INEG 5823 Systems Simulation I

Instructor

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

Course Description

Random number generation, random variate generation, timekeeping in simulations, discrete event modeling, construction of digital simulation models, statistical analysis of simulation results, and analysis of simulation experiments utilizing a computer programming language. Prerequisite: INEG 3623 or INEG 5803 or equivalent.

Course Objectives

The objective of the course is to further explore simulation as a system modeling technique. After taking this course, the student is expected to:

- Be able to use random number generation algorithms
- Be able to derive, implement, and use random variate generation methods
- Be able to implement and use statistical collection algorithms
- Be able to implement and understand event-based simulation models
- Be able to develop computer simulation programs
- Be able to model a variety of systems found in industrial engineering using simulation.

The ability to program in a general-purpose language such as "C", Java, C++, or VB is assumed. The modeling will be performed using the Java programming language. Familiarity with spreadsheets and other office productivity software is assumed. Knowledge of probability and statistics is assumed.

Texts

- Rossetti, M. D. (unpublished manuscript) *Simulation Modeling: An Open Source Approach*, available within Blackboard

Reference Texts (not required)

- Law, A. (2007) *Simulation Modeling and Analysis*, McGraw-Hill, 3rd Edition
- Leemis, L. and Park, S. (2006) *Discrete-Event Simulation: A First Course*, Prentice-Hall.
- Rossetti, M. D. (2010) *Simulation Modeling and Arena*, John Wiley & Sons.

Additional readings will be made available through Blackboard and handouts.

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 and Assignments

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. There will be at least 6 homework assignments with the possibility of a few smaller assignments. The two exams will be a mixture of in-class examination and take-home components. The final exam will be your final project. 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:

Homework	40%
Exam 1	20%
Exam 2	20%
Final Project	20%
Total	100%

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

Course Topics

The emphasis of this course will be on modeling and programming aspects of simulation in conjunction with the fundamental statistical aspects of simulation. I expect students to use sound statistical simulation practices as they exercise and explore their models. For a theoretical basis for the statistical aspects of simulation and simulation optimization, the student is encouraged to consider taking INEG 6823 Advanced Simulation.

These topics are subject to change given student and instructor interest. If there is a particular type of system that you are interested in modeling, then bring it to my attention for consideration in class. This class will not be completely "lecture" oriented. Instead, you should expect that topics will be introduced through lecture and then portions of class time will be spent actually designing and developing models. Additional class time will be dedicated to students asking thoughtful questions, presenting interim ideas, and presenting final models and results.

Topic	**Week(s)**
Fundamentals of programming in Java[1]	1
Random number generation (generators, algorithms, control of randomness through seeds, etc.)	1
Random generation methods (inverse transform, acceptance rejection, generating from particular distributions, stochastic processes, etc.)	1.5
Basic Monte Carlo Methods and Statistical Analysis (simple integration, sample size determination, confidence intervals, etc.)	1
Discrete-Event modeling (discrete event concepts, terminology, clock-mechanics, simulation views (event, process, activity), implementing simulation executives)	3.5
Statistical issues in discrete-event simulation (replications, warm up analysis, batching, etc.)	1.5
Modeling systems with resources and queues	2.5
Modeling inventory systems	2
Modeling movement	2
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[1] *I assume that you know how to program in some language. I will only emphasize the fundamentals of Java programming so that you may become productive within the course. Additional programming concepts will be introduced as needed throughout the course.*

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.

Permitted Collaboration:

- Homework: 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 logic, how formulas work, etc are okay. But be careful not to collaborate so much that there will be no distinguishable difference between your work and another student's work. You must do your own write up, programs, models, etc. The physical sharing of models, write ups, programs, etc is strictly prohibited. You must list the names of any students that you discussed your work with on the front cover of your assignment. A group pledge is not necessary in this instance.
- Exams: No collaboration is permitted on examinations.
- Project: You may work in a group of no more than two. The group must do its own write up, programs, models, etc. Sharing of models, write ups, programs, etc. between groups is strictly prohibited. A group pledge is necessary in this instance.