The University of Georgia

Department of Computer Science

Course Information Sheet

CSCI 4210

Simulation and Modeling

Brief Course Description (50-words or less)	In this course, we will study complex dynamic systems, examining their performance, reliability, etc. The reason for doing this is to improve such systems either in the design phase (before a costly system is built) or the operation phase (tune or upgrade). A simulation model may be used for such studies. It is an approximation of the complex system that captures its essential properties and often mimics the behavior of the actual system. Behavior is studied by carrying out multiple runs of the simulation model to produce statistical outputs of properties such as system response time or throughput.
Extended Course Description / Comments	Further insight into system behavior can be gained by animating the model. The course will involve a major project to create a simulation model of a system chosen by the project group (2 students). The model will be created using Java 6 (or 7) or Scala 2.9 and parts of JSIM, a simulation system coded in Java or ScalaTion, a simulation system coded in Scala.
Pre-Requisites and/or Co-Requisites	Prerequisite: CSCI 2720 (Data Structures) OR CSCI 2725 (Data Structures for Data Science)
Required, Elective or Selected Elective	Selected Elective Course
Approved Textbooks (if more than one listed, the textbook used is up to the instructor's discretion)	Banks, Carson, Nelson and Nicol *Discrete-Event System Simulation* 5th edition, 2010
Specific Learning Outcomes (Performance Indicators)	Students will learn how to construct and analyze simulation models of complex systems. 1. A basic ability to categorize various mathematical modeling techniques. 2. A basic ability to select and use various probabilistic and statistical models. 3. An ability to explain and develop models following the event scheduling simulation world view. 4. An ability to explain and develop models following the process-interaction simulation world view. 5. A basic ability to understand and use various queuing models (e.g., M/M/1, M/G/1). 6. An ability to generate random number and random variates 7. An ability to analyze and draw conclusions from the outputs of simulation models. 8. An ability to create simple computer games. 9. Experience with a term project/report involving the creation of a simulation model that includes 2D/3D animation.

Relationship Between Student Outcomes and Learning Outcomes

		Student Outcomes										
		a	b	c	d	e	f	g	h	i	j	k
Learning Outcomes	□	●									●	
	□	●									●	
	□			●								●
	□			●								●
	□	●										●
	6	●	●									●
	7	●	●									
	8		●	●	●					●	●	●
	9		●	●	●		●			●	●	●

Major Topics Covered
(Approximate Course Hours)

3 credit hours = 37.5 contact hours
4 credit hours = 50 contact hours

Note: Exams count as a major topic covered

1. Introduction to Modeling and Simulation (2 hours)
2. Simulation Examples (4 hours)
3. Discrete Event Simulation (6 hours)
4. Simulation Software (2 hrs)
5. Simulation Engines: Concurrent Programming/Threads (8 hours)
6. Animation Techniques (2D/3D) (4 hours)
7. Statistical Models (4 hours)
8. Markov Chains (2 hours)
9. Queueing Models (2 hours)
10. Verification and Validation (2 hours)
11. Random Number Generation (2 hours)
12. Random Variate Generation (2 hours)
13. Output Analysis (4 hours)
14. Simple Computer Games (6 hours)

Course Master

Dr. John Miller