ISE 435: Discrete Systems Simulation (31613)

Spring 2016
(Lecture: Tue & Thu 11:00pam - 12:20pm, KAP 144)
(Lab: W 12:45-1:35pm & 4:00pm - 4:50pm, GER 309)

Instructor:	**Dr. Kim Peters**	Phone:	213-740-0867 (during office hours)
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Course Description
More and more, today's businesses are challenged with limited resources and operate under critical time constraints. They are increasingly utilizing model simulations to forecast outcomes. This course develops simulation models and fosters basic exposure to the discrete system configuration challenges. Students will develop comprehensive simulation models while at the same time, adhering to simulation risks and rigorous quality demands from the user's perspective. This course will provide students with the fundamental simulation tools and the modeling skills to develop the decision making application systematically.

Course Objective
In this course, you will learn how to create computer models of discrete event systems, and how to use these models to make decisions about the design/improvement of the actual physical systems that the models represent. You will learn how to evaluate business systems and identify the input and output variables. You will learn how to evaluate field data to obtain input information and how to evaluate output predictions from the simulation model to select effective operating policies.

The subject matter will be covered with lectures, lab exercises, discussions, reading the text, individual research, and the development of a comprehensive simulation application in a team environment.

Course Materials

Required text:

Khoshnevis and Palmer, Discrete Systems Simulation, reader

- Chapters 1-6 of the text, plus topics discussed in lecture by the instructor

***Software:* Arena**: The course will utilize Arena simulation software.

- Arena is available on the ISE laboratory computers in GER 309 (open M-F 8 to 5).

Online access to materials
The assignments, handouts, lecture notes, team rosters and other class information will be posted on D2L, Desire2Learn (https://courses.uscden.net). All students are expected to be able to access information from the on-line website.

Class project

The class project will involve development and validation of a computer simulation model. A project will be due in two parts on the following dates:

Part I – Thursday, March 24(tentative)

Part II – Thursday, April 21(tentative)

For this project, you will work with an assigned partner. The project assignment will be distributed about five weeks in advance of the Part I due date. Your team's system description and model layout will be due on Thursday, March 3. A Peer Review of another team's system description will be due on Thursday, March 10. The class project will be graded based on the class and lab participation, final model report and a 360° team rating.

Grading

Exam 1	20%
Exam 2	20%
Final Exam 3	20%
Project	30%
Homework	10%

Exam 1: 20% (individual). The midterm (2/18/2016, tentative) will include all the materials covered until 2/16/2016. This date will mark the end of the first part of the course.

Final Exam: 20% (individual). The final exam (5/10/2016) will be comprehensive of all the course materials, with an emphasis on the second part of the course. A student may elect to omit the final exam, if both exams and the project have been completed.

Homework Assignments: 10% (individual). Homework must be turned in at the specified due date or via D2L prior to the beginning of class. No late assignments will be accepted unless an extreme circumstance can be proven.

Project: 30% (group). The final project deliverable is due on 4/21/2016 (*tentative*).

50%: Project performance: creativity, quality, precision and etc.

12.5%: Part I (Preliminary design review)

12.5%: Part II (Critical design review)

25%: 360 degree peer evaluation: contribution, participation and etc.

Participation/Behavior: Notable consideration will be given for class participation and behavior (in person or via D2L).

Quality Expectations

All assignments and presentations should be completed with the upmost professionalism. This means that all the homework, project, papers and other materials must be prepared using a word processor, spreadsheet, PowerPoint or any other relevant computer software.

All work shall have cover page with:

1. Your full name
2. Your group member names with last names in alphabetical order (group assignments)
3. Document title
4. Document date
5. File name must conform to the following: **group# _assignment#.ext** (doc, xls. ppt, etc.)

Attendance

Regular class attendance and lab participation is strongly encouraged and recommended. You are responsible for all material presented in the lecture whether you are present or not. Electronic devices such as cell phones, pagers, and alarms should be turned off or set to silent mode throughout class. ***Note**: Attendance will be taken for the first two weeks of class, after which an honor code for you as young adults will be adhered to.*

Important Dates

Jan 11	Classes Begin
Jan 18	Martin Luther King's Birthday
Feb 15	Presidents' Day
Feb 18	Exam 1 *(tentative)*
Mar 13 - Mar 20	Spring Recess
Apr 14	Exam 2 *(tentative)*
Apr 29	Classes End
Apr 30 – May 3	Study Days
May 10, 11:00am-1:00pm	Final Exam
May 13	Commencement

Language Support Systems

USC provides support for students who need help with scholarly writing. Students whose primary language is not English should check with the American Language Institute *http://dornsife.usc.edu/ali*, which sponsors courses and workshops specifically for international graduate students.

Emergency Services

If an officially declared emergency makes travel to campus infeasible, USC Emergency Information *http://emergency.usc.edu* will provide safety and other updates, including ways in which instruction will be continued by means of D2L, blackboard, teleconferencing, and other technology.

Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to the professor(s) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Academic Integrity

USC seeks to maintain an optimal learning environment. The Department of Industrial and Systems Engineering adheres to the University's policies and procedures governing academic integrity as described in *Scampus*, the Student Guidebook. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. *Scampus*, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at *http://www.usc.edu/student-affairs/SJACS*. All students are expected to understand and abide by these principles, as they will be strictly enforced throughout the semester.

Note: This syllabus is subject to change.

Course Schedule (tentative)

Week	Date	Topics	Text Sections
1	1/12 – 1/14	Discrete Event Systems Queueing Systems Terms & Definitions	1.1– 1.3, 2.1 – 2.2, Handout
2	1/19 – 1/21	Simulation Model Layout Input Analysis	2.3, 3.1 – 3.5, 4.1 – 4.3
3	1/26 – 1/28	Uniform Random Numbers	4.4
4	2/2 – 2/4	Random Numbers from Other Distributions Computer Simulation Software	4.5, 5.1 – 5.2
5	2/9 – 2/11	Arena	Handout
6	2/16 – 2/18	Review, **Exam 1**	
7	2/23 – 2/25	Model Validation Arena (continued)	6.11.1 – 6.11.2 Handout
8	3/1 – 3/3	Model Performance Measures Statistical Inference Review	6.1-6.3, 6.6 – 6.8,
9	3/8 – 3/10	Project Peer Reviews Output Analysis for Terminating Simulations Output Analysis for Steady-State Simulations	 6.4, 6.9, 6.5, 6.10
10	3/15 – 3/17	***Spring Recess - no classes***	
11	3/22 – 3/24	Simulation Experiments	6.11.3
12	3/29 - 3/31	Inventory Systems Terms & Definitions Two-Factor Simulation Experiments	Handout Handout
13	4/5 – 4/7	Experiment Analysis in Excel and Minitab	Handout
14	4/12 – 4/14	Review, **Exam 2**	Handout
15	4/19 – 4/21	Capacity Schedules and Failures	Handout
16	4/26 – 4/28	Non-Stationary Poisson Processes Routes and Stations in Arena	Handout
	5/10 11:00am-1:00pm	**Final Exam**	

Note: This course schedule is subject to change.

Lab Schedule (tentative)

Week	Date	Topics	Lecture Text Sections
1	Jan 13	System Layout Diagrams, Single-Server Queue in Excel	1.1– 1.3, 2.1 – 2.2, Handout
2	Jan 20	Excel: Random Number Generation, Chi-Sq Goodness-of-Fit, and Weibull Parameters Estimates	2.3, 3.1 – 3.5, 4.1 – 4.3
3	Jan 27	Minitab Probability Plots, KS test in Excel, Commute Data	4.4
4	Feb 3	Congruential Generator and Runs Up/Down in Excel	4.5, 5.1 – 5.2
5	Feb 10	Arena: Restaurant Drive-Thru Model	Handout
6	Feb 17	No Lab, **Exam 1**	
7	Feb 24	Arena: Drive-Thru Data Mode	6.11.1 – 6.11.2 Handout
8	Mar 2	Arena: Project Schedule Network Model	6.1-6.3, 6.6 – 6.8,
9	Mar 9	Arena: Three Chefs Input Model	6.4, 6.9, 6.5, 6.10
10	Mar 16	***Spring Recess - no classes***	
11	Mar 23	Arena: Inventory Model with Input Control Panel	6.11.3
12	Mar 30	No Lab (Project – Part I)	Handout Handout
13	Apr 6	Arena: Electronic Assembly Models	Handout
14	Apr 13	No Lab, **Exam 2**	Handout
15	Apr 20	Arena: Hotel Buffet Model with Animation	Handout
16	Apr 27	Make–up Lab	Handout
	5/10 11:00am-1:00pm	**Final Exam**	

Note: This lab schedule is subject to change.