

# ISyE 3044 Simulation (6/6/2022)

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## Course Summary

To learn how to develop computer simulation models of real or conceptual systems, and how to correctly design, analyze, and interpret the results of computer simulation experiments.

## Scheduled Class Times

MTWR 12:30 – 2:40, IC 205

## Teaching and Learning Team

**Professor:** Seong-Hee Kim, Groseclose Room 434; Phone: 404-894-4551; Email: [skim@isye.gatech.edu](mailto:skim@isye.gatech.edu)

**Office Hours:** Mon, Tue, Wed, Thu 2:45 pm – 3:15 pm or by appointment

**TAs:** Xiaochen Shi ([xshi74@gatech.edu](mailto:xshi74@gatech.edu)) and Jason Lu ([jasonphlu@gatech.edu](mailto:jasonphlu@gatech.edu))

**TA Office Hours:** TBA (through Zoom) or by appointment

## Texts

- J. S. Smith, and D. T. Sturrock (KSS), *Simio and Simulation: Modeling, Analysis, Applications*, 6th edition, Simio LLC (recommended).
- Banks, J., J. S. Carson, B. L. Nelson, and D. M. Nicol (BCNN), *Discrete-Event System Simulation*, 5th edition. Prentice Hall, New York, 2010.

The first book is available at <https://textbook.simio.com/books/SASMAA6.php> for free (registration is required). The second text is a solid source. You can purchase a cheaper version online (an old edition for the second book is also OK).

## Preparation

ISYE2027, ISYE2028, and ISYE3232: probability, statistics, and stochastic processes

## Course outcomes

At the end of this course, students will be able to:

1. Fit statistical distributions to input data.
2. Develop credible and valid simulation models.
3. Analyze output data from simulations.
4. Compare alternative system designs using simulation.
5. Evaluate the effects of randomness on system behavior and performance.

## Delivery Mode

- **Residential + Synchronous + Asynchronous Modes:** Lectures will be given in IC 205 with the option of attending the lectures in person or online synchronously. In addition, all lectures will be recorded and available on Canvas for those registered in the ASY and RIE sections.

- **Office Hours:** Office hours will be conducted online through Zoom. The Zoom link for office hours will be announced on Canvas.
- **Lecture notes:** The lecture notes (with many blanks) will be posted on Canvas, and I will use OneNote in class. The link to the OneNote will be available. If you prefer taking notes on your own, you can (i) print posted lecture notes or download them to your note-taking device and (ii) take notes and fill out blanks in class or while watching a recorded video. This is recommended. However, if you prefer to focus on lecture contents without worrying about note-taking, you can download the completed lecture notes from OneNote.
- **Programming:** We will do a lot of programming during many classes, everyone must have a laptop. When we do programming in lectures, it is strongly recommended that you have two devices: one for watching videos and one for doing programming. For example, you can watch lecture videos using your cell phone while coding on your laptop.

## Simulation Language

- We will do a simple simulation using Excel and Python but spend most of the time on Simio.
- Simio is a comprehensive discrete-event simulation package with extensive modeling, animation, and statistical analysis capabilities. Simio runs on reasonably new computers running the Microsoft Windows operating systems. It also runs on Macintosh computers *using an emulator* (e.g., Parallels Desktop or VMware Fusion) *on top of macOS*.
- The instruction of Simio will be based on the Simio text and short pre-recorded videos. You will need to save Simio models you built during classes because we will often continue from the previous models and revise them in later lectures. Also, you will be asked to submit models you created in class.
- Additional Simio resources:
  - The introductory e-book *Rapid Simulation Solutions: Introduction to Simulation and Simio* is available from the Books menu in the Support ribbon of Simio.
  - 2019\_SIMIO\_ONLINE\_TRAINING\_COURSE.pdf posted on our Canvas page under Modules -> Course Materials.
- Simio's academic edition is available in the ISyE computer labs. Simio is available on [mycloud.gatech.edu](http://mycloud.gatech.edu) on the *ISYE-SIMIO* virtual desktop or as an app. Keep in mind that the total number of concurrent users is limited to 250. *Since virtual applications depend on network connections and often experience technical issues, I strongly recommend that you purchase and install an academic version (\$25) on your own computer. Instructions on purchasing an academic version follow next.*
- In addition to the full software available in our computer labs and virtual desktops, you have the option to also install Simio *on your own Windows computer* at a very low cost. Unlike other similar academic software, the Simio student edition is not a crippled version — it is a full, unlimited model size version equivalent to the \$12,000 Simio Design Edition. The \$25 cost for one year of use allows access to all the training videos

on the Simio web site. *I strongly recommend this option!* To purchase a license, follow the steps below:

Note to Apple Users:

Simio® is a Windows application, but Simio runs well on Macs running Windows (natively or using Parallels or Fusion). Detailed Mac instructions can be viewed here: <https://cdn.simio.com/SimioLicenses/MacInstructions.pdf>

Update: Macs with the new M1 chip are not compatible with Simio. (If this is your case, you will need to use Simio through mycloud.gatech.edu.)

1) Purchase the Simio® Student Version with your Paypal account.

<https://www.simio.com/academics/order-academic-software/student-edition-order.php>

2) You will receive a confirmation email at the email address associated with your Paypal account. If you cannot find the email, check your spam or contact [customer\\_service@simio.com](mailto:customer_service@simio.com) with provide your PayPal transaction ID or receipt.

3) Download and install the software. Apply the activation code per the instructions in the email.

4) When prompted, enter the following information to complete the activation.

**Pass Phrase: GATech\_2022**

**Pass Code: 4568BBBA**

- You should *not* contact Simio's technical support regarding modeling issues. There are several Simio forums, where you can post serious questions *after you have spent considerable time with your model*. The forums are listed on [www.simio.com/forums](http://www.simio.com/forums).

## Evaluation

In Lecture Submission	10%
Homework & Labs	20%
One Quiz	10%
2 Projects	60% (25% for midterm project; 35% for final project)

Top 25% students in the class (three combined sections) or overall score 90 or above: guaranteed A

Top 60% students in the class or overall score 80 or above: guaranteed B or above

Above 60 points in the overall scores at the end: guaranteed C or above

## Class Policies

- **DO NOT UPLOAD 3044 MATERIALS TO ANY OPEN WEB PLEASE!**
- **In Lecture Submission:** We will be frequently asked to do in-lecture activities and submit the work. This needs to be done alone. These submissions are to ensure that you watch the day's lecture recording. ***Your work should be submitted electronically (pdf or jpg format only, no heic files please) to Canvas by 11:59 pm on the day of a lecture when the activity was assigned.***
- **Homework & Labs:** There will be a few homework and/or lab assignments. These assignments are individual and should be submitted electronically along with Python or Simio codes. For the write-up, we only take pdf or jpg only. No late submission.
- **Quiz:** One online quiz will be given on the date scheduled on *ISYE3044 Schedule*. ***The quiz is 50 min long and formatted as Canvas Quiz.*** It is closed-book and closed-note and will be proctored through Honorlock.

You must show your work and submit it to Canvas within 5 mins after you are done with the quiz. Use pdf or jpg formats only (but no heic). ***Double check if the work is successfully uploaded. If you fail to upload the work, no partial points will be given.***

In general, I don't provide ***any make-up exam***. If you cannot take the quiz on its scheduled date due to an institute-approved reason, you should give the instructor at least a one-week advance notification. In case of an emergency, you should ***contact the Dean of Students (not the instructor) immediately***. Only with a recommendation from the Office of the Dean of Students will we discuss which options you can have.

- **Projects:** Two individual projects will be given. The midterm project is about Monte Carlo simulation and involves programming in Python. The final project is about process simulation and involves programming in Simio. The Simio project replaces the final exam and will be due 11:59 pm on the day of the final exam date scheduled by the Institute.

For each project, you need to assume that you are hired as a consultant and the teaching staff are your client with little knowledge of probability and statistics. Your report writing matters a lot. ***Only minimum guidelines for report writing will be given. It is part of your job to determine***

- ***what questions to be answered,***
- ***what background information to provide for the justification of your approach, what to report to support your recommendations, and***
- ***what extra info to deliver to help the client's effective process management etc.***

Your reports along with codes must be submitted electronically.

- **Level of Expectation for Coding:** I assume that everyone took a Python course and has a Python editor/compiler already installed on your computer. If not, use

colab.research.google.com. For Simio, you can use either mycloud.gatech.edu or purchase a student edition at \$25. We don't have time to cover every detail of Python and Simio modules. Thus, please understand that ***homework/projects will often go beyond class materials and instructions, and you will need to figure out how to do it either by googling for Python functions or searching Simio book/Simio SimBits, which is typical in programming.***

- ***In general, no late submission for all assignments!*** If you need an extension, you should contact the instructor ASAP but usually we can't give much extension because solutions often need be posted the next day from the due date.
  - Internet connection may not be reliable so save often. Also, submit early and check the files are submitted.
  - Incorrect submissions get zero credit even if you present files with a time stamp.
  - If some homework involves multiple files, submit all of them.
- **Honor Code:** We are strict with the Institute's Honor Code. Any violation of the honor code will be reported to the Office of Student Integrity and comes with a minimum penalty of one letter grade reduction.  
Using solutions (including Simio models) to past homework assignments is considered an honor code violation. As a warning, we change numbers, distributions, and details. So if you copy or submit past assignments/codes, you will get caught with a very high probability. Copying codes and solutions of other students is also a serious honor code violation.
- **Regrade:** Regrade for in-class submissions, homework & labs, quiz, and projects is obtained by submitting a written explanation (via email) to the teaching staff (all three). For regrade, submit a written explanation (via email) to the teaching staff ***within 3 days of when the test results were released.***  
Regrades will only be discussed *after* submitting the work in this manner.  
You must *neatly* state in writing the reason that you would like your work to be regraded. It is strongly recommended that you do not ask for a regrade on the basis of partial point distribution. As we apply the same rubric and partial point distribution, it is impossible to change the partial point distribution for one student.
- **Office Hours:** Most questions can be answered through Piazza. ***Please do not email questions about the course materials/assignments to the instructor or TA. Instead, post them on Piazza.***  
If you want to see TA or the instructor, feel free to join scheduled online office hours. Or you can contact us to make an appointment. Remember that the teaching staff has other responsibilities, meetings, and obligations. Therefore, please plan ahead if you want to set up an appointment outside scheduled office hours. I rarely check email on weekdays after 5 pm and during weekends.
- **Announcements:** Many important announcements will be posted on Canvas. Do not skip them but make sure that you take time and read them carefully.