

Digital Simulation Techniques

EIN 6529 Section 1FE2/2FED/CAMP/OVER

Class Periods/Location:

T, Period 4 (10:40 AM - 11:30 AM) / CSE E112

R, Period 4/5 (10:40 AM - 12:35 PM) / CSE E112

Academic Term: Spring 2023

Instructor:	Dr. Karen T. Hicklin Assistant Professor Department of Industrial and Systems Engineering khicklin@ufl.edu	Teaching Assistant:	Haolan Zheng haolan.zheng@ufl.edu
Office Hours (via Zoom):	Wednesdays: 1-2pm and by appointment	Office Hours (via Zoom):	Fridays: 1-3pm

Course Description

Credits: 3; Computer programming aspects of digital simulation. Deterministic simulation, stochastic simulation. Use of 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

Computer programming and probability theory

Course Objectives

This 3-credit course intends to introduce the basic techniques for the modeling and simulating industrial systems incorporating uncertainty. By the end of this course, students will have gained experience in the following aspects:

- Understand the major capabilities and limitations of simulation modeling
- Formulation of appropriate simulation models for a system
- Implementation of discrete event simulation using computer simulation software
- Evaluation of output data from simulation models

Materials and Supply Fees

None

Required Software

- **You must have a laptop to sign up for this course.** The laptop is necessary for the in-class exercises, homework assignments, and term project.
- **Simio (Simulation Software)**
 - Option 1: The Simio Academic RPS Edition is available at no cost on UF Apps (apps.ufl.edu).
 - Option 2: The Simio Personal Edition is offered to all Simio users and is available at no cost. The Personal Edition can be used to solve most but not all models found in the Simio textbook but is generally not recommended for a formal class where assignments must be submitted. The Personal Edition can be downloaded here: <https://www.simio.com/free-simulation-software/index.php>
 - Option 3: The Simio Student Version is only for students taking a class and is available for a nominal fee (US \$25 for 1-year unlimited access to a \$10,000 product). You can expect more detail on this option in a course announcement.
 - Option 4: Simio has a biannual student competition. If you choose to participate in the competition you will receive complimentary student software valid for the duration of the competition. <https://www.simio.com/academics/student-competition/>

Required 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)

Recommended Reading

- Law, "Simulation Modeling and Analysis", 5th Edition, McGraw-Hill, ISBN-10: 0073401323, ISBN-13: 978-0073401324

Tentative Course Schedule*

Week	Dates	Topics	Deliverables
1	Jan 10	Module 1: Course Overview, Introduction to Simulation	
	Jan 12	Module 1: Course Overview, Introduction to Simulation	
2	Jan 17	Module 2: Probability, Statistics, Random Number, Random Variables	HW 1 Assigned
	Jan 19	Module 2: Probability, Statistics, Random Number, Random Variables	
3	Jan 24	Module 3: Random Variable Generation, Queueing, Hand Simulation	HW 2 Assigned
	Jan 26	Module 3: Random Variable Generation, Queueing, Hand Simulation	ICA 1 Assigned
4	Jan 31	Module 4: Fundamentals of Simulation, First Simio Models	
	Feb 2	Module 4: Fundamentals of Simulation, First Simio Models	
5	Feb 7	Module 4: Fundamentals of Simulation, First Simio Models	
	Feb 9	Module 4: Fundamentals of Simulation, First Simio Models	ICA 2/HW 3 Assigned
6	Feb 14	Module 4: Fundamentals of Simulation, First Simio Models	Project Details Presented
	Feb 16	Module 4: Fundamentals of Simulation, First Simio Models	
7	Feb 21	<i>Exam 1 Review</i>	
	Feb 23	<i>Exam 1</i>	
8	Feb 28	Module 5: Intermediate Modeling	
	Mar 2	Module 5: Intermediate Modeling	ICA 3/HW 4 Assigned
9	Mar 7	Module 5: Intermediate Modeling	
	Mar 9	Module 6: Input Analysis	
10	Mar 14	NO CLASS - SPRING BREAK	
	Mar 16	NO CLASS - SPRING BREAK	
11	Mar 21	Module 6: Input Analysis	
	Mar 23	Module 7: Model Data	ICA 4/HW 5 Assigned
12	Mar 28	Module 8: Animation and Entity Movement	Midterm Report, Evaluations
	Mar 30	Module 8: Animation and Entity Movement	
13	Apr 4	Module 9: Advanced Modeling	
	Apr 6	Module 9: Advanced Modeling	ICA 5/HW 6 Assigned
14	Apr 11	<i>Exam 2 Review</i>	
	Apr 13	<i>Exam 2</i>	
15	Apr 18	Project Workday	

	Apr 20	Project Workday	
16	Apr 25	Final Project Presentations	Project Presentation Due
FINAL	May 4	Final Exam Period: 5:30-7:30 PM (reserved if needed)	Final Report, Evaluations Due

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

Assignments

All work is assumed to be individual work unless the specific assignment denotes a group activity.

Exams (40%)

There will be two exams. Exam 1 will cover Chapters 1-4 and any supplementary material presented during this time frame. Exam 2 will cover Chapters 5-9 along with any supplementary material presented during this time frame. There will not be a final exam. However, the final exam time block is noted on the syllabus schedule as back-up in case it is needed.

Exam and Date	Logistics
Exam 1: Thursday, February 23	Class period (100 minutes allowed to complete exam)
Exam 2: Thursday, April 13	Class period (100 minutes allowed to complete exam)

Homework and Class Assignments (25%)

In some weeks there will be in-class assignments sessions related to the homework. Homework is submitted as an individual assignment; however, you are permitted to ask questions and work together to solve the problems. It is recommended that you attend the lab so that you will feel comfortable with homework questions.

Canvas Assignments (15%)

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

1. Canvas quizzes may be used for in-class participation and knowledge checks.
2. Graded quizzes from the flipped classroom (Chapters 4-9) -
Embedded quizzes and/or file submissions may be required to ensure the students are keeping up with the pace of the course and practicing the models.

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

Term project (20%)

There will be a team-based term project. The project requires the modeling of a stochastic service system. Teams are required to handle input and output analysis, build animation, set-up performance measures, etc. and evaluate alternative system designs. The prompt for the project will come from the Simio Student Competition: <https://www.simio.com/academics/student-competition/>. More details on the course project will be presented in class.

Evaluation of Grades

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

Grading Policy

Grade	Range	Grade Points
A	93.0 - 100.0	4.00

A-	90.0 – 92.9	3.67
B+	87.0 – 89.9	3.33
B	83.0 – 86.9	3.00
B-	80.0 – 82.9	2.67
C+	77.0 – 79.9	2.33
C	73.0 – 76.9	2.00
C-	70.0 – 72.9	1.67
D+	67.0 – 69.9	1.33
D	63.0 – 66.9	1.00
D-	60.0 – 62.9	0.67

More information on UF grading policy may be found at: <https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

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

- Attendance is required. That is, for asynchronous sessions, the lecture recordings should be reviewed, and for synchronous sessions, students should show up during class meeting time.
- 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 because of the absence. Students are expected to be aware of all announcements made in class and know all previously covered material when attending the following class.

Late Assignments and Exam Make-Up Policy

- Late assignments will be accepted for **24 hours** after the due date with a **20% deduction**.
- In cases where students would like to appeal a grade, this should be done within one week of when the assignment has been graded. The appeal regarding homework and class assignments can be directed to the TA and all other appeals (i.e., canvas quizzes, exams, project components, etc.) should be directed to the course instructor.
- In general, there will be no makeup assignments given. However, a student is permitted to make up a missed assignment without penalty if he/she has a conflict between the assignment and a scheduled University-approved activity. A student needing a make-up assignment due to schedule conflicts must notify the instructor at least one week before the day the exam or assignment is scheduled. Excused absences are consistent with university policies and require appropriate documentation.

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 Content Availability

The Canvas e-Learning system will be used to disseminate course related material and turning in assignments during the semester. Specific details will be discussed in class. Our class sessions will be audio visually recorded for students in the class to refer back to and for enrolled students who are attending online.

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/>.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

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>.