

**Digital Simulation Techniques**  
ESI 6529 Section 1HYB/CAMP  
**Class Periods:** M,W,F (4:05 pm -4:55 pm)  
**Location:** WEB  
**Academic Term:** Spring 2021

**Instructor:**

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352-294-7716

Office Hours: Wednesday 1 pm to 3 pm, Zoom

**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**

*COP 2271* Computer Programming For Engineers, *STA 4322* Introduction to Statistics Theory, and *ESI 4313* Operations Research 2 with minimum grades of C.

**Course Objectives**

This 3-credit course intends to introduce the basic techniques for modeling and simulating industrial systems in the presence of uncertainty. You will gain experience in

- Understand the major capabilities and limitations of simulation
- Formulating an appropriate simulation model for a system
- Implementing the model as a computer program
- Evaluating the output of the model

**Materials and Supply Fees**

\$57.99

**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.
- For the class you will require access to the ARENA Software, and the student version is freely available through the following link: <https://www.arenasimulation.com/academic/students>. ARENA is not compatible with Mac OS. An alternative option is to use UF Apps to access ARENA if you do not own a PC.
- Zoom. 100% online course delivery (lectures, office hours, labs, and project presentations) will be held using Zoom. Zoom is a video conferencing software that is accessible via CANVAS.
- 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](http://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](mailto:support@honorlock.com)).

### Required Textbooks

- Kelton, Sadowski, and Sturrock, "Simulation Using ARENA", 5th Edition, McGraw-Hill, ISBN 10: 0073376280 ISBN 13: 9780073376288

### Recommended Reading

- Law, "Simulation Modeling and Analysis", 4th Edition, McGraw-Hill, ISBN-10: 0073294411 ISBN-13: 978-0073294414

### Tentative Course Schedule

Week	Class Subject	Chapter	Class Subject	Chapter	Remark
1	Introduction	1	Monte Carlo Simulation	1/Handout	
2	Basic Probability and Statistics	App B	Random Number Generation	12	
3	Random Variable Generation – Inverse Transformation Method	12	Random Variable Generation – Acceptance Rejection Method	12/Handout	Lab 1
4	Queueing Theory	Handout	Simulation Concepts	2	
5	Simulation by Hand	2	Tour of Arena	3	Lab 2
6	Tour of Arena	3	Review for Exam	Handout	<b>Exam 1</b>
7	Basic Modeling - Flowchart modules	4	Basic Modeling – Data modules	4	
8	Distribution Fitting	Handout	Input Analysis	4	Lab 3
9	Modeling Detailed Operations – More modules	5	Modeling Detailed Operations	5	
10	Hypothesis testing	Handout	Output Analysis	6	Lab 4
11	Output Analysis	6	Steady-State Analysis	7	
12	Intermediate Modeling	7	Variance Reduction Technique	12	Lab 5
13	Agent-Based Simulation	Handout	Review for Exam	Handout	<b>Exam 2</b>
14	Hybrid Simulation	Handout	<i>*Project - No Class*</i>		
15	<i>*Project - No Class*</i>		<b>Project Presentations</b>		

### Attendance Policy, Class Expectations, and Make-Up Policy

- Attendance is required, i.e., for asynchronous sessions, the lecture recordings should be reviewed, and for synchronous sessions, students should show up during the zoom meeting.
- Excused absences must be consistent with university policies in the Graduate Catalog and require appropriate documentation. (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>)
- University and Departmental guidelines will be applied to categorize excused and unexcused absences.
  - Students unable 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 Rules
  - Keep Zoom audio on mute unless asking a question, responding, or presenting
  - Avoid surfing the internet, texting, using phone/tablet apps, and checking e-mail during class to prevent distracting yourself. We recommend placing your phone and/or tablet across the room to avoid distractions while attending class or watching videos.
  - For more class rules and expectations, see the “Netiquette Guidelines” posted on the course website
- Course Communication
  - Important communication from the course instructor will be posted on the CANVAS “Announcements” page
  - Canvas messaging is the preferred method of communication for the instructor. Please give the instructor 28 hours to respond to questions. You are highly encouraged to “bump” the messages to the instructor’s attention if you have not received a response within 48 hours

### ***Late Assignments and Exam Make-up Policy***

- Late homework assignments will be accepted within 24 hours after the due date with a 20% deduction.
- In general, there will be no makeup exams given. However, 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. 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.
- If a student wants to argue their grade, they must do so within the first week of the grade posted.

### ***Lab Sessions***

Every other week will be a lab session. Following the lab materials, you will be able to ask questions and work together to solve the problems. It would be a good idea to attend the lab so that you will feel comfortable with homework questions.

### ***Homework Assignments and Term Project***

There will be five homework assignments. **They will be due the following week’s Wednesday by 11:59 pm.** This is individual work. Term project is group work and effort report and peer evaluation are required.

### ***Academic Integrity***

Academic integrity requires that students take credit only for ideas and efforts that are their own. Students must not use unauthorized assistance, materials, information, or study aids in any assessments. Students must not use another person or his or her work as a substitute in taking assessments or completing homework or activities. Students must not take any credit for a team project unless the student has made a fair and substantial contribution to the group effort. Lastly, student must not intentionally or knowingly help or attempt to help another student to commit an act of academic misconduct.

### ***Evaluation of Grades***

<b>Assignment</b>	<b>Total Points</b>	<b>Percentage of Final Grade</b>
Homework (5)	20 each	25%
Exam 1	100	25%
Exam 2	100	25%
Group Project	100	25%
<i>Total</i>	<i>400</i>	<i>100%</i>

### ***Grading Policy***

<b>Grade</b>	<b>Range</b>	<b>Grade Points</b>
A	93-100	4.00
A-	90-92	3.67
B+	87-89	3.33
B	83-86	3.00
B-	80-82	2.67
C+	77-79	2.33
C	73-76	2.00
C-	70-72	1.67
D+	67-69	1.33
D	63-66	1.00
D-	60-62	0.67

\*The weighted average will be rounded to the nearest integer.

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 requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/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://www.dso.ufl.edu/sccr/process/student-conduct-honor-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.

### ***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:

<http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

### ***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](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@ufl.edu](mailto:nishida@ufl.edu)

### ***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](mailto:title-ix@ufl.edu)

### ***Campus Resources:***

#### ***Health and Wellness***

#### **U Matter, We Care:**

If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) or 352 392-1575 so that a team member can reach out to the student.

**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 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](mailto: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://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

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