ÇANKAYA UNIVERSITY
Department of Industrial Engineering

IE 327 – System Simulation

Spring 2026

Instructor:
Prof. Dr. Orhan Karasakal
E-mail: okarasakal@cankaya.edu.tr
Office: L-301/318

Teaching Assistant:
Res. Asst. Ahmet Yücel TANRIVERDİ
E-mail: ahmet.tanriverdi@cankaya.edu.tr
Office: L-310

Course Schedule:

Lectures:	Section 1:	Monday 13:20- 15:10 (L-B05) Wednesday 13:20-14:10 (L-B05)
	Section 2:	Monday 15:20- 17:10 (L-B05) Wednesday 14:20-15:10 (L-B05)
Labs*:	Lab 1:	Thursday 15:20-17:10 (H-338)
	Lab 2:	Thursday 13:20-15:10 (H-338)

* *Students should enter the assigned laboratory session throughout the semester.*

Textbooks:

W. David Kelton, Randall Sadowski, Nancy B. Zupick, Simulation with ARENA, 6th Edition with Connect, McGraw Hill, 2014.

Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol, Discrete-Event System Simulation, 5th Edition, Pearson, 2014. (T57.62 D57 2010)

Reference Books:

A.M. Law, W.D. Kelton, "Simulation Modeling and Analysis", 3rd ed., McGraw-Hill International Editions, 2000. (QA76.9.C65L415 2000 C.1)

George S. Fishman, Discrete-event simulation: modeling, programming, and analysis, Springer, 2001. (T57.62 F57 2001)

Course Description:

Introduction, types of simulation, concepts and examples of discrete-event simulation, event-scheduling/time advanced algorithm, hand simulation, random-number generation, random-variate generation, input modelling, verification and validation of simulation models, output analysis for a single model, comparison and evaluation of alternative system designs, simulation model development and analysis using a simulation software package.

Course Objective:

The main aim of this course is:

- To provide a framework to the students in understanding and applying discrete-event simulation.
- To understand the process and steps of discrete-event simulation modeling.
- To specify ways a computer can generate random numbers and random variates.

- To demonstrate a basic understanding of how any simulation language computes its answers.
- To develop input modeling skills.
- To develop constructing simulation models using ARENA.
- To understand and interpret outputs of a simulation study.
- To develop decision making skills based on the comparison of simulated systems.
- To develop skill of analyzing, modeling, simulating a real-life system and making decisions about the system.
- To prepare the students work effectively in teams, write a report on the results of a simulation study.

Tentative Course Schedule:

Week	Subject
1	Introduction to simulation
2	Various simulation examples
3	Discrete-event simulation concepts
4	Event scheduling oriented hand simulation
5	Input data analysis: Overview, identifying family of distributions using descriptive statistics and graphical tools
6	Input data analysis: Parameter estimation, goodness-of-fit tests
7	Input data analysis: Goodness-of-fit tests, selecting an input model in the absence of data
8	Random-number generation
9	Random-variate generation
10	Verification and validation
11	Output data analysis: Estimation of absolute performance for a terminating simulation
12	Output data analysis: Estimation of absolute performance for nonterminating simulation
13	Output data analysis: Estimation of relative performance for comparing multiple system alternatives
14	Output data analysis: Selecting the best among multiple system alternatives

Course Web Page:

A web page will be available for this course at https://webonline.cankaya.edu.tr. You will need to access this web page for announcements about class, lecture notes, and assignments. A copy of the lecture slides will be posted on webonline site at the beginning of every week. These lecture slides may not contain all the discussion, examples, and the solutions of the problems solved in the class; you are expected to use the slides to go over the plan of the week and to take notes during the class.

All students are encouraged to download and install the student version of ARENA to their personal computers. The student version of ARENA suitable for the course textbook will be available at the course webpage. However, you may download the latest free version of ARENA from the Rockwell Automation's website (URL: https://www.rockwellautomation.com/en-us/products/software/arena-simulation/buying-options/download.html) as well.

Students are required to follow the course website and the announcements. The deadlines are strict and will be dictated by Moodle functionality.

Grading:

Midterm	30 %
Final Exam	35 %
Project[1]	15 %
Lab Work[2]	20 %
Total	100 %

[1] In doing the project study, students should work in **teams of at most four**. It is the student's responsibility to find his/her team members. The composition of the study teams cannot be changed throughout the semester. Groups should provide the group information to the teaching assistant as required. Group lists will be announced when finalized. Please note that if a student name is not included in any one of the submitted group list, she or he will treat it as a single member team.

[2] Learning tasks will be given in each lab section.

Classroom Policy:

Every student is expected to respect the other students' right to learn. Any behavior, which distracts or disturbs the other students or the instructor or disrupts class in any way is unacceptable and will not be tolerated.

Make-up Policy:

A make-up examination for the midterms and the final exam will only be given under highly unusual circumstances (such as serious health or family problems). The student should contact the instructor as early as possible and provide the instructor with proper documentation (such as a medical report certified by Çankaya University's Health Center). A make-up exam may have a different format and may contain different type of questions than the regular exam.

Attendance:

Attendance will be recorded at every lecture and laboratory hour. Students are strongly encouraged to attend all lectures and laboratory sessions in order to comprehend the course material. **A minimum of 60% attendance** in both lectures and laboratories is **mandatory**. Students who do not meet the minimum attendance requirement **are not eligible to take the final** exam. Be aware that **absences due to health problems**, even confirmed by health reports, will be **counted as absences** under applicable by-laws.

Conditions that lead to the letter grade "NA":

- **Not attending any one of the Midterm Exam or the Final Exam**. That is,
    - If you fail to take the midterm exam (or its makeup), you will NOT be able to take the final exam and you will receive the letter grade NA.
    - If you fail to take the final exam (or its makeup), you will receive the letter grade NA.
- **Having less than 60% attendance** to the lectures or the labs. That is,
    - Both the lecture and the lab attendances should be greater than 60%.