

IE 1083 – Simulation Modeling

Spring 2021

Course Syllabus

(Subject to change)

Instructor

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Office: Zone 4-220

Office Hours: Monday 13:20-16:25

Teaching Assistant

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Office Hours: By appointment

Lecture

Monday: 8:15-11:00 am, Location: Zone 3-104

Course Description

Random number generation; distribution functions and random variates; game of chance; applications of discrete event simulation methods of queuing, inventory control, and production planning problems; Introduction to Arena simulation software. 3 credit hours.

Course Prerequisites

MATH 0240, IE 1070, IE 1081

Course Objectives

1. Learn techniques for modeling and simulating discrete-event systems.
2. Provide an understanding of why good statistics are critical to effective decision making.
3. Use this knowledge to build models that will help solve practical problems.
4. Applications of discrete event simulation methods to queuing, inventory control, and production planning problems.
5. Learn the basics of the Arena simulation software.

Applicable ABET Outcomes

1. An ability to apply knowledge of mathematics, science and engineering.
2. An ability to design and conduct experiments, as well as analyze and interpret data.
3. An ability to identify, formulate and solve engineering problems.
4. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Textbook

1. Jerry Banks, John Carson, Barry Nelson, David Nicol, Discrete-Event System Simulation, 2013, 5th Edition. Prentice Hall, Englewood Cliffs, New Jersey.
2. W. David Kelton, Randall Sadowski, Nancy Zupick, Simulation with Arena, 6th Edition. McGraw-Hill Education, 2 Penn Plaza, New York

Grading

Homework assignments, projects, and exam questions related specifically to the objectives above.

Attendance:	10%
Homework:	20%
Mid-term Examination:	30%
Final Examination:	<u>40%</u>
	100%

Score	Letter Grade
90.00-100.00	A
85.00-89.99	A-
80.00-84.99	B+
76.00-79.99	B
73.00-75.99	B-
70.00-72.99	C+
66.00-69.99	C
63.00-65.99	C-
61.00-62.99	D+
60.00-60.99	D
0.00-59.99	F

Attendance

There are 15 165-minute lecture periods in the semester. Attendance will be taken for each lecture period. Each student is allowed **two** absences. Each absence, after the second absence, will result in a **1% deduction** from the attendance grade. After the **tenth** absence, the student will not be allowed to take the final exam.

Homework and Other Assignments

Homework problems and other assignments will be assigned periodically and are due as stated. Late submission **will not** be accepted. Submissions must be done on **A4 papers and stapled** together at the top left-hand corner. Students' names and ID numbers must be listed on the first page at the top right-hand corner.

Exams

There will two exams, all are CLOSED BOOK, CLOSED NOTES, CLOSED COMPUTER. Students are allowed to bring one A4 page note and it must be hand-written on one side of the paper only. It cannot be a photocopy. If you must miss an exam, you should make alternative arrangements with the instructor before the exam is given. If you miss an exam without prior notification, you will receive a score of "zero" for that exam except under extenuating circumstances.

Make-Up Exams

Students who have not taken both mid-semester and final exams are not eligible for make-up exams. Make-up exams can only be taken by students who have attained between 50.00 % and 59.99 % (out of 100 %) of the total score. Only 75 % of the make-up exam grade can be used to replace the final exam grade. Students taking make-up exams can only attain at most a "D" grade.

Student Opinion of Teaching Surveys

Students in this class will be asked to complete a Student Opinion of Teaching Survey. Surveys will be sent via SCUPI email and appear on your Blackboard landing page during the last three weeks of class meeting days. Your responses are anonymous. Please take time to thoughtfully respond, your feedback is important to me. Read more about Student Opinion of Teaching Surveys.

Avoiding Plagiarism

1. Unacknowledged direct copying from the work of another person, or the close paraphrasing of somebody else's work, is called plagiarism and is a serious offence, equated with cheating in examinations. This applies to copying both from other students' work and from published sources such as books, reports or journal articles.
2. Paraphrasing, when the original statement is still identifiable and has no acknowledgement, is plagiarism. A close paraphrase of another person's work must have an acknowledgement to the source. It is not acceptable for you to put together unacknowledged passages from the same or from different sources linking these together with a few words or sentences of your own and changing a few words from the original text: this is regarded as over-dependence on other sources, which is a form of plagiarism.

Tentative Course Schedule

Lecture	Week	Dates	Topics	Chapter
1	2	March 8	Course Introduction and Review of Syllabus, Introduction to Simulation Modeling, Systems and Models, Discrete Event System Simulation	2
2	3	March 15	Simulation Examples: Single-Server Queue and Inventory Simulation using Excel	3
3	4	March 22	Concepts in Discrete Event Simulation, Elements of Discrete Event Simulation, Examples of DES Models	5
4	5	March 29	Review statistical concepts: Discrete and Continuous Distributions, Confidence Intervals, Hypothesis Testing	9
5	6	April 5	Input Modeling and Data Collection, Identifying the Distribution with the Data, Parameter Estimation, Goodness of Fit Tests	7
6	7	April 12	Simulation Implementation	7
7	8	April 19	Random Number Generation: Linear Congruential Method, Tests for Random Numbers Random Variate Generation: Inverse-Transform Method, Acceptance-Rejection Technique. Mid-term Review	
8	9	April 26	Mid-term Exam	
9	10	May 3	Simulation Software Introduction	
10	11	May 10	Simulation with Arena	
11	12	May 17	Model Verification and Validation, Estimation of Absolute Performance: Output Analysis – Terminating Simulation	10, 11
12	13	May 24	Estimation of Absolute Performance: Output Analysis – Steady State Simulation, Estimation of Relative Performance: Comparison of Two System Designs	12
13	14	May 31	Estimation of Relative Performance: Comparison of Several System Designs	12
14	15	June 7	Simulation of Manufacturing and Material Handling Systems	13
	16	June 14	Dragon Boat Festival. No lectures.	
15	17	June 21	Review	
16	18	June 28	Final Exam	