

ISE 435 Discrete Systems Simulation  
Spring Semester 2024  
Lecture: TuTh 10:00 - 11:50 am, DMC 101  
Lab: Th 5:00 - 5:50 pm, SAL 127  
Web Site: blackboard.usc.edu

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**Objective:** In this course, you will learn how to create computer models of discrete event systems, and how to use these models to make decisions about the design/improvement of the actual physical systems that the models represent. You will learn how to evaluate a business system and identify the input and output variables. You will learn how to evaluate field data to obtain input information and how to evaluate output predictions from the simulation model to select effective operating policies.

**Text:** Kelton, Zupick, and Ivey, Simulation with Arena, 7th edition (denoted KZI)  
Khoshnevis and Palmer, Discrete Systems Simulation (denoted KP, sections on Blackboard)

**Course Material:** Text sections called out on Reading Assignments, plus topics discussed in lecture by the instructor

**Grading Policies:**

Points Breakdown -

Quizzes	40
Homework	120
Project	150
Exam #1	115
Exam #2	<u>115</u>
Subtotal	540
Final Exam	150

Course GRADES will be determined by the distribution of point totals for the class. “Natural groupings” will be used to assign letter grades. The highest scoring group will receive A’s, the next group is the B’s, and so on. A single point will not be the difference between any two letter grades. A “gap” must exist to create a grade boundary.

QUIZZES will be posted on Blackboard to check your familiarity with important topics from other courses. References to text sections will be given or supplementary documents will be posted for you to review. Each quiz may be taken as many as three times. The maximum score of the three attempts will be used.

HOMEWORK assignments will be due on the following Thursdays:

**January 18, 25; February 1, 22, 29; March 7, 28; April 23 (Tu)**

Late homework will be accepted until noon on the Friday (Wednesday) following the original due date. Homework will be graded on an “all or nothing” basis. If a paper shows an answer to each assigned exercise that uses approximately the correct method, the grade for the assignment is 15 points. If any exercise is unacceptable, the paper will be returned with no points awarded. Completions of returned assignments will be accepted for full credit until noon on the Friday after the assignment is returned to the class.

An EXAM will be given on each of the following dates:

**Thursday, February 8 and Thursday, April 4**

Each exam will cover the material presented up to and including the preceding homework assignment. Points will be assigned to each section of the exam. Partial credit will be awarded according to work shown. No re-takes will be allowed. No make-up exam will be given.

A PROJECT will be due in two parts on the following dates:

**Part I – Thursday, March 21**

**Part II – Tuesday, April 16**

The project will involve development and validation of a computer simulation model. For this project, you will work with an assigned partner. The project assignment will be distributed about five weeks in advance of the Part I due date.

Your team's system description and model layout will be due on **Tuesday, February 20**.

A Peer Review of another team's system description will be due on **Tuesday, February 27**.

The FINAL EXAM is scheduled for **Tuesday, May 7 at 11:00-1:00**. It will be comprehensive and will be graded similarly to the other exams. A student may elect to omit the final exam, if both exams and the project have been completed.

Reading Assignments:

Week	Topic	Text Sections
1	The Simulation Process Discrete Event Systems Queuing Systems Terms & Definitions	KZI: 1.1 – 1.4, 13.1 – 13.9 KP: 2.1 – 2.2 Handout
2	Simulation Models Input Analysis	KZI: 2.1, 2.2, 2.6 – 2.8 KP: 3.4, 4.1 – 4.3
3	Uniform Random Numbers Random Numbers from Other Distributions	KZI: 4.6, 12.1 – 12.3 KP: 4.4 – 4.5
4	Introduction to Arena Statistics Review	KZI: 3.1 – 3.8, Appendix B
5	Modeling Basic Operations Data Collection	KZI: 4.1 – 4.5
6	Exam #1	
7	Terminating vs Nonterminating Operations Output Analysis for terminating simulations Batch Means	KZI: 6.1 – 6.4 KP: 6.1 – 6.5, 6.9 – 6.10

## Reading Assignments (continued):

Week	Topic	Text Sections
8	Modeling Detailed Operations Inventory Systems Terms & Definitions	KZI: 5.7, 5.1 – 5.4 Handout
9	Modeling Detailed Operations (cont.)	KZI: 5.5 – 5.6
10	Common Random Numbers, Paired t-test Simulation Experiments	KZI: 12.4 KP: 6.11.3
11	Comparing Systems with Arena The Oupput Analyzer and the Process Analyzer	KZI: 6.4 – 6.5
12	Exam #2	
13	Sensitivity analysis	Handout
14	Using simulation for prescriptive analytics	KZI: 12.6
15	Optimization with OPT-Quest	KZI: 6.6

### **Academic Integrity:**

The University of Southern California is a learning community committed to developing successful scholars and researchers dedicated to the pursuit of knowledge and the dissemination of ideas. Academic misconduct, which includes any act of dishonesty in the production or submission of academic work, comprises the integrity of the person who commits the act and can impugn the perceived integrity of the entire university community. It stands in opposition to the university's mission to research, educate, and contribute productively to our community and the world.

All students are expected to submit assignments that represent their own original work, and that have been prepared specifically for the course or section for which they have been submitted. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s).

Other violations of academic integrity include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), collusion, knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

The impact of academic dishonesty is far-reaching and is considered a serious offense against the university. All incidences of academic misconduct will be reported to the Office of Academic Integrity and could result in outcomes such as failure on the assignment, failure in the course, suspension, or even expulsion from the university.

For more information about academic integrity see [the student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment, or what information requires citation and/or attribution.

**Students and Disability Accommodations:**

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at [osas.usc.edu](https://osas.usc.edu). You may contact OSAS at (213) 740-0776 or via email at [osasfrontdesk@usc.edu](mailto:osasfrontdesk@usc.edu).

**Support Systems:**

[\*Counseling and Mental Health\*](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[\*988 Suicide and Crisis Lifeline\*](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline is comprised of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[\*Relationship and Sexual Violence Prevention Services \(RSVP\)\*](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[\*Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)\*](#) - (213) 740-5086

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

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[\*The Office of Student Accessibility Services \(OSAS\)\*](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[\*USC Campus Support and Intervention\*](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[\*Diversity, Equity and Inclusion\*](#) - (213) 740-2101

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

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) 442-1200 – 24/7 on call  
Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or [otfp@med.usc.edu](mailto:otfp@med.usc.edu)

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.