INEG 5813 Introduction to Simulation

Instructor

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The most effective way to contact me is through electronic mail.

Description

The development and use of discrete-event simulation models for the analysis and design of systems found in manufacturing, distribution, and service contexts. Coverage includes conceptual modeling, model translation to computer form, statistical input models, random number generation and Monte Carlo methods, experimentation and statistical output analysis, and queueing analysis. Includes the use of modern computer simulation languages. Pre-requisite: Graduate Standing

Course Objectives

The objective of the course is to establish a fundamental understanding of the use of discrete-event simulation for modeling and analyzing appropriate problems in industrial engineering contexts. After taking this course, the student is expected to:

1. Be able to describe, model, and document a problem in preparation for the application of simulation solution techniques
2. Be able to recognize, model, and analyze typical queueing scenarios
3. Be able to develop and apply appropriate random number and random variable generation techniques
4. Be able to analyze, model, and select appropriate input distributions
5. Be able to explain simulation time advance mechanisms
6. Be able to apply appropriate simulation statistical output techniques
7. Be able to use the Arena simulation language to model and analyze problems found in industrial engineering practice
8. Be able to analyze and interpret simulation experimental results

Text

Rossetti, M. D. (2016) *Simulation Modeling and Arena*, 2nd Edition, John Wiley & Sons.

Additional readings may be made available through UA's Blackboard System. The ability to program in a general-purpose language such as C, C++, Java, or VB is assumed. Familiarity with spreadsheets and other office productivity software is assumed. Knowledge of probability and statistics is assumed.

Email and Web Page

A web course page has been established for this course on UA's Blackboard system: learn.uark.edu
I will use email and discussion lists within the course. You are responsible for logging into and working with Blackboard on a regular basis.

Weather Policy

Unless conditions require the University to close, students should make every attempt to get to class within the bounds of their personal safety. For information concerning the University's weather related closings see: http://emergency.uark.edu/14701.php I will make every attempt to post a message to Blackboard and/or to student email concerning the cancellation of class. Your responsibility is to check for such messages to the best of your ability.

Grading

Textbook reading assignments are indicated in the course topic outlined below. Each student is expected to have read the material **before** the class in which it will be discussed. The course materials within Blackboard are also organized to facilitate progression through the materials.

The grade for this course will be based on the following:

Quizzes	20%
Exam 1	25%
Exam 2	25%
Final Project	30%
Total	100%

[100 – 90%]	A
(90 – 80%]	B
(80 – 70%]	C
(70 – 60%]	D
(60 - 0]	F

Homework problems from the text or other sources will be suggested on a regular basis but not collected or graded; however, a **substantial portion of the material/questions on quizzes will be based on suggested homework problems**. The **other material on quizzes will be based on the textbook and course materials**. If you do not understand the material, then it is your responsibility to seek assistance. The suggested homework is meant to keep you up to speed with the material and to prepare you for quizzes, the exams and the final project. Honors and graduate students can expect to have additional homework problems, exam problems, and must to the project individually.

The quizzes will be in an on-line format, using Blackboard. Generally, the quiz will be released so that you have 24 hours in which to complete it; however, once you start the quiz it will have a time limit. **If there are any "Blackboard" problems within the last 4 hours of the quiz due date, do not expect me to reset your quiz or make allowances. Thus, waiting until the last minute to submit your quiz has risks.** There will be no-make up quizzes. The two exams will be based on solving problems that cannot be easily assessed with quizzes. You can expect the exams to have a "take home" component as well as an on-line component.

The final project will serve as your final exam for the course. It is a comprehensive model building exercise designed to allow you to demonstrate your full understanding of simulation modeling. More information concerning the project will be provided sometime after the first exam in a separate handout.

I firmly believe that this material is best learned by doing and discussing. *You may discuss your homework/projects with other students in the class within the guidelines of the assignment; however, you must develop your own solutions/programs within the guidelines of* the University's Academic Integrity Policy. *Programs or solutions that are copies of other student's work are considered academic misconduct.*

If you have any questions concerning a grade, see me **within one week** of the assignment's return. No grade will be revised after that time. Unless the proposed revision is immediately clear, you should submit a **typed explanation** for any grade revision.

Code of Ethics

As a core part of its mission, the University of Arkansas provides students with the opportunity to further their educational goals through programs of study and research in an environment that promotes freedom of inquiry and academic responsibility. Accomplishing this mission is only possible when intellectual honesty and individual integrity prevail. Each University of Arkansas student is required to be familiar with and abide by the University's Academic Integrity Policy, which may be found at http://provost.uark.edu/. Students with questions about how these policies apply to a particular course or assignment should immediately contact their instructor.

All work should be turned in with a ***typed*** cover sheet that includes the following information:

Name:	ID#:
Course#:	Assignment#:
Pledge: See below for the appropriate pledge wording to insert	
Signature(s):	Date:

Individual Pledge *(Signed by student):*
On my honor as a University of Arkansas student, I have abided by the University of Arkansas' Academic Integrity Policy on this work.

Group Pledge *(Signed by all students)*:
On our honor as University of Arkansas students we have abided by the University of Arkansas' Academic Integrity Policy on this work. In addition, each of us participated, read, approves, and understands our work.

When an assignment (homework, exam, case study, etc) is marked Individual, each person is ethically bound to work on the assignment alone. For assistance, an individual may contact the Teaching Assistant or the Instructor. Consultation with other students is considered an ethical violation in this instance. When an assignment is marked Group, students may form a group of the specified number to work on the assignment. A group pledge is required, with each person signing the pledge. For assistance, a group may contact the Teaching Assistant or Instructor. Consultation with other groups is considered an ethical violation unless specifically permitted in the assignment instructions. Assignments that are not pledged will be returned without a grade, and shall receive a grade of 0 if not returned within 24 hours pledged. Instances of academic misconduct will not be tolerated and will be dealt with through the University's Judiciary Committee.

Permitted Collaboration:

- Homework: Since homework is not graded, you may *discuss and compare* your homework with other students in the class. Asking a fellow student: What approach did you take? What kind of answers did you get? Talking about model logic, how a module works, etc. are all permitted. But be careful not to collaborate so much that you don't really understand the homework because this lack of understanding will be reflected on your quizzes.
- Exams and Quizzes: No collaboration with other students in the class is permitted in any form. You may not show/discuss/compare your work to another student's work. You may not discuss the exam or quiz questions with another student until the exam has been completed. Violations of this policy are considered academic misconduct. If you know of someone who is collaborating, then you are honor bound to report the offense. Not reporting the offense can be considered aiding and abetting the violation and is considered academic misconduct.
- Project: No collaboration with other students in the class is permitted in any form. You must do your own write up, programs, models, etc. Sharing of models, write ups, programs, etc. is strictly prohibited. Collaboration is limited to the members of your project team.

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Course Outline

Week	Topic	Reading Assignment
1	Overview of Arena	Ch 1.6, 1.7
	How the clock ticks	Ch 1.3
	Simulation methodology	Ch 1.1-1.5,1.8
	Basic Process Modeling	Ch 2.1-5
2	Basic Process Modeling	Ch 2.6-2.7
	Basic Process Modeling	Ch 2.8
	Input Modeling	Ch 3.1-3.2
	Input Modeling	Ch 3.1-3.2
	Random Number Generation	Ch 3.3.2
3	Random variable generation	Ch 3.3.2
	Random variable generation	Ch 3.3.2
	Randomness in Arena	Ch 3.3.3
	Types of Statistical Variables	Ch 4.1. 4.2
	Finite Horizon Simulation	Ch 4.3.1,4.3.2
4	**Exam 1 (details to be announced)**	
	Finite Horizon Simulation	Ch 4.3.3, 4.3.4
	Infinite Horizon Simulation	Ch 4.4
	Infinite Horizon Simulation	Ch 4.4
	Comparing Two Systems	Ch 4.5
5	Comparing multiple systems	Ch 4.5
	Single line queueing stations	Ch 5.1
	Single line queueing stations	Ch 5.1
	Single line queueing stations	Ch 5.1
6	Stations, Routes, and Sequences	Ch 5.2.2
	Stations, Routes, and Sequences	Ch 5.2.2
	Stations, Routes, and Sequences	Ch 5.2.2
	Modeling an (r, Q) inventory system	Ch 5.3.1
	Constrained Transfer with resources	Ch 6.1
	Exam 2 (details to be announced)	
7	Constrained Transfer with transporters	Ch 6.2
	Constrained Transfer with transporters	Ch 6.2
	Modeling Conveyors	Ch 6.3
	Modeling Conveyors	Ch 6.3
	Modeling Guided Path Transporters	Ch 6.4
8	Advanced Resource Modeling	Ch 7.1, 7.2
	Entity and Resource Costing	Ch 7.3
	Generic Station Modeling	Ch 7.4.1
	Pick up and drop off	Ch 7.4.3
	Final Project Due (details to be announced)	