USC Viterbi School of Engineering

ISE 580 Performance Modeling and Simulation
Spring 2016, Monday, 6:40-9:20 pm
Location: OHE 132

Instructor: Dr. Sima Parisay
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Hours of Service:
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Course Description

This course is an introduction to modeling and analysis of stochastic systems, with an emphasis on analytic methods for Markovian systems and discrete-event simulation of non-Markovian systems. This course emphasizes the development of modeling skills, analysis skills, and communication skills. These skills lead to information mining that provides in-depth understanding of a system and assists with a better decision making regarding system design and operation.

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

Learning Objectives

- Application of Markovian systems, especially queuing systems
- 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 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.

Required Readings and Supplementary Materials

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

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/

We may use software for Markov Chain and Queuing Theory.

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 Blackboard before the next class (unless otherwise indicated). HW will be randomly selected for grading and returned the following week. No late homework will be accepted. No makeup homework will be considered. HW is expected to be typed, and professionally done.
- **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.
- **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.

Grading Breakdown

Assignment	Points	% of Grade
Midterm I	15	15
Midterm II: Arena	10	10
Midterm II: theory	15	15
Final Examination	15	15
Homework (3 best out of 5)	9	9
Quizzes (2 best out of 4)	8	8
Project: initial report, 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.

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.

Course Schedule: A Weekly Breakdown

Readings and Homework: They will be posted on Blackboard as lecture proceeds.

	ISE 580 Topics/Daily Activities Tentative (may change)	Readings and HW	Deliverable/ Due Dates
Week 1 Jan 11	Introduction to the course Queuing Concept, Queuing Theory		
Week 2 Jan 18	Holiday	Readings on Background	
Week 3 Jan 25	Queuing Theory Analysis and Writing Report Goodness-of-Fitness Test		Quiz, Homework
Week 4 Feb 1	Application of Input Analyzer of Arena, Introduction to simulation and Arena		Quiz, Homework, Bring your computer with Arena
Week 5 Feb 8	Simulation Concepts and Related Modeling Features of Arena Logical Model, Verification		Quiz, Homework, Project teams
Week 6 Feb 15	Holiday	Readings	
Week 7 Feb 22	**Midterm I** (1.5 hour) Lecture: Analysis of Performance Measures and Report Writing		
Week 8 Feb 29	Simulation Concepts and Related Modeling Features of Arena		Quiz, Homework
Week 9 Mar 7	Simulation Concepts and Related Modeling Features of Arena Random Number and Random Variable Generation		Quiz, Homework, Project proposal
Week 10 Mar 14	Spring Break		
Week 11	Simulation Concepts and Related Modeling		Quiz,

Mar 21	Features of Arena Transient and Steady State, Replications, Output Analyzer of Arena		Homework
Week 12 Mar 28	Simulation Concepts and Related Modeling Features of Arena		Quiz, Initial report of project
Week 13 April 4	**Midterm II in two sections: theory**(1.5 hour) **and software**(1 hour)		
Week 14 April 11	Markov Chain, Ergodic Chain, Absorbing Chain		
Week 15 April 18	Markov Chain: Workforce Planning		Quiz, Homework
Week 16 April 25	Project presentations (optional)		Final project and Arena models are due
Week 17 May 2	**Study Break**		
Week 18 Mar 9	**Final Exam**		

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.