

SIE 431/531
Simulation Modeling and Analysis
Fall 2023

Class hours: MWF 10:00 – 10:50 a.m.

Instructor: Prof. Wei Lin

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Office hour: by appointment.

Teaching Assistants:

Ryan Ford

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Office hour:

T: 10:00 am – 11:00 am

W: 7:00 pm – 8:00 pm

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Office hour:

M: 8:00 pm - 9:00 pm

TH: 5:00 pm - 6:00 pm

Purpose: This course is designed to develop student's ability to *model* and *analyze* real systems using *discrete event simulation*. Through this course, the student will understand the power and characteristics of discrete event simulation modeling. During the course, the student will get experience in: (1) formulating an appropriate simulation model for a system, (2) implementing the model as a computer program, and (3) evaluating the output of the model.

Course structure: The course is offered in the flipped classroom mode. In that case, some lectures that are traditionally done in class will be pre-recorded and distributed before class. Homework, usually done at home in the traditional mode, will be done in-class in various forms.

Textbook: *Simulation with Arena*, W. David Kelton, et al, 6th edition, McGraw-Hill, Boston, MA, 2014

Site for the Course Material: Book examples and Arena software can be downloaded from https://highered.mheducation.com/sites/0073401315/student_view0/arena_software_download.html (please download the software and book examples before the first day of the class)

Topics to be covered:

1. Basic concepts of simulation (definitions and types of simulations)
2. Mechanism of discrete event simulation
3. Steady state analysis: rate diagram and non-terminating simulation system

4. Random number generation
5. Input data analysis (input distribution modeling)
6. Simulation modeling using Arena package
7. Review of probability and statistics
8. Simulation output analysis
9. Monte Carlo simulation
10. Verification and validation of simulation models
11. Other simulation approaches (Time driven simulations).

Work Required:

1. Exams: There will be two midterms.
2. Homework: Homework will be assigned on a regular basis.
3. Final project: Final project will be performed as groups. Further information on the project will be provided in a separate handout in the middle of the semester.

Homework Policy:

1. Homework will be assigned on a regular basis.
2. Homework needs to be completed independently unless otherwise notified.
3. All homework needs to be submitted to D2L Dropbox.
4. Each homework set counts 10 points. A maximum of 6 points will be given for late homework. Homework will not be accepted after the solution is discussed.
5. For all homework that involves ARENA models, please submit: 1) the .doe file; 2) a brief summary (less than a page) of the result, including a screenshot of the ARENA model. Please do not submit the output report generated by ARENA towards the end of the simulation.
6. For homework problems with hand calculation, please show all the intermediate results.

Grading Scheme

Grading (SIE 431 on campus and yuma: Section: 001 and 010):

1. Homework: 10%
2. Midterm Exam 1: 25%
3. Midterm Exam 2: 30%
4. Term project: 25%
5. Quiz: 10% (three quizzes with the lowest scores will be dropped)

Grading (SIE 531 on campus: Section: 001):

1. Homework: 10%
2. Midterm Exam 1: 20%
3. Midterm Exam 2: 30%
4. Term project: 30%
5. Quiz: 10% (three quizzes with the lowest scores will be dropped)

Grading (SIE 431/531 online: Sections:025, 110, 210, 410):

1. Homework: 15%
2. Midterm Exam 1: 25%

3. Midterm Exam 2: 25%
4. Term project: 35%

Inclusive Excellence:

Inclusive Excellence is a fundamental part of the University of Arizona's strategic plan and culture. As part of this initiative, the institution embraces and practices diversity and inclusiveness. These values are expected, respected and welcomed in this course. This course supports elective gender pronoun use and self-identification; rosters indicating such choices will be updated throughout the semester, upon student request. As the course includes group work and in-class discussion, it is vitally important for us to create an educational environment of inclusion and mutual respect.

Homework Policy:

- 1) Homework will be assigned on a regular basis.
- 2) All assignments need to be submitted to D2L Dropbox.
- 3) Each homework set counts 10 points. Late submission will be accepted but 3 points will be deducted for lateness. Late submission will not be accepted after the solution is discussed in the lecture.
- 4) For all homework that involves ARENA models, please submit: a) the .doe file; and b) a brief summary (less than a page) of the result, including a screenshot of the ARENA model. Please do not submit the output report generated by ARENA towards the end of the simulation.
- 5) For homework problems with hand calculation, please show all the intermediate result.