

# USC Viterbi School of Engineering

## ISE 435 Discrete System Simulation

Fall 2017, Monday and Wednesday, 3:30-4:50 pm

**Location:** GFS 101

**Instructor: Dr. Sima Parisay**

<https://ise.usc.edu/directory/faculty/profile/?lname=Parisay&fname=Sima>

**Office:** OHE 310U

**Office Hours:** Mon, Wed 2:45-3:15 and 5-6 pm

**Contact Info:** [parisay@usc.edu](mailto:parisay@usc.edu)

**Teaching Assistant:** Jing Voon Chen

**Office and Office Hours:** GER 309, M and Th 12-1 pm

**Contact Info:** [jingvooc@usc.edu](mailto:jingvooc@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 Black Board, 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-class based on the schedule, closed book. The exam consists of two sections: one section on “theory”, which is 1:15 hours in length, and one section on “software”, which is 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** are assigned each Thursdays to be due the next Mondays, you will submit your answer as a Word file to the Blackboard before the next 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, and professionally done.

- **Quiz/Participation** usually conducted at the beginning of class on Wednesdays and randomly 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 Thursdays. 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, efile, and the Arena models before the last class session.

### Grading Breakdown

Assignment	Points	% of Grade
Midterm I: theory	15	15
Midterm II: Arena	10	10
Midterm II: theory	15	15
Final Examination: theory	15	15
Homework and lab (3 best out of 5)	9	9
Quizzes (3 best out of 5)	12	12
Project: initial report and final report	24	24
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.

### Assignment Submission Policy

Assignments should be submitted to the Blackboard/D2L 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.**

## Course Schedule: A Weekly Breakdown

**Readings and Homework:** They will be posted on Blackboard as the lecture proceeds. Homework is due one hour before class on Mondays. Quizzes are conducted at the beginning of Wednesday classes.

Date	ISE 435 Topics Tentative Weekly Activities	Readings	Deliverable /Due Dates
Aug 21, 23	Introduction to the course Data Summary	3a	
Aug 28, 30	Queuing Theory	5a, 5b	Quiz
Sept 4 holiday, Sept 6	Queuing Theory Analysis and Writing Report Data collection process	5b	Quiz, Homework
Sept 11, 13	Introduction to Simulation and Arena Random Variables and Probability Distributions	3b, 7a, 8a	Quiz, Homework
Sept 18, 20	Review of Confidence Interval and Hypothesis Testing Preparing Logical Model	4a, 7b, 7c	Quiz, Homework
Sept 25, 27	<b>Midterm I</b> (1:15 hour on Mon) Calculation of Utilization, Simulation Concepts	7f, 7a, 8a	
Oct 2, 4	Goodness of Fitness Test	4b	Quiz, Homework
Oct 9, 11	Input Analyzer of Arena Analysis of Performance Measures and Report Writing	4d, 11a	Quiz, Homework
Oct 16, 18	Simulation Concepts and Related Modeling Features of Arena Output Analyzer of Arena	7a, 8a, 11b	Quiz, Homework
Oct 23, 25	Simulation Concepts and Related Modeling Features of Arena, Random Number and Random Variable Generation	7a, 8a, 10a	Quiz, Homework
Oct 30, Nov 1	Verification of Simulation Model <b>Midterm II in two sections: theory</b> (1:15 hour on Mon) <b>and software</b> (50 min on Thurs Lab)	12a	Quiz, Homework
Nov 6, 8	Simulation Concepts and Related Modeling Features of Arena Experimentation, Process Analyzer of Arena	7a, 8a	Quiz, Homework
Nov 13, 15	Simulation Concepts and Related Modeling Features of Arena	7a, 8a	

Nov 20, 22 holiday	Simulation Concepts and Related Modeling Features of Arena	7a, 8a	
Nov 27, 29	Simulation Concepts and Related Modeling Features of Arena Material Handling, Animation	7a, 8a	Final project
Dec 11	<b>Final Exam 2-4 pm</b>		

### **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](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](mailto: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](http://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/D2L, teleconferencing, and other technologies.