USC Viterbi School of Engineering

ISE 435 Discrete System Simulation
Fall 2019, Monday and Wednesday, 3:30-4:50 pm
Location: KAP 167

Lab: Wed 2-2:50 in SAL 127

Instructor: Dr. Parisay
https://ise.usc.edu/directory/faculty/profile/?lname=Parisay&fname=Sima
Office: OHE 310U
Office Hours: Mon, Wed 2:30-3:15 and 5:15-6 pm
Contact Info: parisay@usc.edu

Teaching Assistant: Ying Peng
Office and Office Hours: TBA
Contact Info: yingpeng@usc.edu

IT Help:
Hours of Service:
Contact Info:

Course Description
Model design to simulate discrete event systems with basic input and output analysis using high-order languages, applied to industrial systems analysis and design problems.

Learning Objectives
Introduction to modeling and analysis of stochastic systems using discrete-event simulation. Emphasis on applications using commercial software
- Data collection process and analysis
- Application of queuing systems to prepare for simulation
- Knowledge of concepts in discrete-event simulation and their applications.
- Creating simulation model and animation using a commercial simulation software (Arena)
- Model verification
- Input modeling, statistical output analysis, report writing
- Random-Number generators, Random Variable generation, their impact on simulation
- Experimentation, system improvement

Prerequisite(s): CSCI 101 and ISE 225
Co-Requisite (s): ISE 435 Lab
Concurrent Enrollment: None

Recommended Preparation: None

Course Notes

The course materials are in the Course Reader and the Blackboard.

Technological Proficiency and Hardware/Software Required

Students need to download student version of Arena (free) from the related web site. This software works with Windows operating system. Alternatively, you can use Arena on the virtual desk top.

Required Readings and Supplementary Materials

Required: Course Handouts (Included in Course Reader, course Blackboard, in lab, and in class) by Dr. Parisay and TA. The Course Reader can be purchased from the USC Bookstore.

Required: Discrete Systems Simulation, B. Khoshnevis and K. Pulmer, ISE, USC. This can be purchased on the first day of class/lab.

Required software: Arena Software can be downloaded for free from the web site below
http://www.arenasimulation.com/

Reference: Simulation with Arena, 6th Edition, W. David Kelton, Randall P Sadowski, Nancy B. Zupick, McGraw-Hill, 2015, ISBN: 978-0-07-340131-7. This book can be purchased from Internet.

Description and Assessment of Assignments

- **Midterm I** will be in-class based on the schedule, closed book, and 1:15 hours in length. Make up exam is only considered under documented emergencies, such as being hospitalized.
- **Midterm II** will be in lab using Arena software based on the schedule, closed book, and 50 minutes in length. Make up exam is only considered under documented emergencies, such as being hospitalized.
- **Final Examination** will be held at the completion of all classes based on the University schedule, closed book, and 2 hours in length. Make up exam is only considered under documented emergencies, such as being hospitalized.
- **Homework** will be assigned on Thursdays to be due the next Wednesdays, you will submit your answer as a Word file (or/and Arena model) to the Blackboard **two hours before the class** (unless otherwise indicated). HW will be randomly selected for grading by the following week. No late homework will be accepted.

No makeup homework will be considered. HW is expected to be as one Word file, typed as much as possible, and professionally done. HW solution will be posted within few days after the due date. <u>You need to refer to the posted solution as part of your next HW.</u>

- **Quiz/Participation** may be conducted any time during the class and collected for grading. Quizzes are based on only the previous two classes and the lab. No late quiz or makeup quiz will be considered.

- **Lab** is on Wednesdays. Your efforts in the lab should be posted to the Blackboard as a file at the end of the lab session. I will select some of your lab posted files randomly to be graded.

- **Project/Term paper:** The project in this class is a team activity. Teams may select a topic according to the team members' interest and in relation to the material covered in this class. The project requires an initial report and a final report. Each one will be graded. The purpose of the project is for you to utilize information you have learned during this class and to prepare a professional report. The project is about simulation of a real system. You need to develop an Arena model, experiment with it, and have a final conclusion. It is required that you use Arena features and simulation concepts as much as possible. The project is delivered as a hard copy report, as well as posting Word file and the Arena models on Blackboard before the last class session.

Grading Breakdown

Assignment	Points	% of Grade
Midterm I: theory	17	17
Midterm II: Arena	10	10
Final Examination: theory	25	25
Homework and lab (4 best out of 6)	12	12
Quizzes (2 best out of 4)	8	8
Project: initial report and final report	28	28
total	100	100

Total points will be curved for the final letter grade. Letter grade with minus and plus are also considered. Please refer to another file called "Grading policy" on the Blackboard for more details.

Assignment Submission Policy
Assignments should be submitted to the Blackboard before the class. It should be professionally done. I may require hard copy as well for some assignments. No late assignment is accepted. No makeup quiz is considered. Makeup exam is considered only under documented emergencies.

Additional Policies

Cellular phones should be turned off in class. No texting in class. Computers can only be used for class related material.

Please bring your Course Reader to every class session.

Course Schedule: A Weekly Breakdown

  Readings and Homework: They will be posted on Blackboard as the lecture proceeds. Homework is due, to be posted on Blackboard, two hours before the class on **Wednesdays**.

Date	ISE 435 Topics Tentative Weekly Activities	Readings	Deliverable /Due Dates
Aug 26, 28	Introduction to the course Queuing Concepts	5a	
Sept 2 holiday, Sept 4	Queuing Theory	5b	Homework
Sept 9, 11	Queuing Theory Analysis and Writing Report	5b	Homework
Sept 16, 18	Introduction to Simulation Concepts Preparing for Modeling, Logical Model Modeling Features of Arena	7a, 7b, 7c, 8a	Homework
Sept 23, 25	Data Collection/Calculation Review of Data Summary Review of Random Variables and Probability Distributions	2a, 2b, 3a, 3b	Homework
Sept 30, Oct 2	Review of Confidence Interval and Hypothesis Testing	4a	Homework
Oct 7,9	Review for exam (Mon) **Midterm I** (1:15 hour on Wed)		**Proposal** (Mon)
Oct 14, 16	Goodness of Fitness Test Input Analyzer of Arena Calculation of Utilization	4b, 13a, 7f	
Oct 21, 23	Verification of Simulation Model Analysis of Performance Measures and Report	9a, 10a	Homework

	Writing		

Date	ISE 435 Topics **Tentative Weekly Activities**	Readings	Deliverable /Due Dates
Oct 28, 30	Simulation Concepts and Related Modeling Features of Arena Random Number and Random Variable Generation	12a, 11a	**Initial Report** (Wed)
Nov 4, 6	Random Number and Random Variable Generation Output Analyzer of Arena	11b, 14a, 14b	Homework
Nov 11, 13	Review for exam (Mon) **Midterm II software**(Wed, 50 min, during the Lab) Simulation Concepts and Related Modeling Features of Arena, Animation	12a	
Nov 18, 20	Experimentation, Process Analyzer of Arena Simulation Concepts and Related Modeling Features of Arena	15a, 15d	Homework
Nov 25, Nov 27 holiday	Simulation Concepts and Related Modeling Features of Arena Material Handling	12a	Homework
Dec 2, 4	Simulation Concepts and Related Modeling Features of Arena Review for exam (Wed)		**Final project** (Wed)
Dec 16	**Final Exam 2-4 pm location will be announced**		

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 me (or to TA) 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. Website and contact information for DSP: http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html, (213) 740-0776 (Phone), (213) 740-6948 (TDD only), (213) 740-8216 (FAX) ability@usc.edu.

Statement on Academic Integrity
USC seeks to maintain an optimal learning environment. 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. All students are expected to understand and abide by these principles. *SCampus*, the Student Guidebook, (www.usc.edu/scampus or http://scampus.usc.edu) contains the University Student Conduct Code (see University Governance, Section 11.00), while the recommended sanctions are located in Appendix A.

Emergency Preparedness/Course Continuity in a Crisis
In case of a declared emergency if travel to campus is not feasible, USC executive leadership will announce an electronic way for instructors to teach students in their residence halls or homes using a combination of Blackboard, teleconferencing, and other technologies.

Statement on Academic Conduct and Support Systems

Academic Conduct:
Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in *SCampus* in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in *SCampus* and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Support Systems:
Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class.
equity.usc.edu

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations.
dsp.usc.edu

Student Support and Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.
Provides overall safety to USC community. dps.usc.edu