ISYE 3044

Simulation Analysis and Design
Fall 2026 Section M12 Syllabus

Classes:

Monday and Wednesday 12:30-1:45 pm, George Tower room 0222

Instructor:

Dr. Nicole Redder
Office Hours: 4:30-5:30 pm Mondays, George Tower room 0610
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Teaching Assistant:

Rosheeta Sheth
Office Hours: 2:00-3:00 pm Thursdays, location TBA
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Prerequisite(s): ISyE 2028 or 3030 and ISyE 3232

Texts:
Simio, Python

Course Description
This course introduces simulation as a key tool for analyzing complex stochastic systems to support decision-making. Students will learn the key steps of the simulation modeling lifecycle from problem formulation and implementation to validation as well as statistical modeling and analyses including input modeling, output analysis, experiment design, and optimization. Students will gain experience working with modern simulation software while developing skills to tackle industrial problems.

Course Learning Outcomes
Upon successful completion of this course, students will be able to:

1. Generate pseudo-random numbers and realizations from input distributions and random processes.
2. Develop discrete-event simulation models of engineering and service systems using appropriate modeling logic, simulation methodologies, and modern simulation software tools.
3. Model stochastic system inputs by postulating input models based on the characteristics of input processes (without data) or fitting distributions from data.
4. Analyze and interpret simulation output data using appropriate statistical techniques to estimate system performance, quantify uncertainty, and support statistically justified conclusions.
5. Verify and validate simulation models to establish model correctness, credibility, and suitability for the intended analysis and decision-making objectives.

6. Compare, evaluate, and improve alternative system designs or operational policies through experimental design, statistical analysis, and optimization methods.
7. Communicate simulation study results and recommendations effectively by translating technical findings into actionable engineering or managerial insights.

Academic Integrity
All course participants (Instructors and Students) are expected and required to abide by the Georgia Tech Honor Code. For information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/ or http://www.catalog.gatech.edu/rules/18/.

Disability Services:
If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404) 894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible in order to set up a time to discuss your learning needs.

Grading
Grades will be assigned with the following weights:

- **Attendance: 5%**
- **Homework: 15%**
- **Midterm Exam 1: 25%**
- **Midterm Exam 2: 25%**
- **Course Project: 30%**

Course Project
A course project will be assigned during the semester in lieu of a final exam. The project will involve modeling, implementing, and analyzing a simulation based on data using Simio, potentially along with other modeling tools, and will be due on Monday, December 7th, the final instructional day for this course.

Attendance
I will take attendance throughout each class period based on participation in discussions as follows:

At the beginning of each class, I will select one student by a discrete random uniform number generation process over all students in the class. The first question I ask during the class will be directed to that student. All subsequent questions will move alphabetically down the class roster, looping to the beginning of the alphabet after reaching the end.

Your attendance grade for the day is

- 100%, if you are *not* called to ask a question that day—I will assume you are here unless proven otherwise.
- The number of questions you respond to a question divided by the number of questions I ask you, if you *are* asked a question. Any response will suffice: a correct answer, an incorrect answer, the word 'pass' and nothing else, a clear nonverbal acknowledgement, etc. will all count as a response.

I will not take attendance during the first week of class (before the end of Phase II registration), and I will drop your two lowest attendance grades. However, I will only excuse Institute Approved Absences for attendance purposes.

Homework

1. This will be 15% **of your course grade.**

2. You should start working on each homework early. That way you will have time to ask (and understand) questions in class before the homework is due.

3. **You are encouraged to discuss topics on the homework and learn from each other, but each person must write and submit their own work, unless the assignment specifically indicates that you should work in groups.** For programming assignments, it is absolutely fine to help another student debug code or discuss ideas. But modifying another student's code for your own use is unacceptable. Any queries on homework grades must be submitted in writing to the instructor, together with the homework report in question.

4. Homework will be due at 10:00 pm ET on the date listed on each assignment. Late homework will be accepted up to three days after the deadline with credit given linearly decreasing to zero by the following formula, where x is the number of minutes the homework is submitted after the deadline:

$$\text{homework grade} = \text{earned points} \times \max\left(0, 1 - \frac{x}{60 \times 24 \times 3}\right)$$

Exams
Tentative dates:
Midterm Exam 1 Date: Monday, September 28th, 2026
Midterm Exam 2 Date: Wednesday, October 28th, 2026

Exams will be given in class and will be closed book, with the exception of a single, double-sided and handwritten note sheet that you may bring with you. This sheet must be no larger than 8.5 by 11 inches and must be turned in with the exam. Unless otherwise stated, you may not use any other notes or any technology, including calculators; nor may you collaborate with other students or share the content of the exams.

Review and Re-grade Requests:
You may request a regrade of a homework assignment or exam within one week of its return to you if you believe a mistake has been made in its grading. To do so, you must contact the instructor with the original assignment and a note attached clearly stating your claim. Regrade will not take place on the spot nor will it be considered face-to-face. If you do request a regrade of an assignment, the entire assignment may be regraded to ensure accuracy. Please only contact the instructor regarding a regrade; the TA will not perform any regrades.

Excused Absences from Exams:
We only accept notifications from Dean's office or Institute Approved Absences. Please inform the instructor of your approved absences as soon as possible. If the notification from Dean's office is for instructor's discretion and your absence prevents you from completing assignments or tests, please discuss the accommodations with the instructor as soon as possible.

Topical Outline

The topical outline is shown in the table below. The table has 2 columns. The first column lists the topics to be covered. The second column lists the number of weeks these topics will be covered.

Topics	Weeks
General principles and simulation languages	1
Estimation of error and risk in simulation experiments; simulation with spreadsheets	1.5
Fundamental Concepts from probability and statistics Queueing models	1
Random number generation	0.5
Random variate generation	1
Input modeling	1.5
Verification and validation	0.5
Output analysis for a single system	1
Comparison and evaluation of alternative system designs	1
Introduction to Simio	1
Animation in Simio	0.5
Entity routing logic	1
Advanced Modeling Techniques: Simio Processes	1
Modeling with Tables and External Data	1
Simulation of Systems with Moveable Resources and Conveyors	1
Total	14

The Mapping from the Course Outcomes to ABET Student Learning Outcomes

The table below shows the relationship between course outcomes and ABET student learning outcomes. The table has 8 columns. The first column lists the course learning outcomes listed above. The next 7 columns list the abbreviated ABET Student Learning Outcomes. The entry of H in a row with specific course learning outcome and column with specific ABET Student Learning Outcomes indicate the importance of attaining this outcome is high and will be assessed.

Course outcome \ Program Outcomes	1. identify, formulate solve engg prob by engg, sci & Math	2. produce solutions consider public health, safety, welfare, global, cultural, social, environ & economic	3 communicate with a range of audience	4 recognize ethical & professional responsibilities, make informed judgement consider resolutions in global, economic, environ and societal context.	5. effective on a team provide leadership, collaborative and inclusive envirn, plan tasks & meet objectives	6. develop and conduct experiment, analyze and interpret data & use engineering judgement to draw conclusions.	7. acquire and apply new knowledge using appropriate learning strategies
1. Generate pseudo-random numbers and realizations from input distributions and random process							
2. Develop discrete-event simulation models of engineering and service systems ...	H						
3. Model stochastic system inputs by postulating input models based on ...	H						
4. Analyze and interpret simulation output data using appropriate statistical ...							
5. Verify and validate simulation models …							

6. Compare, evaluate, and improve alternative system …		H					
7. Communicate simulation study results and recommendations …			M		M		

Evaluation of the important outcomes

Course outcomes 2, 3 and 6 will be assessed on direct questions on final exam.
Outcome 7 are assessed by the project or modeling assignments.