

Industrial Systems Simulation
 ESI 4523 Section 225D
Class Periods: MWF, Period 7 (1:55-2:45 PM)
Location: Zoom
Academic Term: Spring 2021

Instructor:	Dr. Karen T. Hicklin , Assistant Professor Department of Industrial and Systems Engineering khicklin@ufl.edu	Office Hours (via Zoom): Wednesdays: 3-4pm Thursdays: 12-1pm
Teaching Assistant:	Behshad Lahijanian b.lahijanian@ufl.edu	Office Hours (via Zoom): TBA
Grader:	Lawson Hefler lawson.hefler@ufl.edu	Office Hours (via Zoom): TBA

Course Description

Credits: 3; Computer programming aspects of digital simulation. Simulation methodology and languages. Design and analysis of simulation experiments as well as applications to solutions of industrial and service system problems.

Course Pre-Requisites / Co-Requisites

- COP 2271 Computer Programming For Engineers
- STA 4322 Introduction to Statistics Theory with minimum grades of C

Course Objectives

This 3-credit course intends to introduce students to the basic techniques of discrete event simulation used for modeling, analyzing, and simulating complex industrial systems. By the end of this course, students will:

- Learn techniques for modeling and analyzing industrial systems based on the following approaches: spreadsheet-based Monte Carlo, process-interaction simulation, and discrete event simulation.
- Develop graphical and statistical techniques using software tools for estimating stochastic simulation inputs, verifying, validating, and animating simulation models, and analyzing stochastic simulation outputs.
- Learn techniques for the generation of random numbers, non-uniform random variables, and time-dependent arrival processes.

Major Outcome: Model, analyze, and optimize complicated problems using computer simulation.

Relation to Program Outcomes (ABET):

This is a course with significant design content. Throughout the semester, students will complete a team project expected to meet specific design criteria.

Outcome	Coverage**
1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Medium
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Medium
3. An ability to communicate effectively with a range of audiences	Low
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Low

5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	High
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	High
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

**Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks, Materials, and Software

- **Laptop:** You must have a laptop to be enrolled in this course. Needed to access software and to complete in-class activities, homework assignments, exams, and term project.
- **Software:**
 - Simio Simulation Software
 - Option 1: Simio Academic RPS Edition is available at no cost on UF Apps (<https://apps.ufl.edu>)
 - Option 2: Simio Student Version is available for \$25 or 1 year of unlimited access (<https://www.simio.com/academics/order-academic-software/student-edition-order.php>)
 - Zoom
 - This course is offered 100% through online delivery, including all lectures, office hours, labs, and presentations
 - Zoom is a video conferencing software that is accessible via our Canvas Site: <https://ufl.instructure.com/courses/417425>
 - Honorlock
 - Honorlock will proctor your exams this semester. Honorlock is an online proctoring service that allows you to take your exam from the comfort of your home. You DO NOT need to create an account or schedule an appointment in advance. Honorlock is available 24/7 and all that is needed is a computer, a working webcam, and a stable Internet connection.
 - To get started, you will need Google Chrome and to download the Honorlock Chrome Extension. You can download the extension at www.honorlock.com/extension/install.
 - When you are ready to test, log into Canvas, go to your course, and click on your exam. Clicking "Launch Proctoring" will begin the Honorlock authentication process, where you will take a picture of yourself, show your ID, and complete a scan of your room. Honorlock will be recording your exam session by webcam as well as recording your screen. Honorlock also has an integrity algorithm that can detect search-engine use, so please do not attempt to search for answers, even if it's on a secondary device.
 - Honorlock support is available 24/7/365. If you encounter any issues, you may contact them by live chat, phone (855-828-4004), and/or email (support@honorlock.com).
- **Course Textbook:** Smith, J.S., Sturrock, D.T., & Kelton, W.D. (2018). Simio and Simulation: Modeling, Analysis, and Applications (Vol. 5). Simio, LLC. (<https://www.simio.com/publications/Simio-and-Simulation-Modeling-Analysis-Applications-Edition-05/>; option for \$29 full-color ebook)

Course Schedule*

Week	Dates	Topic	Deliverables
1	January 11	Chapter 1: Introduction to Simulation (Part 1)	HW: Getting to Know You QUIZ: Syllabus Quiz
	January 13	Chapter 1: Introduction to Simulation (Part 2)	HW: Module 1 Assignment
	January 15	Review: Statistics, Probability, and Queueing (Part 1)	ICA: Statistics Assignment 1

2	January 18	No Class – Martin Luther King Jr. Holiday	
	January 20	Review: Statistics, Probability, and Queueing (Part 2)	ICA: Statistics Assignment 2
	January 22	Chapter 2: Basics of Queueing Theory	
3	January 25	Chapter 3: Fundamentals of Simulation (Part 1)	
	January 27	Chapter 3: Fundamentals of Simulation (Part 2)	ICA/HW: Human Simulation Demo
	January 29	Lab Assignment 1	
4	February 1	Chapter 3: Fundamentals of Simulation (Part 3)	ICA: Hand Simulation QUIZ: Statistics Quiz
	February 3	Chapter 4: First Simio Models (Part 1)	HW: Module 4.1 Assignment
	February 5	Chapter 4: First Simio Models (Part 2)	HW: Module 4.2 Assignment
5	February 8	Chapter 4: First Simio Models (Part 3)	HW: Module 4.3 Assignment
	February 10	Lab Assignment 2 (Day 1)	
	February 12	Lab Assignment 2 (Day 2)	
6	February 15	Chapter 4: First Simio Models (Part 4)	HW: Module 4.4 Assignment
	February 17	Chapter 4: First Simio Models (Part 5)	HW: Module 4.5 Assignment
	February 19	Project Work Day	PROJECT: Project title and abstract
7	February 22	Chapter 5: Intermediate Modeling (Part 1)	HW: Module 5.1 Assignment
	February 24	Lab Assignment 3 (Day 1)	
	February 26	Lab Assignment 3 (Day 2)	
8	March 1	Mid-term 1 Review	
	March 3	<u>MID-TERM 1 (Good luck!!) 7-9 PM</u>	
	March 5	Chapter 5: Intermediate Modeling (Part 2)	HW: Module 5.2 Assignment
9	March 8	Chapter 5: Intermediate Modeling (Part 3)	HW: Module 5.3 Assignment
	March 10	Chapter 5: Intermediate Modeling (Part 4)	HW: Module 5.4 Assignment
	March 12	Chapter 6: Input Analysis (Part 1)	HW: Module 6.1 Assignment
10	March 15	Chapter 6: Input Analysis (Part 2)	HW: Module 6.2 Assignment
	March 17	Lab Assignment 4 (Day 1)	
	March 19	Lab Assignment 4 (Day 2)	
11	March 22	Chapter 7: Working with Modeling Data (Part 1)	HW: Module 7.1 Assignment
	March 24	No Class – Spring Recharge Day	
	March 26	Chapter 7: Working with Modeling Data (Part 2)	HW: Module 7.2 Assignment
12	March 29	Chapter 8: Animation and Entity Movement (Part 1)	HW: Module 8.1 Assignment
	March 31	Chapter 8: Animation and Entity Movement (Part 2)	HW: Module 8.2 Assignment
	April 2	Chapter 9: Advanced Modeling (Part 1)	HW: Module 9.1 Assignment
13	April 5	Chapter 9: Advanced Modeling (Part 2)	HW: Module 9.2 Assignment
	April 7	Lab Assignment 5 (Day 1)	
	April 9	Lab Assignment 5 (Day 2)	
14	April 12	Mid-term 2 Review	
	April 14	<u>MID-TERM 2 (Good Luck!!) 7-9 PM</u>	
	April 16	Project Work Day	
15	April 19	Project Work Day	
	April 21	Project Work Day	
FINAL	April 29 10AM-12PM	Final Project Presentations	PROJECT: Report and Presentation

*This course schedule is tentative and subject to change as the semester progresses.

ICA = in-class assignment
HW = homework

Exams (40%)

There will be two exams. Exam 1 will cover Chapter 1-4 and any supplementary material presented during this time frame. Exam 2 will cover Chapter 5-8 and any supplementary material presented during this time frame.

Exam 1: Wednesday, March 3 (20%)	7-9 PM Evening Exam	Honorlock
Exam 2: April 16	7-9 PM Evening Exam	Honorlock/Take-home

Labs (25%)

There will be 5 in-class labs and each will be followed by a lab homework assignment. The course instructor and TA will walk you through the lab materials and you will be able to ask questions and work together to solve the problems. The resulting homework will be an individual assignment due 5-7 days later (check CANVAS for specific deadlines).

Lab Dates:

Lab 1	Friday (January 29)
Lab 2	Wednesday (February 10) and Friday (February 12)
Lab 3	Wednesday (February 24) and Friday (February 26)
Lab 4	Wednesday (March 17) and Friday (March 19)
Lab 5	Wednesday (April 7) and Friday (April 9)

Canvas Assignments/Homework (15%)

Assignments may be given periodically to reinforce course content covered. There are four mechanisms that will result in graded content:

- 1) Canvas questions may be used for in-class participation and knowledge checks.
- 2) Attendance will be taken during labs, presentations, etc.
- 3) Flipped classroom (Chapter 4-9) - the instructor will ask that some of the files be submitted to ensure the students are keeping up with the pace of the course and practicing the models.
- 4) Graded quizzes from the flipped classroom videos.

These grades will be tallied and account for 15% of the final course grade.

Not all assignments will be graded. Instead, one or more problems may be randomly selected and graded. All work is assumed to be individual work unless the specific assignment denotes a group activity.

Final Project (20%)

There will be a team-based term project worth of 20% of the final course grade. Each team will consist of 4-5 students. The goal of the project is to extend material covered in class to a real-world or research problem ideal for simulation. Each group will choose the topic and research questions. Additional assistance will be given to groups who have a hard time deciding on a project.

Project Deadlines:

Project Overview	February 19	
Title and Abstract	February 26	1 page title and abstract
Project Presentations	April 29	~10 mins presentations per group
Final Report	April 29	<30 page report
Team Evaluations	April 29	1-2 page evaluations using template

Online Course Recording

Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Attendance Policy, Class Expectations, and Make-Up Policy

- **Attendance:** This course will be a mix of live sessions and pre-recorded material. Attendance is required for all live sessions, which will occur during the class period (**MWF, 1:55-2:45PM**). A list of classes of when attendance is required is provided below. However, there may be changes to this schedule as the semester progresses and you will be made aware of all changes in advance. Excused absences must be consistent with university policies in the Undergraduate Catalog and require appropriate documentation (<https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>).
 - University and Departmental guidelines will be applied to categorize excused and unexcused absences. Students unable to attend class should notify the instructor of excused absences via email IN ADVANCE of the planned absence; in emergency situations the notification should occur BEFORE THE NEXT SCHEDULED LECTURE.
 - Regardless of whether an absence is excused or unexcused, students are responsible for any coursework missed as a result of the absence. As most assignments will be posted in advance, students should have sufficient time to complete and submit these assignments in spite of excused activities/absences, unless otherwise discussed and approved by the professor. For excused absences, students are expected to be aware of all announcements made in class and know all previously covered material when attending the following class.
- **Class Expectations:**
 - Please keep Zoom audio muted unless asking a question, responding, or presenting
 - Avoid surfing the internet, texting, using phone/tablet apps, and checking email
 - Please be courteous to your fellow classmates
 - More class rules and expectations checkout the “Netiquette Guidelines” posted on the course website in *Module 0*
- **Missed assignments:** Late homework assignments will be accepted for 24 hours with a 20% deduction. There will be no makeup exams. A student is permitted to make up a missed exam (without penalty) if he/she has a conflict between an exam/quiz and a scheduled University-approved activity (please do not ask for a make-up exam to attend a job interview). A student needing a make-up exam due to schedule conflicts must notify the instructor at least one week before the day the exam is scheduled for. If notification Excused absences are consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation. You are expected to be present without exception and to plan any travel around these dates accordingly. Medical emergencies are of course excluded if accompanied by a doctor's note. A note indicating that you were seen at the health center the day of the exam is not sufficient documentation of a medically excused absence from an exam. The note must say that you were medically unable to take the exam. If you fail to take the exam on the assigned day and do not have a valid excuse, there will be no make-up exam and you will be given a zero (0) on the exam. Employment interviews, employer events, weddings, vacations, etc. are not excused absences.

Evaluation of Grades:

Assignment	Percentage of Final Grade
Canvas/Homework Assignments	15%
Lab Assignments	25%
Midterm Exam 1	20%
Midterm Exam 2	20%
Final Project	20%
Total	100%

Grading Policy

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Course Evaluation

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu.
<https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://care.dso.ufl.edu>.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.