SYLLABUS

College of Computing and Software Engineering
Department of Computer Science
CS 4632 Modeling and Simulation
Academic Term: Spring 2025

Course Information

Online Modeling and Simulation Section W01 Spring Semester 2025

Instructor Information

Name: Chris Regan
Email: cregan1@kennesaw.edu
Office Location: J163
Office Hours:

- M, W, F
- 1:30 pm -> 2:15 pm
- Or virtually by appointment.

Preferred method of communication: Email, Team, Class Teams group.

Email Policy and Procedure

To ensure effective communication, please adhere to the following guidelines when sending emails:

Subject Line:

Format your subject line as follows: **CS 4632 - [Section number] - NetId - [Concern]**

Email Body:

Before sending an email, follow these steps to ensure clarity and completeness:

1. **Search First:** Verify if your question has been addressed in course materials or previous announcements.
2. **Be Specific:** Clearly state your question or concern, providing all relevant details and context.
3. **Provide Context:** Include any relevant information, such as specific sections of code, error messages, or data that are pertinent to your query.
4. **Be Respectful and Professional:** Use polite and professional language.
5. **Include Steps Taken:** Mention any steps you have already taken to solve the problem or find the answer.

Course Description

Catalog Description:

This course emphasizes simulation modeling and computer programming perspectives, focusing on designing and implementing simulation models. The fundamental concepts of object-oriented simulation are introduced. Model implementation will require programming in object-oriented simulation languages, including but not limited to C#, Java, C++, Python, or other suitable programming languages.

Prerequisites: CS 3305

Credit Hours: 3-0-3

Last Day to Withdraw is March 28, 2025 (Friday) at 11:45 PM

Last Day of Classes: April 28, 2025 (Monday)

Course Materials

Text and Technology:

- **Required**:
  - *Object-Oriented Simulation: A Modeling and Programming Perspective* by José Garrido.
- **Recommendation**:
  - *Theory of Modeling and Simulation* by Bernard P. Zeigler, Alexandre Muzy, Ernesto Kofman.
  - *Modeling and Simulation of Discrete Event Systems* by Byoung Kyu Choi and DongHun Kang.
  - *Discrete-Event System Simulation* by Jerry Banks, John Carson, Barry Nelson.
  - *Principles of Modeling and Simulation: A Multidisciplinary Approach* by John Sokolowski and Catherine Banks.
  - *Simulation with Arena* by W. David Kelton, Randall P. Sadowski, Nancy Swets.
- **Required Tools**:
  - LaTeX and Overleaf (or other LaTeX tools): All research documents and project deliverables must be submitted as PDF outputs created via LaTeX.
- **Recommended Tools**:
  - Git and GitHub: For version control and project collaboration.
  - UML Diagramming Tools: Examples include Lucidchart, Draw.io, or any other UML tool of the student's choice.
  - Programming IDEs: Jet Brains, Visual Studio Code, or any suitable IDE for the chosen programming language.

Learning Outcomes

As a result of completing this course, students will be able to:

1. **Systems Understanding:** Describe the structure and dynamic behavior of diverse systems, emphasizing both conceptual and computational perspectives critical to simulation modeling.

2. **UML Modeling:** Design clear, comprehensive UML diagrams to represent system components, interactions, and properties, serving as a foundation for simulation model development.
3. **Simulation Implementation**: Develop discrete-event simulation models using object-oriented programming principles and languages, such as Python or Java, while incorporating modern simulation methodologies.\
4. Simulation Analysis: Conduct simulation runs to collect, evaluate, and interpret data, applying statistical techniques to analyze results and drawing meaningful conclusions in alignment with project objectives.
5. **Reporting and Documentation**: Prepare professional-grade technical documentation and interim reports for milestones, emphasizing clarity, technical accuracy, and effective use of simulation terminology.
6. **Advanced Scenario and Sensitivity Analysis**: Perform sensitivity and scenario analyses to evaluate system performance under varying conditions, identifying key parameters and behaviors that influence outcomes.
7. **Comprehensive Simulation Project**: Develop and present a significant simulation project alongside a well-documented research paper that integrates the conceptual model, simulation results, analysis, and findings. The project milestones provide a structured pathway to achieve this final deliverable.

Course Requirements and Assignments

Summary of Assignments/Project Milestones:

1. Milestone 1: Project Proposal
2. Milestone 2: Literature Review and Research
3. Milestone 3: UML Diagram and Initial Design
4. Milestone 4: Model Implementation
5. Milestone 5: Simulation Runs and Data Collection
6. Milestone 6: Sensitivity and Scenario Analysis
7. Milestone 7: Validation and Verification
8. Milestone 8: Final Report and Presentation
    a. C-Day Submission and Poster (Bonus)

Evaluation and Grading Policies

The final grade will be assessed based on students' progress and findings as follows:

Category	Weight	Points
Milestone 1: Project Proposal	10%	50
Milestone 2: Literature Review and Research	10%	50
Milestone 3: UML Diagram and Initial Design	10%	50

Milestone 4: Model Implementation	25%	100
Milestone 5: Simulation Runs and Data Collection	15%	75
Milestone 6: Sensitivity and Scenario Analysis	15%	75
Milestone 7: Validation and Verification	15%	50
Milestone 8: Final Report and Presentation	35%	300
Regular Exams	20%	200
Discussion Post Participation	5%	50
C-Day Submission (Bonus)	Optional	25

Grading Scale:	
A	90% - 100%
B	89% - 80%
C	79% - 70%
D	69% - 60%
F	59% or below

Students will receive feedback on each assignment/exam within one to two week of the assignment/exam due date.

Midterm grades will be posted on Owl Express by the midterm grade deadline to provide students with an update on their progress in the course.

Course Policies

Attendance:
This course is fully online, and there are no in-person sessions. While attendance is not tracked in a traditional sense, active engagement with the course materials, assignments, and discussions is essential for success.

To facilitate communication and collaboration, a Microsoft Teams group chat will be established after the semester begins. Students are encouraged to use this space for project discussions, peer collaboration, and direct communication with the professor. This group will serve as an additional channel for questions, feedback, and fostering a community of learning. Participation in the Teams chat is highly recommended, although it is not mandatory.

Students are responsible for keeping up with all course announcements, materials, and deadlines posted on D2L. Regular engagement and timely submission of assignments will ensure steady progress in the course.

Disruptive behaviors, including excessive conversation, inappropriate use of electronic devices, and other actions that disrupt the classroom, are unacceptable.

Email Policy:
All students are reminded to conduct themselves in accordance with the Student Code of Conduct, as published in the University Catalog. Every KSU student is responsible for upholding these provisions. Students who violate KSU policy will be asked to leave the classroom and may be subject to disciplinary action by the University.

Classroom Behavior:
All students are reminded to conduct themselves in accordance with the Student Code of Conduct, as published in the University Catalog. Every KSU student is responsible for upholding the provision.

Students violating KSU policy will be asked to leave the classroom and may be subject to disciplinary action by the University.

Teams Group Policy
The Microsoft Teams group is an additional space for collaboration and communication. All official announcements, course materials, assignments, and critical information will be posted on D2L first and will be considered firm. Please ensure you check D2L regularly to stay updated on the course.

Collaboration Policy:
This course is designed as a solo project, but students may pair up in groups of no more than two. In rare cases, capstone group formations may allow up to three members, subject to instructor approval. Students wishing to work in groups must act before the initial proposal deadline and submit a request. Regardless of group formation, each member is expected to contribute equally. Collaborative work must clearly indicate each student's contributions.

Use of AI Tools
Students may use AI tools (e.g., ChatGPT, GitHub Copilot) for brainstorming, debugging, or enhancing understanding of course material. However, all submissions must be original and appropriately credit the use of any AI tool. Misrepresentation of AI-generated work as your own is considered academic dishonesty and will result in disciplinary action. Students must explicitly reference the usage of AI tools, including what they were used for, in their submissions.

Department of College Policies

Students are expected to be aware that the Computer Science department has certain policies in place that govern practices within the department including:

1. A "B" or better grade is required for CS 3305 and their equivalent transfers. All courses used toward any undergraduate degree in computer science must be completed with an assessed performance grade of "C" or better. This means that all prerequisite courses from the CS Department must have been completed with a "C" or better for a student to enter the next course in a sequence.

2. All requests for course overloads must be made through the College advising office and with the approval of the Program coordinator and department chair. The instructor of any course is not permitted to authorize course overloads.

3. All requests for prerequisite bypasses must be made through the College advising office and with the approval of the Program coordinator and department chair. The instructor of any course is not permitted to authorize course overwrites.

4. All students are encouraged to register their current choice of major using the department major change process. Students who are not recorded under their intended major may find that they may be limited from registering for courses they require to complete their intended program of study.

Institutional Policies

Please visit each of the following links for Institutional policies.

Federal, BOR, & KSU Course Syllabus Policies

Student Resources

Academic Integrity Statement

Confidentiality and Privacy Statement (FERPA):
Kennesaw State University adheres to the Family Educational Rights & Privacy Act of 1974 - FERPA.

KSU Student Resources

This link contains information on help and resources available to students.

Graduate Teaching Assistant (GTA) Support
This course is not expected to have a Graduate Teaching Assistant (GTA) positioned in the CCSE tutoring lab, J-263. However, if available, you are encouraged to contact them for additional help as you see fit. The availability of the GTA will be notified via D2L at the earliest convenience.

Links to frequently used and helpful services:
http://www.kennesaw.edu/myksu/

Department of Career Planning & Development
https://careers.kennesaw.edu

Counseling and Psychological Services
https://counseling.kennesaw.edu

Center for Health Promotion and Wellness
https://wellness.kennesaw.edu

Student Health Services
https://studenthealth.kennesaw.edu

Course Schedule – Flexible (subject to change during the semester)

Milestone	Due Date	Description
Milestone 1: Project Proposal	January 22, 2025 (Wednesday)	Students submit a detailed project proposal outlining objectives, scope, and research questions.
Milestone 2: Literature Review and Research	February 12, 2025 (Wednesday)	Submit a literature review identifying related works and methodologies for the project.
Milestone 3: UML Diagram and Initial Design	February 19, 2025 (Wednesday)	Develop and submit UML diagrams representing the system's conceptual model and initial design.
Milestone 4: Model Implementation	March 12, 2025 (Wednesday)	Submit the first working implementation of the simulation model, with code and supporting documentation.
Milestone 5: Simulation Runs and Data Collection	March 26, 2025 (Wednesday)	Submit results from simulation runs, with initial data analysis and observations.
Milestone 6: Sensitivity and Scenario Analysis	April 16, 2025 (Wednesday)	Submit detailed sensitivity and scenario analyses to evaluate the model under different conditions.
Milestone 7: Validation and Verification	April 23, 2025 (Wednesday)	Submit a report on validation and verification processes, including

		updates to improve model accuracy.
Final Project Deliverable	April 28, 2025 (Monday)	Submit the final research paper and project presentation, incorporating all milestone components.
C-Day Submission (Bonus)	TBD (Late April)	Optional: Participate in the college-wide C-Day event by submitting and presenting your simulation project.

Module 1	**Introduction to Modeling and Simulation.** **Intro to Latex** **Review of Object-Oriented Modeling and Programming.**
Module 2	**Review of Object-Oriented Modeling and Programming.** **Techniques for Discrete-Event Simulation: Object orientation.** **What is in a Git repo?**
Module 3	**Single-server Simulation Models, case studies.** **Simulation with Multiple-Server Models, and case studies.** **Understanding GitHub.**
Module 4	**Models with priorities. Review - Midterm exam.** **Models with Standard Resources, and case studies.**
Module 5	**Models with Detachable Resources, case studies.** **Advanced Process Interaction: synchronous cooperation, case studies.**
Module 6	**Conditional Waiting, case studies.** **Models with Interrupts, case studies.**
Module 7	**Overview of Basic Applied Probability Theory.** **Simulation Output Analysis: Overview**
Module 8	**Review and presentations**