

Course Syllabus
IE 4353: Industrial Systems Simulation (CRN: 11084)
Fall 2022

Instructor	Dr. Md Fashiar Rahman
Location	Business Administration Building, Room 319
Meeting Time	Monday: 3.00 PM – 5.50 PM Wednesday: 3.00 PM – 4.50 PM
Instructor’s Office	A 243
Instructor’s Office Hours	Wednesday and Thursday: 12 PM to 1.00 PM
Email	mrahman13@utep.edu
Teaching Assistant	Hugo Soto Email: hsoto8@miners.utep.edu Office hour: Tuesday and Friday 1.00 PM – 2.00 PM

Course Motivation:

Simulation modeling solves real-world problems safely and efficiently. It provides an important method of analysis which is easily verified, communicated, and understood. Across industries and disciplines, simulation modeling provides valuable solutions by giving clear insights into complex systems. Simulation enables experimentation on a valid digital representation of a system. Unlike physical modeling, such as making a scale copy of a building, simulation modeling is computer based and uses algorithms and equations. Simulation software provides a dynamic environment for the analysis of computer models while they are running, including the possibility to view them in 2D or 3D. The uses of simulation in industries are varied and it is often utilized when conducting experiments on a real system is impossible or impractical, often because of cost or time.

The ability to analyze the model as it runs sets simulation modeling apart from other methods, such as those using Excel or linear programming. By being able to inspect processes and interact with a simulation model in action, both understanding and trust are quickly built.

Course Description (3 Credits)

This course is an introductory course for the senior undergraduate students. As an introductory course on simulation, this course introduces the different concepts and methods simulation. Students will investigate the use of discrete-event simulation (DES), pedestrian model, and agent-based simulation to solve mathematically intractable problems in stochastic modeling. The course emphasizes the fundamental concepts of, and proper interpretation of results from process and agent centric models. The course includes topics such as 1) Queuing theory, 2) Introductory Java programming, 3) Several case studies for DES, 4) Pedestrian modeling, 5) Agent-based modeling, 6) Statistical distribution, 7) Statistical result analysis of simulation output, 8) Presenting simulation using Graphical User Interface (GUI), and 9) Model verification and validation.

Prerequisites:

Basic engineering probability and statistics. Having basic programming knowledge would be an advantage. However, this is not a course of mathematical probability or advanced statistics.

Course Objectives and Learning Outcomes:

The primary objectives pursued in this course are as follows:

- be familiar with commonly used techniques in simulation, such as random number and variate generation, input modeling, events and event types, run-length issues, auto-correlated output, and presentation of simulation results.
- be able to identify problems from their specific domains suitable for simulation, and correctly approach the modeling of those problems, including identification of simulation goals and necessary real-world data.
- be able to implement and execute discrete-event simulation models and correctly interpret and present the results.

Required book reference:

- The Big Book of Simulation Modeling: Multimethod Modeling with AnyLogic 8 Authors: Andrei Borshchev, Ilya Grigoryev (<https://www.amazon.com/Big-Book-Simulation-Modeling-Multimethod-ebook/dp/B00YO0K1ZQ>)
- AnyLogic in three days – A quick course in simulation modeling by Ilya Grigoryev (<https://www.anylogic.com/resources/books/free-simulation-book-and-modeling-tutorials/>)

Technology Requirements:

This course has been designated as a laptop course. Most class activities will be conducted using laptops. You will need to bring your laptop every class unless otherwise noted explicitly. In general, I assume that each student has a laptop with the appropriate software. You will need to have access to a computer/laptop, scanner, webcam, and microphone. You will need to download or update the following software: Microsoft Office, Adobe Acrobat Reader, Windows Media Player, QuickTime, and Java. Check that your computer hardware and software are up-to-date and able to access all parts of the course. Suppose you do not have word-processing software. In that case, you can download Word and other Microsoft Office programs (including Excel, PowerPoint, Outlook and more) for free via UTEP's Microsoft Office Portal. Click the following link for more information about [Microsoft Office 365](#) and follow the instructions.

Student also need to install **AnyLogic personal learning edition (PLE)** on their laptop. AnyLogic PLE is free and compatible with all kind of operating systems. Click the following click to install the [AnyLogic PLE](#) version. Installing AnyLogic is easy and straightforward. If you have any download/installation issues, visit my office hour of further instructions.

IMPORTANT: If you encounter technical difficulties beyond your scope of troubleshooting, please contact the [UTEP Help Desk](#) as they are explicitly trained in assisting with the technological needs of students. Please do not contact me for this type of assistance. The Help Desk is much better equipped than I am to assist you!

Course Materials and Office Hours

I will post lectures, links to other relevant reading materials, homework questions, and project details on Blackboard. All submissions **MUST** be submitted through Blackboard. Paper submissions will not be accepted. The office hours are on Wednesday and Thursday between 12.00 PM and 1.00 PM. However, I can also meet with you using video

conferencing services such as Microsoft Teams based/Zoom on a pre-determined meeting time.

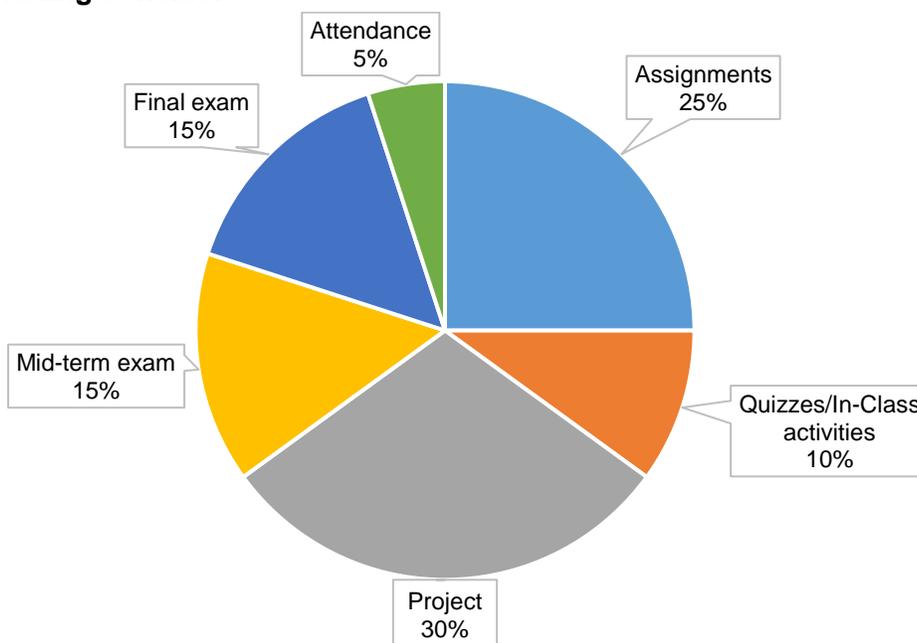
Email:

UTEP e-mail is the best way to contact me. I will make every attempt to respond to your e-mail within 24-48 hours of receipt. When e-mailing me, be sure to email from your UTEP student account and please put the course number in the subject line. In the body of your e-mail, clearly state your question. At the end of your e-mail, be sure to put your first and last name, and your university identification number.

Grades:

- **A:** 90 and above
- **B:** ≥ 80 and < 90
- **C:** ≥ 70 and < 80
- **D:** ≥ 60 and < 70
- **F:** < 60

Course Grading Scheme:



Homeworks/Assignments and Make-Up Work Policy:

Homeworks/Assignments will be announced every week. Make-up work will be given only in the case of a documented emergency. Note that make-up work may be in a different format than the original work, may require more intensive preparation, and **may be graded with penalty points**. If you miss an assignment and the reason is not considered excusable, you will receive a zero. It is therefore important to reach out to me—in advance if at all possible—and explain with proper documentation why you missed a given course requirement. Once a deadline has been established for make-up work, no further extensions or exceptions will be granted.

Quizzes/In-Class Activities

The quizzes/In-class activities will in class **without previous notice**. The contents of the quiz will be covered before on the same class. So, all the students are suggested to be regular in class. Note that make-up quiz may be in a different format than the original work,

may require more intensive preparation, and may be graded with penalty points. If you miss a quiz and the reason is not considered excusable, you will receive a zero.

Course Project

All students are required to do a course project in this class. The project will be based on the Simulation Competition and student will be using AnyLogic software to complete their project. The project will be determined in the first quarter of the semester. Students are strongly encouraged to form teams (maximum two members per team) to work on the project. You can use course's discussion boards to find your team members if you don't know anyone else. It is highly advised to actively participate in project collaboration. **Two complaints of non-performance/non-participation about the other teammates will result in reduction of grade by one grade. Four cumulative complaints will result in an F-grade.** Two best projects will be selected and send for the winter simulation competition, if appropriate. So, all groups need to follow all the requirements for the competition. Further will be discussed and guided during the class.

Blackboard Submission

I strongly suggest that you submit your work with plenty of time to spare in the event that you have a technical issue with the course website, network, and/or your computer. If you are experiencing difficulties submitting your work through the course website, please contact the UTEP Help Desk. It is your responsibility to submit the assignments in Blackboard before the due date

Netiquette

As we know, sometimes communication online can be challenging. It's possible to miscommunicate what we mean or to misunderstand what our classmates mean given the lack of body language and immediate feedback. Therefore, please keep these netiquette (network etiquette) guidelines in mind. Failure to observe them may result in disciplinary action.

- Always consider audience. This is a college-level course; therefore, all communication should reflect polite consideration of other's ideas.
- Respect and courtesy must be provided to classmates and to the instructor at all times. No harassment or inappropriate postings will be tolerated.
- When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a face-to-face situation.
- Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only.

Accommodations Policy:

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services (CASS). Contact the Center for Accommodations and Support Services at 915-747-5148, or email them at cass@utep.edu, or apply for accommodations online via the CASS portal.

Scholastic Integrity:

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) for possible disciplinary action. To learn more, please visit HOOP: Student Conduct and Discipline.

Plagiarism Detecting Software

Some of your course work and assessments may submitted to SafeAssign, a plagiarism detecting software. SafeAssign is used review assignment submissions for originality and will help you learn how to properly attribute sources rather than paraphrase.

Copyright Statement for Course Materials

All materials used in this course are protected by copyright law. The course materials are only for the use of students currently enrolled in this course and only for the purpose of this course. They may not be further disseminated.

COVID-19 Precautions

You must STAY AT HOME and REPORT if you (1) have been diagnosed with COVID-19, (2) are experiencing COVID-19 symptoms, or (3) have had recent contact with a person who has received a positive coronavirus test. Reports should be made at screening.utep.edu. If you know of anyone who should report any of these three criteria, you should encourage them to report. If the individual cannot report, you can report on their behalf by sending an email to COVIDaction@utep.edu. For each day that you attend campus—for any reason—you must complete the questions on the UTEP screening website (screening.utep.edu) prior to arriving on campus. The website will verify if you are permitted to come to campus. Under no circumstances should anyone come to class when feeling ill or exhibiting any of the known COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, and alternative instruction will be provided. Students are advised to minimize the number of encounters with others to avoid infection. Wear face coverings when in common areas of campus or when others are present. You must wear a face covering over your nose and mouth at all times in this class. If you choose not to wear a face covering, you may not enter the classroom. If you remove your face covering, you will be asked to put it on or leave the classroom. Students who refuse to wear a face covering and follow preventive COVID-19 guidelines will be dismissed from the class and will be subject to disciplinary action according to Section 1.2.3 Health and Safety and Section 1.2.2.5 Disruptions in the UTEP Handbook of Operating Procedures.

Civility Statement:

Please be respectful of all students' right to learn without disruptions. In line with this statement please make an active effort to keep the talking to a minimum during lectures and presentations. Also make an active effort to either turn cell phones off or turn them to vibrate mode prior to the start of class. Appointments with instructor should be made in advance.

Tentative Course Schedule (It may change, based on feedback or progress)

Lecture	Date	Topics
1	08/22	Course Introduction
2	08/24	Introduction to Modeling and Simulation
3	08/29	Introduction to Queuing Theory
4	08/31	Methods of Simulation Modeling
5	09/05	Labor Day Holiday – University Closed
6	09/07	Introduction to AnyLogic and Java Script
7	09/12	Discrete Event Simulation (Case Study 1)
8	09/14	Discrete Event Simulation (Case Study 1) – Follow up and Practice
9	09/19	Discrete Event Simulation – Data visualization and Analysis
10	09/21	Discrete Event Simulation – Data visualization and Analysis
11	09/26	Discrete Event Simulation (Case Study 2) – 3D Visualization
12	09/28	Discrete Event Simulation (Case Study 2) – Follow up and Practice
13	10/03	Discrete Event Simulation (Case Study 2) – Completion
14	10/05	Project Discussion and Mid-Term Exam Review
15	10/10	Mid-Term Exam
16	10/12	Pedestrian Modeling
17	10/17	Pedestrian Modeling
18	10/19	Pedestrian Modeling - Follow up and Practice
19	10/24	Project Progress Presentation
20	10/26	Project Progress Presentation
21	10/31	Agent-based Modeling (Case Study 1)
22	11/02	Agent-based Modeling (Case Study 1) – Follow up and Practice
23	11/07	Agent-based Modeling (Case Study 1) - Completion
24	11/09	Agent-based Modeling (Case Study 2)
25	11/14	Agent-based Modeling (Case Study 2) – Follow up and Practice
26	11/16	Agent-based Modeling (Case Study 2) – Completion
27	11/21	Advanced Topics
28	11/23	Advanced Topics
29	11/28	Debugging Tools and Techniques
30	11/30	Final Project Presentation
31	12/05	Final Project Presentation
32	12/07	Final Exam