Viterbi School of Engineering

ISE 580 Performance Modeling with Simulation
Unit: 3
Fall 2021, Tues, 5:00-7:50 pm

Location: Stauffer Science Lecture Hall, SLH 100

Instructor: Dr. Parisay
https://ise.usc.edu/directory/faculty/profile/?lname=Parisay&fname=Sima
Office: online, Zoom link on the course's Blackboard
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IT Help:
Hours of Service:
Contact Info:

Catalog Course Description

Introduction to modeling and analysis of stochastic systems, with an emphasis on discrete-event simulation of non-Markovian systems.

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 get ready 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
- Experimentation, system improvement

Learning Objective By the end of this course, students should be able to:	Assignment/Assessment tools used This learning objective and skill is measured by:
Reproduce knowledge in relation to simulation	Quizzes at the beginning of each class based on pre-recorded video lectures and handouts. Quiz can be as multiple-choice or short written essay
Create simulation model using Arena software (Software skill)	Assigned homework, exam, project, in-class work
Verify their model, experiment with the model (Critical thinking)	Assigned homework, exam, project, in-class work
Analyze software output (Analysis skill)	Assigned homework, exam, project, in-class work
Detect extra information (Critical thinking)	Presenting extra higher-level information in exam and project, optional and self-developed extra credit
Compile a well-structured final report (Communication skill)	Essay in exam and project, in-class work

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

Course Notes

This course will be conducted as a **Flipped Classroom,** as much as possible. There will be 1 or 2 pre-recorded video lectures each week that students have to watch and learn before the class. These videos will be accessible from the course Blackboard. Each video will be around half-an-hour and will cover the basic knowledge about each topic. There will be handouts on Blackboard to accompany these pre-recorded video lectures. The course materials (handouts and video lectures) are on the course Blackboard. There may be some pre-class work (activity) to enforce the learned material from the pre-recorded video.
We will use class meetings (sessions) for lectures on Tuesdays to concentrate on more practice, answering common questions, and higher level of discussions. There will be in-class work during these meetings. **IT IS REQUIRED TO BRING YOUR LAPTOP TO THE CLASS MEETINGS.**

Technological Proficiency and Hardware/Software Required

Students have several options to access the software for modeling:

- You can access the professional version of Arena software on Virtual Desktop at USC. There will be a demo on how to access it in class. This one is version 6.1 of the software.
- You can download Student Version 6.1 of Arena (for free) from the related web site. This software works with Windows operating system.
- Mac users will have some issues installing this software.

Required Readings and Supplementary Materials

Required: Course handouts and pre-recorded lectures on course Blackboard site by Dr. Parisay.

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 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

Description and Assessment of Assignments

- **Midterm exam** will be based on the schedule and will take 1.5 hours. Make up exam is only considered under special situations with advance approval of instructor. There will be one midterm exam. A sample midterm exam will be added to the course's Blackboard site.
- **Final exam** will be held at the completion of all classes based on the University schedule and it takes 2 hours. Make up exam is only considered under special situations with advance approval of instructor. A sample final exam will be added to the course's Blackboard site.
- **Homework** will be assigned each week on Thursdays. You will post your answer as a Word file, and Arena model, on Blackboard before the next class by 3:00 pm on Tuesdays (unless otherwise indicated). Late homework and makeup homework will be considered under special situations with advance approval of instructor. Homework is expected to be typed as much as possible and professionally done. Homework on average will take about 1.5 hour each week, depending on your background. The homework can be at different level of difficulty and take different amount of time. I will select seven homework randomly for grading. Each homework will have 2 points. The two lowest grades for homework will be dropped.

- **Project/Case study:** The project in this class is a team activity. I will assign the teams and the project in week 5. Some information in respect to your project will be posted on Blackboard later on. 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 delivered as one Word file per each team that is posted on Blackboard. There will be an initial report and a final report.
- **Quiz:** Quiz will be conducted at the beginning of each class on Tuesdays. Quiz will be based on the assigned pre-recorded video lecture and posted handouts on Blackboard. It will take about 10-15 min. It will require a few short answers or multiple choice. I will grade seven of the quizzes randomly. Makeup quiz will be considered under special situations with advance approval of instructor. The quizzes can be at different level of difficulty and take different amount of time. I will select seven quizzes randomly for grading. Each quiz will have 2 points. The two lowest grades for quizzes will be dropped.

Grading Breakdown

Assignment	Points	% of Grade
Midterm exam	20	20
Final Exam	30	30
Homework	10	10
Case study (initial and final report)	30	30
Quiz	10	10
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 Blackboard for more details.

Course Schedule: A Weekly Breakdown

Readings and Homework: They will be posted on Blackboard as lecture proceeds. Homework is due on Tuesdays on Blackboard before 3:00 pm.

HW stands for homework.

Week	ISE 580 Weekly Topics Tentative Plan	pre-recorded videos	Text-book	Due Dates
1, Aug 24	Introduction to the course Queuing Concepts			
2, Aug 31	Queuing theory	Data summary, Probability- Part 1		HW quiz
3, Sept 7	Introduction to Simulation Concepts and Arena Software	Probability- Part 2 Confidence Interval, Hypothesis Testing- Part 1	2.3, 3.3, 3.4, Appendices B and C	HW quiz
4, Sept 14	Modeling features (branching, balking, failure, break, ..) Analysis of output	Confidence Interval, Hypothesis Testing- Part 2	3.5, 4.2	HW quiz
5, Sept 21	Fitting distribution, Input Analyzer, Verification	Goodness-of-fitness	4.6	HW quiz
6, Sept 28	Modeling features (attribute) Run conditions (transient, run length, replications)	Will be added	4.3, 4.4	HW quiz
7, Oct 5	2-D Animation Analysis of Performance Measures and Report Writing	Will be added	6	HW quiz
8, Oct 12	Review for midterm			HW quiz
9, Oct 19	**Midterm online** (1.5 hour beginning of class) Project discussion			
10, Oct 26	Output Analyzer application			Initial Project Report

Week	ISE 580 Weekly Topics Tentative Plan	Pre-recorded video	Text-book	Due Dates
11, Nov 2	Random Number and Random Variable generation		12	HW Quiz
12, Nov 9	Design of Experiments			
13, Nov 16	Entity transfer (Material Handling) miscellaneous topics		8	HW quiz
14, Nov 23	Project discussion			HW quiz
15, Nov 30	Review of final exam			HW
16, Dec 14	**Final Exam, 4:30-6:30 pm online**			Final project report due on **Dec 14** noon

ISE 580 COURSE SPECIFIC POLICIES

We all come from different backgrounds and hope for an excellent learning experience in a great learning environment. This section is to clear MY EXPECTATIONS and POLICIES for this course.

Intellectual property policies:
This is a clarification that any misuse, inappropriate dissemination, or attempted sale of class recordings and handouts, as well the appropriation of intellectual property is not acceptable. It is student's responsibilities towards the appropriate use and handling of these recordings under existing SCampus policies regarding class notes (https://policy.usc.edu/scampus-part-c/). Students are not permitted to create their own class recordings without the instructor's permission. Violations of these policies will be met with the appropriate disciplinary sanction.

Communication Policies
- Students are required to **use their USC email account** for any contact with instructor through email. It is required to include the course number **(ISE 580) in the subject** of the email. The instructor will reply to emails within 24 hours. It may take longer over

weekends and holidays. The instructor does not respond to emails sent from non-USC accounts or email that <u>does not have the course number on its subject</u>.

- Instructor's office hours (online) are open to all students and there is no need for prior appointment. However, if a student would like to have a private appointment, he/she can request it by sending an email. Provide several time windows that works for you so that I can select the one that works for me.
- Simple questions will be answered by email, but for more complex discussions students may need to make an appointment for meeting.
- To promote independence and critical thinking, students are encouraged to try to find their answers by checking the video lectures on D2L, the posted handouts on D2L, and your textbook. If you do not find the answer you need, email the instructor.

USC'S STATEMENT ON ACADEMIC CONDUCT AND SUPPORT SYSTEM

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, policy.usc.edu/scientific-misconduct.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org
Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press "0" after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault
Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298
equity.usc.edu, titleix.usc.edu
Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report
Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity |Title IX for appropriate investigation, supportive measures, and response.

The Office of Disability Services and Programs - (213) 740-0776
dsp.usc.edu
Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Campus Support and Intervention - (213) 821-4710
campussupport.usc.edu
Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101
diversity.usc.edu
Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call
dps.usc.edu, emergency.usc.edu
Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call
dps.usc.edu
Non-emergency assistance or information.