

INEG 3623/INEG 5803 Simulation

Instructor

Manuel D. Rossetti
Professor
Department of Industrial Engineering

Phone: (479) 575 - 6756
Fax: (479) 575 - 8431
Email: rossetti@uark.edu

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.

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. (2015) *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.

INEG 3623/INEG 5803 Simulation

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	40%			Undergraduate Students			Honors & Graduate students	
Exam 1	15%			[100 – 88%]	A		[100 – 90%]	A
Exam 2	15%			(88 – 76%]	B		(90 – 80%]	B
Project	30%			(76 – 64%]	C		(80 – 70%]	C
Total	100%			(64 – 58%]	D		(70 – 60%]	D
Honor and Graduate students will have extra homework assignments, problems on exams, and project requirements.				(58 - 0]	F		(60 - 0]	F

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, lecture, and on-line videos**. The quizzes occur either during drill or in an on-line format, using Blackboard. Student Response “Clickers” will also be used for quizzing students in class.

Homework problems from the text or other sources will be suggested on a regular basis but not collected or graded. 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.

Verifiable (a priori) excuses are necessary for me to consider make up exams.

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 in a separate handout.

I firmly believe that students who actively engage in this material will have the best learning outcome. *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.

On-Line Testing

This course requires the use of LockDown Browser and a webcam for some online exams. The webcam can be built into your computer or can be the type that plugs in with a USB cable. Please see the items describing the use of this technology within the Blackboard course content for further information.

INEG 3623/INEG 5803 Simulation

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/academicintegrity/252.php>

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 and exams.
- **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 assessment has been completed by all students. 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.

INEG 3623/INEG 5803 Simulation

Course Outline

Drill meetings will be announced via Blackboard

	Topic	Reading Assignment
1	Overview of Simulation	Ch. 1
2	Random Number Generation	Ch. 2.1-2.3
3	Testing Random Numbers	Ch. 2.4
4	Random Variates,	Ch. 2.5
5	Random Variates	Ch. 2.5
6	Random Variates	Ch. 2.5
7	Random Variates	Ch. 2.5
8	Spreadsheet Simulation	Ch. 3.1-3.3
9	Statistical Concepts	Ch. 3.4
10	Introduction to Arena	Ch. 4.1-4.3
11	How the clock works	Ch. 4.4
12	How the clock works	Ch. 4.4
13	Pharmacy Model	Ch. 4.5-4.7
14	How Arena manages Entities	Ch. 4.8-4.10
15	Basic Process Modeling	Ch. 5.1-5.5
16	Basic Process Modeling	Ch. 5.6-5.7
17	Basic Process Modeling	Ch. 5.6-5.7
18	Discrete Distribution Modeling,	Ch. 6.1-6.5
19	Continuous Distribution Modeling	Ch. 6.6-6.8
20	Modeling Randomness	Ch. 6.9
21	Analyzing Statistical Output	Ch. 7.1-7.3
22	Analyzing Statistical Output	Ch. 7.1-7.3
23	Infinite Horizon Simulation	Ch. 7.4
24	Infinite Horizon Simulation	Ch. 7.4
25	Comparing Systems	Ch. 7.5
26	Modeling Queues	Ch. 8.1-8.2
27	Modeling Queues	Ch. 8.3-8.4
28	Modeling Queues	Ch. 8.3-8.4
29	Modeling Queues in Arena	Ch. 8.5
30	Hold and Signal	Ch. 8.6
31	Networks of Queues	Ch. 8.7
32	Networks of Queues	Ch. 8.7
33	Networks of Queues	Ch. 8.7
34	Resource Constrained Transport	Ch. 9.1-9.2
35	Transporters, Last day to drop with W	Ch. 9.3
36	Transporters	Ch. 9.3
37	Modeling Conveyors	Ch. 9.4
38	Miscellaneous Modeling	Ch. 10.2-10.6
39	Miscellaneous Modeling	Ch. 10.2-10.6
40	<i>Project work day</i>	
41	<i>Project work day</i>	

INEG 3623/INEG 5803 Simulation

Emergency Procedures

Many types of emergencies can occur on campus; instructions for specific emergencies such as severe weather, active shooter, or fire can be found at emergency.uark.edu.

Severe Weather (Tornado Warning):

- Follow the directions of the instructor or emergency personnel
- Seek shelter in the basement or interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside
- If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building
- Stay in the center of the room, away from exterior walls, windows, and doors

Violence / Active Shooter (CADD):

- **CALL-** 9-1-1
- **AVOID-** If possible, self-evacuate to a safe area outside the building. Follow directions of police officers.
- **DENY-** Barricade the door with desk, chairs, bookcases or any items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it's safe.
- **DEFEND-** Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.