Georgia Institute of Technology

ASE 6003 Modeling & Simulation for Systems Engineers Syllabus

Spring 2027

Delivery: 100% Web-Based, Synchronous. **There will be no live sessions for this course.**

Dates course will run: Jan 11 – Oct 9

Instructor Information

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Mentor Information

TBD

Office Hours

Office hours will be held using Zoom on Wednesdays from 5:30pm to 6:30pm EST. Office hour recordings will be available within 24–48 hours in the Media Gallery.

Mentor Office Hours

Mondays, time to be determined.

General Course Information

Description

ASE 6003 is a survey of Modeling and Simulation (M&S) and how it's used in systems engineering. The course will introduce students to a range of topics, including M&S fundamentals, theoretical foundations, methods and methodologies, experimentation and execution, simulation in the systems engineering life cycle, and management. The course includes labs that cover different simulation methods (discrete event, agent-based, system dynamics). The goal is for students to understand how to use M&S to solve systems engineering problems.

Course Goals and Learning Outcomes

After completing this course, students will be able to:

- Clearly define modeling, simulation, and modeling and simulation
- Explain a Model-Based Systems Engineering (MBSE) approach and its application to complex systems
- Explain the importance, roles, benefits, and limitations of modeling and simulation when used for systems engineering across the acquisition lifecycle
- Choose the most suitable modeling and simulation approach when performing systems engineering to support system requirements, design, analysis, verification, and validation

- Formulate modeling and simulation problems including identifying input parameters, measures of performance, constraints, and objective functions
- Construct and solve system dynamics models to identify growth, cyclic behavior, and stability of a large system
- Construct and simulate discrete event models to discover bottlenecks and measure utilization of resources
- Construct and simulate agent-based models to detect and characterize emergent behaviors
- Explore modeling and simulation enablers such as Design of Experiments and Surrogate Modeling
- Evaluate the integration of Multidisciplinary Design, Analysis, and Optimization (MDAO) with Model-Based Systems Engineering (MBSE)
- Perform Multidisciplinary Design, Analysis, and Optimization (MDAO) and supporting analysis
- Evaluate simulation credibility using Verification, Validation, and Accreditation techniques

Course Materials

Primary Textbook
Loper, M. L. (Ed.). (2015). *Modeling and simulation in the systems engineering life cycle: core concepts and accompanying lectures*. (Available on Amazon and Springer websites). Also available on GT library website.

Supplemental References
- AnyLogic Simulation Software
- AnyLogic 7 in Three Days

Course Website and Other Classroom Management Tools
All course content will be delivered through Canvas and Ed Discussions.

Course Requirements, Assignments & Grading

Assignments

Assignment	Weight	Description
Quizzes	25%	Five (5) quiz assignments based on weekly lessons (individual).
Labs	60%	Six (6) Lab assignments associated with learning modules (individual).
Participation	15%	You must complete a minimum of 1 contribution per week during office hours or on the discussion board. On the discussion board, simply agreeing to someone else's comment is not sufficient. Your participation must move the conversation forward: add ideas, ask a question, mention an application, provide an interesting link, etc.
Total	**100%**	

Grading Scale
Your final grade will be assigned as a letter grade according to the following scale. All grades will be rounded up to the nearest whole number (e.g., 89.1 will be rounded up to 90).

A 90–100%
B 80–89%
C 70–79%
D 60–69%
F 0–59%

Assignment Submissions Naming Convention

- **Lab Title Page**: Include Student Name, LAB Number, Date
- **File Name**: Use the following naming convention:
  ASE6003 - LAB Number - LastName.(doc, ppt, xls, ...)
  Example: ASE6003 - LAB1 - Smith.doc

Submitting Assignments

All assignments must be completed and submitted within the Canvas.

Assignment Due Dates

- Homework Quiz assignments and weekly participation are due Mondays at 11:59pm, EST/Atlanta time covering previous week content.
- Lab assignments are due on Sunday night at 11:59PM EST/Atlanta time. Make sure to attempt labs early in order to ask questions at mentor and instructor office hours.

Late and Make-up Work Policy

Late submissions will not be accepted for full credit unless excused due to a medical, family, or related emergency. Late and unexcused submissions submitted up to 24 hours past the due date will receive an automatic deduction of 15% (regardless of when they are submitted within the 12-hour window). Unexcused submissions greater than 24 hours past the due date will not be accepted. If you have a valid reason for the late submission, contact the instructors as soon as possible and we will handle your situation together.

Grading and Feedback

Grades will typically be posted within one week.

Course Policies, Expectations & Guidelines

Communication Policy

- Questions regarding learning materials and assignments will be handled through Ed Discussions and Canvas Inbox (see Canvas site) rather than through the instructor's e-mail. Class-wide announcements will be made through Canvas.
- For questions related to technology, the Digital Learning Support Team for assistance. You can also reach the Canvas Hotline by phone at 877-259-8498 or by email.

Online Student Conduct and (N)etiquette

Students are asked to behave in the discussions and other class interactions professionally and civilly. If you are in doubt, do not post it! Instructors reserve the right to remove any postings deemed inappropriate, unprofessional, or otherwise distracting from the course.

Onboarding Quiz and Proctoring Information

All Georgia Tech online degree and certificate students are required to complete the Onboarding Quiz with Honorlock in the first week of the course. Honorlock is utilized for student

identity verification and to ensure academic integrity. Honorlock provides student identity verification via facial and ID photos. You may also be asked to scan the room around you. The Onboarding Quiz is needed to help make sure that your identity is verified and that your system is set up to work with Honorlock online proctoring tool. You are required to complete this quiz early in the semester to avoid problems when taking proctored exams. **No other quizzes in the course will require Honorlock.**

University Use of Electronic Email

A university-assigned student e-mail account is the official university means of communication with all students at Georgia Institute of Technology. Students are responsible for all information sent to them via their university-assigned e-mail account. If a student chooses to forward information to their university e-mail account, he or she is responsible for all information, including attachments, sent to any other e-mail account. To stay current with university information, students are expected to check their official university e-mail account and other electronic communications on a frequent and consistent basis. Recognizing that some communications may be time-critical, the university recommends that electronic communications be checked minimally twice a week.

Plagiarism & Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. All students enrolled at Georgia Tech, and all its campuses, are to perform their academic work according to standards set by faculty members, departments, schools, and colleges of the university; and cheating and plagiarism constitute fraudulent misrepresentation for which no credit can be given and for which appropriate sanctions are warranted and will be applied. For information on Georgia Tech's Academic Honor Code, please visit the GT Academic Honor Code Website.

Students are not allowed to create text, code or images using generative machine learning models and services in any of their graded assignments. Students are reminded that they are attending school to learn new skills and methods and they should focus on attaining them rather than looking for shortcuts that reflect badly on their work ethic. Assignments will be run through AI/plagiarism checking software.

Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, which will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at 404-894-2563 or the Disability Services Website, 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 to set up a time to discuss your learning needs.

Copyright

Among the materials that may be protected by copyright law are the lectures, notes, and other material presented in class or as part of the course. Always assume the materials presented by an instructor are protected by copyright unless the instructor has stated otherwise.

Student-Faculty Expectations Agreement

At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgment, and responsibility between faculty members and the student body. See the Student-Faculty Expectations Website for an articulation of some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Subject to Change Statement

The syllabus and course schedule may be subject to change. Changes will be communicated via the Canvas announcement tool and Ed Discussions. It is the responsibility of students to check email messages and course announcements to stay current in their online courses.

Course Schedule

Weeks & Dates	Module Topic	Assignments	Due Dates
Week 1 Jan 11	Introduction to Modeling & Simulation and (MBSE)	*No assignments due*	*N/A*
Week 2 Jan 18	System Dynamics Simulation	Module 1 Quiz Lab 1: SE Management of Simulation	Jan 18 Jan 24
Week 3 Jan 25	Discrete Event Simulation	Module 2 Quiz Lab 2: System Dynamics Simulation in AnyLogic	Jan 25 Jan 31
Week 4 Feb 1	Agent Based Simulation	Module 3 Quiz Lab 3: Discrete Event Simulation in AnyLogic	Feb 1 Feb 7
Week 5 Feb 8	MDAO Integration with MBSE & Supporting Analysis	Module 4 Quiz Lab 4: Agent Based Simulation in AnyLogic	Feb 8 Feb 14
Week 6 Feb 15	Enablers for Modeling & Simulation	Module 5 Quiz Lab 5: MDAO	Feb 15 Feb 21
Week 7 Feb 22	Modeling & Simulation to Support Decision Making	Lab 6: Design of Experiments	Feb 28