IEMS 310 - Operations Research
Syllabus

FJM and ASB

Spring 2016

Course Description

Survey of operations research techniques using EXCEL. This course will focus on the use of mathematical models to support sound decision-making. We will explore a variety of model types, and spend much of our time talking about how to develop models, get solutions (usually through software), and interpret the solutions we obtain within the real worlds contexts that generate the models.

Instructors

- Francisco Jara-Moroni (FJM) ♦ franciscojaramoroni2013@u.northwestern.edu ♦ Tech L375
- Albert Berahas (ASB) ♦ albertberahas@u.northwestern.edu ♦ Tech L375

Class Time

- March 29 - June 4 ♦ Tuesday, Thursday ♦ 9:30AM - 10:50AM ♦ L251

Office Hours

- FJM ♦ Wednesdays ♦ 4:00-6:00PM ♦ M228
- ASB ♦ Mondays ♦ 4:00-6:00PM ♦ M228

Prerequisites

- Not open to Industrial Engineering and Management Sciences majors.
- May not be taken concurrently IEMS 313 or 315.
- Note: Students that have taken IEMS 313 or IEMS 315 will not get credit form taking IEMS 310.

Canvas

The following Canvas site will be used in this class:

`https://canvas.northwestern.edu/courses/35933`.

Make sure you familiarize yourself with this site. It will contain important course announcements, homework, project information and midterm and final material.

310 Topics

1. Optimization
   - Linear Programming
   - Integer Programming
   - Nonlinear Programming*
2. Network Models
3. Inventory Models
4. Markov Processes
5. Queuing Theory
6. Simulation
7. Decision Theory *
8. Game Theory *

* Time permitting, or by popular request.

Course Materials

There is **no** required book for this class. This class will be based on course notes. However, we suggest the following books as general guides to OR topics:

- Operations Research: Applications and Algorithms, 4^{th} Edition, Wayne Winston
- Operations Research: An Introduction, 9^{th} Edition, Hamdy Taha
- The Science of Decision Making: A Problem-Based Approach Using EXCEL, Eric V. Denardo

As aids to Linear Algebra and Probability & Statistics we suggest Chapters 2 and 12, respectively, from the Winston book. For further references we suggest:

- Linear Algebra and its Applications, 5^{th} Edition, David Lay, Steven Lay, Judi McDonald
- A first course of Probability and Statistics, 3^{th} Edition, Sheldon Ross
- Probability and Statistics for Engineers and Scientists, , 4^{th} Edition, Sheldon Ross

Grade Break-down

- Homework: 30%
- Midterm: 30%
- Final: 40%

- Attendance (bonus): 5%

Homework

- There will be weekly homework assignments (6-7).
- Assignments will involve paper-and-pencil problems and EXCEL problems.
- Homework is always due at the beginning of class (including online submissions).
- Lowest Homework grade will be dropped.
- Homework turned in up to 24 hours late will be accepted with a 25% penalty. No Homework will be accepted more than 24 hours after the deadline.

Midterm & Final

There will be a Midterm and a Final exam for this course.

- Midterm: **Wednesday May 4th** - 17:00-19:00
- Final: **Thursday June 9th** (Finals Week) - 12:00-14:00

Review sessions will be held before the Midterm and Final. Time and date TBD.

Attendance

Attending lecture is **not mandatory** but is **highly encouraged** and **will be rewarded**. Students that attend **more than 85%** of the class lectures will be awarded **a bonus of 5%** in their final grade for the course.

Computer Access

Early in the quarter you will be given access to Tech C135 (the IEMS computer lab). Although you will be able to complete your homework there, it is recommended that you have an alternative method for completing your homework, as the lab is often very crowded. You will be able to complete all homework with the use of Excel and other freely available software. More details will be provided in Canvas and in class.

Email

Please address all email queries to both instructors. You will usually receive a response within one day. **You must send all email from your northwestern.edu account with "IEMS 310" in the subject line** (otherwise it may be overlooked). Your **questions must be specific.** Questions like "How do I do problem xyz?" cannot be answered in any meaningful way. If you have questions about a homework problem, then discuss how you are approaching the problem or what you are thinking about. If you have no idea how to begin a problem, discuss how it is similar to or different from other problems done in class and what aspects of the problem are giving you the most difficulty. If you are asking a question about a spreadsheet model that you are building, please attach it to the message.

Regrade Policy

If you feel that an error has been made in grading one of your assignments, you may request a regrade. You must submit the original graded assignment, along with a written statement outlining the potential error, **within one week of it being returned**; this time-limit will be strictly enforced. You should only request a regrade if you gave an entirely correct answer that was marked entirely wrong, or a partially correct answer that was marked entirely wrong. Regrade requests that do not satisfy this criterion but merely ask for an increase in points awarded will not be considered. Understand that resubmitted assignments are subject to a regrade **in their entirety**, so a regrade may result in a lower score than the original. Be sure of the error—and work out how to articulate it—before asking for a regrade.

Students with Disabilities

Any student with a documented disability needing accommodations is requested to speak directly to the Office of Services for Students with Disabilities (SSD; 847-467-5530) and to the instructor as early as possible in the quarter (preferably within the first two weeks of class). All discussions will remain confidential.

Academic Integrity

Any violation of the Academic Integrity Policy will be reported immediately. The following link provides a comprehensive guide to the rules of academic integrity all McCormick students are supposed to adhere to (Link to Academic Integrity Statement).

Schedule (tentative)

Week	Lecture: Date	Topics	Assigned	Due
1	1: 3/31	Intro to 310, Linear Algebra Basics	HW1	-
2	2: 4/5	Intro to Linear Programming (LP)	-	-
	3: 4/7	General LPs & Solving LPs graphically	-	-
3	4: 4/12	Simplex & Solving LPs in EXCEL	HW2	HW1
	5: 4/14	LP Sensitivity Analysis	-	-
4	6: 4/19	Interesting LPs	HW3	HW2
	7: 4/21	Integer Programming (IP)	-	-
5	8: 4/26	IP Relaxation & Branch and Bound	HW 4	HW3
	9: 4/28	Network Problems	-	-
6	10: 5/3	Probability & Statistics Basics, & Midterm review	-	HW4
	5/4	MIDTERM	-	-
	11: 5/5	Deterministic and Probabilistic Inventory models	HW 5	-
7	12: 5/10	Inventory models & Intro to Markov Chains (MC)	-	-
	13: 5/12	MC 2	-	-
8	14: 5/17	MC 3	-	-
	15: 5/19	Queuing Theory 1	HW 6	HW 5
9	16: 5/24	Queuing Theory 2	-	-
	17: 5/26	Simulation 1	HW 7	HW 6
10	18: 5/31	Simulation 2	-	-
	6/3	-	-	HW 7
	6/9	FINAL (12:00-2:00PM)	-	-

Important Dates

- MIDTERM REVIEW SESSION ♦ time/date TBD ♦ location TBD
- MIDTERM ♦ Wednesday 5/4 ♦ 5:00-7:00PM ♦ location TBD
- FINAL EXAMINATION REVIEW SESSION ♦ time/date TBD ♦ location TBD
- FINAL EXAMINATION ♦ Thursday 6/9 ♦ 12:00-2:00PM ♦ location TBD