegie Mellon's policies regarding academic integrity.

## Weekly readings and course outline

Class	Date	Topic	Assignment
1	12-Jan	Intro and Prob & Stats review	
2	14-Jan	Flaw of Averages	PS1 out
3	19-Jan	Excel Data Tables and Randomization	
4	21-Jan	RVs in Excel	PS1 due; PS 2 out
5	26-Jan	Correlated variables	
6	28-Jan	Statistical Analysis	PS2 due; PS3 out
7	2-Feb	Project management	
8	4-Feb	Project management	
9	9-Feb	Intro to @Risk	PS3 due; PS4 out
10	11-Feb	More @Risk	
11	16-Feb	Financial Statements	
12	18-Feb	Financial Statements	
13	23-Feb	Valuation	PS4 due; Exam out
14	25-Feb	EXAM	EXAM
X	2-Mar		
X	4-Mar		
15	9-Mar	Inventory Analysis	PS5 out
16	11-Mar	Inventory Analysis	
17	16-Mar	Inventory Analysis	
18	18-Mar	Inventory Analysis	
19	23-Mar	Inventory Analysis	
20	25-Mar	Queueing	PS5 due; PS6 out
21	30-Mar	Queueing	
22	1-Apr	Queueing	
24	6-Apr	Markov Chains	PS6 due ; PS7 out
25	8-Apr	Markov Chains	
26	13-Apr	Stochastic Optimization	
27	15-Apr	Stochastic Optimization	PS7 due; Exam out
28	20-Apr	EXAM	EXAM
29	22-Apr	Project Presentation	