

Prof. Ying-Ju Chen

## **Simulation in Business and Management**

Course Syllabus ISOM 4720 (**Undergraduate Level**)

2017 Spring

(Subject to change)

### **Instructor:**

**Ying-Ju Chen**

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### **TA:**

**Edmond Ho**

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**Required text & Recommended book:**

**Text Book(s)**

*Simulation with ARENA*, by Kelton, Sadowski and Swets, 6<sup>th</sup> Edition

*Simulation Modeling Using @Risk*, by Winston

**Reference Book(s)**

*Spreadsheet Modeling and Applications*, by Albright and Winston

**Course-related Technology:**

Canvas (Course website)

iPRS (Mobile-based Clicker)

IPeer (Peer evaluation)

**Assessment Methods:**

Class Participation	7%
In-class exercise	20%
Quiz (Midterm)	20%
Homework	8%
Final	20%
<u>Final Project</u>	<u>25%</u>
<b>Total</b>	<b>100%</b>

Late submissions are not accepted

**Course Content Descriptions:**

This course introduces basic approaches and popular software packages for computer simulation. Two kinds of simulations will be covered: Monte Carlo simulation (for static systems) and discrete event simulation (for dynamic systems). In particular, we discuss Monte Carlo simulation with Excel and its add-in, @Risk, and discrete event simulation with ARENA, a popular simulation package. We focus on the application of simulation in supporting decision making for marketing, finance, and operations of service and manufacturing systems. The course will emphasize critical thinking rather than memorization.

### **Class Participation:**

Class participation is critical for this course. You will be assessed by your contribution to in-class discussion as an individual. Both quality and frequency of participation will be taken into account, with more emphasis on quality. Your team will also be evaluated based on how well you collaborated in class work and games, and how well your team members help out each other in class. All mobile phones and ringing devices should be turned off or silent in class.

### **In-class exercises**

We will conduct in-class exercises/ assignments using computer software. They take place multiple times and each group works together and the grading is done on a group basis. However, each student must submit an individual report/answer sheet. Students will be called upon to show and explain their answers to the entire class. Those with excellent performance can earn extra points for their groups. Students in a group will be required to sit together in the classroom. Absence results in zero point for the individual student's grade. Other team members, who show up in class, will get the group grade based on their performance.

### **Homework**

Homework assignments will be announced as the classes go along. Each group submits one report, and it shall include @Risk or ARENA models that work. On each due date, the homework assignment should be submitted online via Canvas. No late submission is accepted either by the instructor or the TA.

### **Quizzes & Final Exam**

There will be 1 quiz/ midterm and a final exam (**OEPN BOOK, OPEN NOTES**). The exams will be conducted in a computer lab and each student will have to work individually on simulation software. For the midterm, students with an approved medical certificate may skip it and will take the final exam instead. However, the exam grade will be deducted by 25%; that is, the maximum the student can get from taking the final alone will be  $75\% * 20\% + 100\% * 20\% = 35\%$ . No make-up exam for the final will be administered for any reason. The time commitment for participating in the exams is essential. Suspected violations of the Code of Student Conduct will be reported to the Office of Student Conduct (or the equivalent authority).

**The final exam is cumulative.**

### **Project:**

The project will be an opportunity for you to learn more about the applications of **simulation techniques** and put into practice what you have learned in class. Projects should study a specific operations management practice in a real organization. You are free to choose a topic and an organization of your interest. Your job is to identify and exploit opportunities for operations improvement in your chosen example.

As broad guidelines for these projects, put yourself in the shoe of a team of analysts trying to analyze some particular issues of an organization that is related to the content of this course. Your study should hopefully culminate with an assessment of the strengths and weaknesses of the associated operations management practice and some suggestions for improvements. This could roughly follow the following outline:

- a. Understand and describe application setting: industry overview, customer characteristics, operations issues, etc.
- b. Describe the current operations management practice.
- c. Assess the strengths and weaknesses of the current practice, possibly with an assessment of the magnitude of benefits (harms) brought by the strengths (weaknesses).
- d. Propose some improvement opportunities, with an assessment of the difficulty to implement such improvements

You do NOT need to collect all the data and solve the model. However, you are expected to explain how you will go about getting the needed data, how the model will be solved and what strategies you expect to use. Furthermore, to set up the simulation environment you necessarily need some inputs to make your simulations sensible. You should explain how critical parameters used in your simulation model fit well in reality. You should also explain how the improvement will be implemented and preferably provide an estimate on the expected magnitude of improvement (justified based on initial data). Basically, you can consider this as a proposal to a company from either a consulting firm or an internal consulting department.

**Project (continued):**

For this semester, the central theme is operations management for **non-governmental organizations (NGO) or social enterprises** either in developed or developing countries. If your project exhibits no such feature, the score will be appropriately downgraded to reflect the lack of focus.

Some relevant materials:

Non-governmental organizations (NGO) in Hong Kong

[http://www.had.gov.hk/en/public\\_services/services\\_for\\_new\\_arrivals\\_from\\_the\\_main\\_land/role.htm](http://www.had.gov.hk/en/public_services/services_for_new_arrivals_from_the_main_land/role.htm)

Social enterprises in Hong Kong

<http://www.social-enterprises.gov.hk/en/home/index.html>

- very good video series organized by J-PAL (MIT) & IPA (Yale) & CEGA (UC Berkeley):

J-PAL: [https://www.youtube.com/channel/UCk-2mgiXoFuZwkdHAsYDJ\\_Q](https://www.youtube.com/channel/UCk-2mgiXoFuZwkdHAsYDJ_Q) (Links to an external site.)

IPA: <https://www.youtube.com/channel/UCRAqMLso6wKvLrKWSVSCDRQ> (Links to an external site.)

CEGA: <https://www.youtube.com/channel/UCaQ0bR9S2jJnQEI5HBN-72w>

- Excellent courses in the relevant area:

MITx: 14.73x The Challenges of Global Poverty

[https://courses.edx.org/courses/MITx/14.73x\\_1/1T2015/info](https://courses.edx.org/courses/MITx/14.73x_1/1T2015/info)

MITx - 14.74x Foundations of Development Policy

also on <https://courses.edx.org>

[Columbia University](#) (Links to an external site.) [The Age of Sustainable Development](#) (Links to an external site.)

<https://www.coursera.org/learn/sustainable-development> (Links to an external site.)

- Online Resources of OR in Developing Countries

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[http://ifors.org/developing\\_countries/index.php?title=Main\\_Page](http://ifors.org/developing_countries/index.php?title=Main_Page) (Links to an external site.)

**Project (continued):**

There are two parts for the project. A one-page proposal is due on 3/3.

For the first part, during 3/13 – 3/20, each group will make a presentation with the **presentation slides**. The presentation slides are prepared for a **10-minute** (targeted) presentation. It should describe the institutional details of the organization you intend to study, and it should focus on the **static simulation** (namely, **Monte Carlo methods using @Risk, Crystal Ball, or Excel**) and your proposed solutions. Soft copies of these materials should be uploaded to the course website before 11:59pm midnight of the **first** presentation date. Failure to meet the deadline results in 1 point reduction of your final score. No excuse is accepted. Thus, make sure you as a team have access to the course website and get your files ready by then.

For the second part, during 4/28, each group will make a presentation with the **presentation slides**. The presentation slides are prepared for a **10-minute** (targeted) presentation. It should remind the audience some broad overview of the organization you intend to study, and it should focus on the **dynamic simulation** (namely, **discrete event approach using Arena**) and your proposed solutions. Soft copies of these materials should be uploaded to the course website before 11:59pm midnight of the presentation date. Failure to meet the deadline results in 1 point reduction of your final score. No excuse is accepted. You should also submit your simulation model (“source codes”, workable spreadsheets, Arena models)

The evaluation will be done by the entire class as well as the instructor. 30% of your project scores come from peer evaluation, and the remaining 70% comes from the instructor’s judgement. No detailed written report is needed. Also, we will not make the presentation slides available to the entire class to ensure fairness. Note: You are not allowed to use previous projects from other courses to fulfill the requirement.

You should also **submit your simulation programs** before deadlines (“source codes”, workable spreadsheets, @Risk models, and ARENA models). We reserve the right to adjust the grade if after reasonable attempts, we are unable to successfully run your simulation programs. Therefore, it is in your best interest to make your programs as assessable and comprehensive to us as possible.

**Project (continued):**

	10/	7 /	4 /	1 /
Problem identification	Well defined and explained; a large amount of original thought; problem with	Well defined and explained; some original thought; problem with	Interesting problem identified, but there is little evidence of original thinking, or	It is not clear what the real problem is
Model and Data	Appropriate and rigorous model but yet not overly complicated; Excellent plan for data collection	Appropriate and rigorous model, but some fine-tuning is required; Some good ideas of how data can be collected	Appropriate model, but major adjustment is required; Little idea of how data can be collected	Inappropriate model, and/or major errors in the model; No idea on how data can be collected
Implementation Planning	Concrete and comprehensive plans; show considerations for all key issues; specific on how to measure the benefit	Good and realistic plan for data collection and improvement implementation	There are some good points in the plan, but the plan is either too vague or some ideas are unrealistic	No or little clue about what data is needed and how the improvement should be implemented; Or plans are unrealistic and illogical
Delivery	Excellent use of visuals; very clear and concise flow of ideas; demonstrate and stimulate passion	Good use of visuals; clear flow of ideas; demonstrate interest	Limited and/or not so good use of visuals; ideas presented but focus is lost at times; limited evidence of interest	No use of visuals; hard to follow ideas; lack of enthusiasm and interest
Response to questions/comments	Excellent response; demonstrate in-depth consideration of all issues	Good response; demonstrate in-depth considerations of most issues	Satisfactory response; demonstrate considerations of some of the issues	Limited response; demonstrate a lack of considerations of significant issues

### Team Members Peer Evaluation

You will assess all team members for the group assignments using the following rubric. For each category, evaluate each team member and give a grade. All responses are confidential. You must submit it via IPeer by the deadlines. Failure to do so for each group assignment will reduce your own total score by 1 point. The instructor and the TA retain the right to adjust individual grade of the homework assignments and the final project based on these peer evaluations.

	4	3	2	1
Attendance	Attend almost all meetings and all classes; inform and/or seek agreement of the team before absence	Attend most of the meetings and classes; inform and/or seek agreement of the team before absence	Attend at least half of the meetings and classes; inform and/or seek agreement of team before most absences	Frequently miss meetings or classes; Or fail to inform the team before absence
Contribution	Contributes a lot of effort; routinely provides useful ideas in team meetings and class discussions	Tries hard to contribute; usually provides useful ideas in team meetings and class discussions	Does what is required; sometimes provides useful ideas in team meetings and class discussions	May refuse to participate; rarely provides useful ideas in team meetings and class discussions
Quality of work	Provides work of highest quality that impresses other team members	Provides work of high quality that meets expectations of other team members	Provides work that occasionally needs to be redone by other team members to ensure quality	Provides work that usually needs to be redone by other team members to ensure quality
Working with others	Always listens and show support to other team members; always help to keep the team work well together	Usually listens to and show supports to others; may talk too much, but does not	Rarely listens, but still shows support to other team members; sometimes not a good team member	Never show support to other team members; often not a good team member
Time management	Always does the assigned work without having to be reminded; no need to adjust deadlines or work responsibilities because of him/her	Usually does the assigned work; rarely needs reminding; no need to adjust deadlines or work	Often needs reminding; occasionally adjust deadlines or work responsibilities	Rarely get things done by deadlines; always have to adjust deadlines or work responsibilities

### **Course Objectives / Learning Goals:**

This course aims to provide you with a fundamental overview of the operations function in business. You will develop a conceptual understanding of the various issues, problems and realities arising in different aspects of operations. Emphasis will be put on critical analysis of real operations problems encountered in business, as well as communication skills that will help you share your thoughts and analysis effectively with peers, colleagues and clients.

### **Course Learning Outcomes**

The course learning goals comply with the educational objectives of the BBA-OM program. Upon completion of the course, you will be able to:

- Illustrate the basic operations management concepts and the role of operations management in firms (PILO 1, 3, 4)
  
- Explain the key operations processes and operations and their inter-relationships (PILO 2)
  
- Examine various problems faced by operations managers on functional, business and company- wide basis (PILO 1, 3, 4, 8)
  
- Evaluate critically the applicability of various operations strategies on different situations
  
- Communicate your ideas effectively through discussions, presentations and written documents (PILO 2, 5)

**Tentative schedule:**

This outline may be modified from time to time, depending on timing and interests.

Session	Date	Topics	Assignment
1	2/3 Fri	Introduction & syllabus	
2	2/6 Mon	Static Simulation with Spreadsheet – I	
3	2/10 Fri	Static Simulation with Spreadsheet – II	
4	2/13 Mon	Static Simulation using @Risk -I	Add/drop period ends on 2/14
5	2/17 Fri	In-class computer assignment 1 - Spreadsheet/@Risk	
6	2/20 Mon	Static Simulation using @Risk - II	
7	2/24 Fri	In-class computer assignment 2 - Spreadsheet/@Risk	
8	2/27 Mon	Static Simulation - Extended examples/ Dynamic Simulation (Simulation with ARENA)	
9	3/3 Fri	In-class computer assignment 3 – Spreadsheet/@Risk	Project proposal due
10	3/6 Mon	Dynamic Simulation (Simulation with ARENA)/ A Guided Tour Through Arena	HW1 distributed
11	3/10 Fri	In-class computer assignment 4 – ARENA	
12	3/13 Mon	Presentation Part I- Static simulation	
13	3/17 Fri	Presentation Part I- Static simulation	
14	3/20 Mon	Presentation Part I- Static simulation	HW1 due Peer evaluation due *2
15	3/24 Fri	Dynamic Simulation - Modeling Basic Operations	
16	3/27 Mon	Class cancelled due to Midterm [Lab reserved for your practice]	
17	3/31 Fri	Class cancelled (Midterm: 3 hours in lab in the evening) [Lab reserved for your practice]	
18	4/3 Mon	Conference- Class cancelled [Lab reserved for your practice]	
19	4/7 Fri	In-class computer assignment 5 – ARENA	HW2 distributed
20	4/10 Mon	Dynamic Simulation - Modeling Detailed Operations	
21	4/14 Fri	Mid-term break	
22	4/17 Mon	Mid-term break	
23	4/21 Fri	In-class computer assignment 6 – ARENA	HW2 due Peer evaluation due

24	4/24 Mon	Dynamic Simulation – Statistical Input/Output analysis	
25	4/28 Fri	Presentation Part II- Dynamic simulation (3 sessions together) Regular class time + evening	
26	5/1 Mon	Holiday	
27	5/5 Fri	Replaced by 4/28 session 2 [Lab reserved for your practice]	Peer evaluation due
28	5/8 Mon	Replaced by 4/28 session 3 [Lab reserved for your practice]	