USC Viterbi School of Engineering

ISE 580 Performance Modeling with Simulation
Spring 2018, Wednesday, 6:40-9:20 pm
Location: OHE 132

Instructor: Dr. Sima Parisay
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Course Description

Introduction to modeling and analysis of stochastic systems using discrete-event simulation. Emphasis on applications using commercial software

Learning Objectives

This course is designed for those with minimum background in this field and concentrates on application of these techniques.

- 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 and validation
- Input modeling, statistical output analysis, report writing
- Random-Number generators, Random Variable generation, their impact on simulation
- Experimentation, system improvement

Prerequisite(s): Probability and statistics, including hypothesis testing, and introductory computer programming
Co-Requisite (s): None
Concurrent Enrollment: None
Recommended Preparation: None

Course Notes

The course materials are in the Course Reader and the D2L.

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.

Required Readings and Supplementary Materials

Required: Course Handouts (Included in Course Reader, course D2L, and in class) by Dr. Parisay. The Course Reader can be purchased from the USC Bookstore.

Required: 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 the USC Book store or any other sources.

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

Reference: Simulation Modeling & Analysis with Expertfit Software, 5th Edition, Averill M. Law, McGraw-Hill, 2015. ISBN: 0073294411 ISBN 978-0-07-340132-4

Reference: Discrete Systems Simulation, B. Khoshnevis, McGraw-Hill, Inc., 1994 or Discrete Systems Simulation, B. Khoshnevis and K. Palmer, ISE, USC, 2014

Description and Assessment of Assignments

- **Midterm I** will be in-class based on the schedule, closed book, and 1.5 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, and 2.5 hours in length. The exam consists of two sections: one section on "theory", which is 1.5 hours in length, and one section on "software", which is 1 hour 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 week, you will submit them to D2L before the next class (unless otherwise indicated). No late homework will be accepted. No makeup homework will be considered. HW feedback and solution will be provided within a week from its due date. HW is expected to be typed, and professionally

done. Five HW will be randomly selected for grading. The best three grades of HW will be used for the total points for HW.

- **Quiz**/**Participation** usually conducted at the beginning of each class and randomly collected for grading. Quizzes are based on only the previous class. No late quiz or makeup quiz will be considered. Four quizzes will be randomly selected for grading. The best two grades of quizzes will be used for the total points for quiz.
- **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 can be: a) simulation of a real system, b) simulation of an existing case study, or c) a research related to the material covered in this class. In case of simulating a 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 and the Arena models on 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 (3 best out of 5)	9	9
Quizzes (3 best out of 5)	9	9
Project: initial report and final report	27	27
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 D2L.

Assignment Submission Policy
Assignments should be submitted to the 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 D2L as lecture proceeds.

Week	ISE 580 Topics Tentative Weekly Activities	Readings	Deliverable /Due Dates
1 Jan 10	Introduction to the course Random Variable and Distributions		
2 Jan 17	Queuing Theory	Data Summary	Quiz, Homework
3 Jan 24	Queuing Theory		Quiz, Homework
4 Jan 31	Queuing Theory Analysis and Writing Report		Quiz, Homework
5 Feb 7	Introduction to simulation concepts, Logical Model		Quiz, Homework
6 Feb 14	**Midterm I** (1.5 hour) Lecture: Introduction to Arena Software		
7 Feb 21	Confidence Interval, Hypothesis testing		
8 Feb 28	Simulation Concepts and Related Modeling Features of Arena		Quiz, Homework
9 Mar 7	Simulation Concepts and Related Modeling Features of Arena, Verification		Quiz, Homework
10 Mar 14	Holiday		
11 Mar 21	Random Number and Random Variable Generation		Quiz, Homework
12 Mar 28	Simulation Concepts and Related Modeling Features of Arena, Transient and Steady State, Replications		Quiz, Homework
13 Apr 4	**Midterm II in two sections: theory**(1.5 hour) **and software**(1 hour)		
14 Apr 11	Simulation Concepts and Related Modeling Features of Arena, Material Handling, Animation		
15 Apr 18	Goodness-of-Fitness Test, Application of Input Analyzer of Arena		Quiz, Homework

16 Apr 25	Analysis of Performance Measures and Report Writing, Application of Output Analyzer of Arena		Quiz, Homework
17 May 2	**Final Exam 7-9 pm**		

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/D2L, teleconferencing, and other technologies.