

ME5960/6960-009 Systems Simulation

Fall 2021

Professor: Todd Easton

Office:

Email:

Phone:

Class Time:

Office Hours:

Textbook: None

Course Description: This course uses Monte Carlo simulation using a commercial simulation package to model numerous types of systems. By using output from these models, students will devise methods to improve the system and obtain statistical results of the anticipated improvement. Topics covered include: simulation software, modeling complex systems, analyzing output for inefficiencies, hypothesis testing, distribution fitting, confidence intervals, random number and random variate generation.

Course Objectives: By taking this course, the student should develop the following skills.

Identify engineering problems related to the production of goods and services.

Measure, evaluate and improve production processes and systems to produce goods and services.

Design and implement efficient production processes and systems to produce goods and services.

Communicate effectively in a professional role with specific capability to write technical reports and presents results effectively.

These objectives will be met by being able to model almost any system in Arena, have a general idea of how simulation works and the problems that this can cause in the analysis, apply statistics to simulated data, and write quality reports.

Grading Scheme

60% 4 Projects (15% each) (Due Sept. 25, Oct. 16, Nov. 6, Dec. 3)

15% Final Project (solo) Due on Wed at 9 am during finals week

25% Exam taken near the beginning of December in class

Projects: Projects should be done in groups of 2 people for undergraduate students and individually by graduate students. Extra work may also be assigned for graduate students. Each project should include a 1 page executive summary (25%), a technical report (25%) and the model (50%).

You may consult with other groups regarding modeling ideas, but do not copy each others models or projects. Each project has an optimization section, so each project should include an email of the base simulation and the student's recommended optimized system. The word document is preferred in hard copy to the professor, unless the student is on-line, then an online submission is fine.

Attendance:

Attendance is heavily encouraged but not required. However, I view it as your job to be here. I will bring handouts.

Research on learning has indicated several things about the way people best absorb and retain information. One finding is that after 10-15 minutes of 'lecture' type presentation, retention rapidly diminishes. Another is that focused discussions between pairs of students can help to improve retention. It also can help create a focus for material being covered. Research indicates that learning is better accomplished through a combination of repetition and active thinking about a topic. I will use cards and lecture based tutoring teaching style. If you are here, you can expect to be asked questions about the course topics.

Nature of the course: The course is time intensive at times. Each project takes from 30-100 hours depending on your ability with computer programming and modeling. I will be around to help you with your simulations.

Tentative schedule:

Week 1-2: Introduction to simulation, Arena and distributions

Week 3: Attributes, variables and assignments

Week 4: Building various models

Week 5: Analysis and improving simulation models

Week 6-7: Complex Arena logic

Week 8: Transporters

Week 9: Automated Guided Vehicles

Week 10: Basics of statistical tests

Week 11: Comparison of means test and confidence intervals

Week 12: Deriving probability distributions from data.

Week 13: Random number generation and random variates

Week 14: Variance reduction techniques and MM1 basic simulation

Week 15: Review of topics covered and using simulation in industry

WWW: The course information (projects, handouts, etc.) will be posted on the Canvas.

University Policies

1) Academic Honesty:

All students are responsible for their own work. Please review the University of Utah's "Rights and Responsibilities of Students (Student Code/Misconduct)"

policies for details about the consequences of misconduct. Students must also complete the Canvas Module for Academic Integrity before accessing other materials on the course Canvas site.

- Violations include, but are not limited to:

a) Cheating on an examination:

such as copying from another's paper, using unauthorized notes, calculators, etc., or giving or receiving unauthorized aid, such as trading examinations, whispering answers, passing notes, or using electronic devices to transmit or receive information.

b) Plagiarism:

This is using someone else's work without giving credit. It is, for example, using ideas, phrases, papers, laboratory reports, computer programs, data - copied directly or paraphrased - that you did not arrive at on your own. Sources include published works such as book, movies, Websites, and unpublished works such as other students' papers or material from a research service. In brief, representing someone else's work as your own is academically dishonest. The risk of plagiarism can be avoided in written work by clearly indicating, either in footnotes or in the paper itself, the source of any major or unique idea or wording that you did not arrive at on your own. Sources must be given regardless of whether the material is quoted directly or paraphrased.

c) Unauthorized collaboration:

This is working with or receiving help from others on graded assignments without the specific approval of the instructor. If in doubt, seek permission from the instructor before working with others. Students are encouraged to learn from one another: Form study groups, discuss assignments, BUT each assignment must be individual work unless specifically stated and turned in as a group assignment.

- Copying another student's assignment and putting your name on it is plagiarism. - You are encouraged to talk to one another about your assignments; however, all assignments must be done by the student whose name is on it!

d) Academic Integrity:

Engineering is a profession demanding a high level of personal honesty, integrity and responsibility. Therefore, it is essential that engineering students, in fulfillment of their academic requirements and in preparation to enter the profession, adhere to the Department of Mechanical Engineering Policy for Academic Misconduct.

This policy is based upon:

[the University of Utah's Policy 6-400: Code of Student Rights and Responsibilities](#)

As part of the ME policy, students must review and acknowledge the:
[“ME EN Academic Misconduct Policy”](#)

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Both documents can be downloaded from the course Canvas page.

Students must provide acknowledgment of the MEEN Academic Misconduct policy via the Canvas Academic Integrity Module for this course before the end of the second week of class or they will be unable to access course content through the Canvas modules.

COLLEGE OF ENGINEERING GUIDELINES –

<https://www.coe.utah.edu/students/academicaffairs/academics/semester-guidelines/>

2) The Americans with Disabilities Act.

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

3) University Safety Statement.

The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu.

4) Addressing Sexual Misconduct.

Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran’s status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

5) COVID-19 Campus Guidelines. Students are required to self-report if they test positive for COVID-19. To report, please contact:

COVID-19 Central @ The U
801-213-2874
coronavirus.utah.edu

To reduce the spread of COVID-19 on campus, **face coverings are required in all in-person classes for both students and faculty.**

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Based on CDC guidelines, the University requires everyone to wear face coverings in shared public spaces on campus. **If you repeatedly fail to wear a face covering in class, you may be referred to the Dean of Students for a possible violation of the Student Code.**

Some courses may require attendance due to hands-on coursework. Please read the syllabus and class requirements for the course thoroughly.

Some students may qualify for accommodations and exemptions from these guidelines through the Americans with Disabilities Act (ADA).

Accommodations should be obtained prior to the first day of class.

If you believe you meet these criteria, contact:

Center for Disability and Access

801-581-5020

disability.utah.edu

162 Union Building

200 S. Central Campus Dr.

Salt Lake City, UT 84112

6) Drop/Withdrawal Policies.

Students may drop a course within a given timeline of a given semester without any penalties. Students may officially withdraw (W) from a class or all classes after the drop deadline through the midpoint of a course. A “W” grade is recorded on the transcript and appropriate tuition/fees are assessed. The grade “W” is not used in calculating the student’s GPA. For deadlines to withdraw from full-term, first, and second session classes, see the U's Academic Calendar.

7) Other important information to consider including:

a) Student Code:

<http://regulations.utah.edu/academics/6-400.php>

b) Accommodation Policy (see Section Q):

<http://regulations.utah.edu/academics/6-100.php>

8) Wellness Statement.

Your personal health and wellness are essential to your success as a student. Personal concerns like stress, anxiety, relationship difficulties, depression, or cross-cultural differences can interfere with a student’s ability to succeed and thrive in this course and at the University of Utah.

Please feel welcome to reach out to your instructor or TA's to handle issues regarding your coursework. For helpful resources to manage your personal wellness and counseling options, contact:

Center for Student Wellness

801-581-7776

wellness.utah.edu

2100 Eccles Student Life Center

1836 Student Life Way

Salt Lake City, UT 84112

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Women's Resource Center

801-581-8030

womenscenter.utah.edu

411 Union Building

200 S. Central Campus Dr.

Salt Lake City, UT 84112

9) Students with Disabilities

The Center for Disability Services is dedicated to serving students with disabilities by providing the opportunity for success and equal access at the University of Utah. They also strive to create an inclusive, safe, and respectful environment.

For more information about what support they provide and links to other resources, view their website or contact:

Center for Disability Services

801-581-5020

disability.utah.edu

162 Union Building

200 S. Central Campus Dr.

Salt Lake City, UT 84112

Students of Ethnic Descent

10) Other Student Groups at the U

To learn more about some of the other resource groups available at the U, check out:

getinvolved.utah.edu/

studentsuccess.utah.edu/resources/student-support

