

**School of Engineering and Natural Sciences / Industrial Engineering (English)**

**2023 - 2024 Academic Year**

**MODELLING and SIMULATION**

**Syllabus**

| <b>Course Description</b>  |   |                                |                         |                           |             |
|--|---|--------------------------------|-------------------------|---------------------------|-------------|
| <b>Name</b>  | <b>Code</b>   | <b>Semester</b>                | <b>T+A Hour</b>         | <b>Credit</b>             | <b>ECTS</b> |
| MODELLING and SIMULATION   | IND3149030  | Fall Semester                  | 3+2                     | 4                         | 8           |
| <b>Prerequisites Courses</b>   | MODELLEME VE OPTİMİZASYONA GİRİŞ; STOKASTİK MODELLER  |                                |                         |                           |             |
| <b>Recommended Elective Courses</b>  |   |                                |                         |                           |             |
| <b>Language of Instruction</b>   | English   |                                |                         |                           |             |
| <b>Course Level</b>  | First Cycle (Bachelor's Degree)   |                                |                         |                           |             |
| <b>Course Type</b>   | Required  |                                |                         |                           |             |
| <b>Course Coordinator</b>  | Assoc.Prof. Yasin GÖÇGÜN  |                                |                         |                           |             |
| <b>Name of Lecturer(s)</b>   | Assoc.Prof. Yasin GÖÇGÜN  |                                |                         |                           |             |
| <b>Assistant(s)</b>  |   |                                |                         |                           |             |
| <b>Aim</b>   | To make students understand the real job applications and provide solutions to the job improvement processes by making simulation of them on a computer environment.  |                                |                         |                           |             |
| <b>Course Content</b>  | This course contains; Introduction to Simulation,Input Analysis,Random-Number and Random-Variate Generation,Monte Carlo Simulation Examples,Dynamic Simulation Examples,Discrete-Event Simulation in Arena - Basic Operations Validation,Discrete-Event Simulation in Arena - Detailed Operations,Output Analysis - Terminating Simulations,Discrete-Event Simulation in Arena - Intermediate Modeling,Output Analysis - Steady State Simulations,Discrete-Event Simulation in Arena - Entity Transfer,Sample Applications I,Sample Applications II,Arena Process Analyzer. |                                |                         |                           |             |
| <b>Course Learning Outcomes</b>  |   |                                | <b>Teaching Methods</b> | <b>Assessment Methods</b> |             |
| 1. Will be able to Make a hand simulation.   |   |                                | 12, 9                   | A, E                      |             |
| 2. Will be able to apply Monte Carlo simulation.   |   |                                | 21, 9                   | A, E                      |             |
| 3. Use Linear Congrential Method to generate a random number   |   |                                | 12, 9                   | A, E                      |             |
| 4. Will be able to make a discrete-event simulation using Arena.   |   |                                | 21, 8                   | A, F                      |             |
| 5. Will be able to analyze the outcomes of Arena.  |   |                                | 8, 9                    | A, F                      |             |
| <b>Teaching Methods</b>  | 12: Problem Solving Method, 21: Simulation Technique, 8: Flipped Classroom Learning, 9: Lecture Method  |                                |                         |                           |             |
| <b>Assessment Methods</b>  | A: Traditional Written Exam, E: Homework, F: Project Task   |                                |                         |                           |             |
| <b>Lecture Schedule</b>  |   |                                |                         |                           |             |
| <b>Sequenc e</b>   | <b>Topics</b>   | <b>Preliminary Preparation</b> |                         |                           |             |
| 1  | Introduction to Simulation  |                                |                         |                           |             |
| 2  | Input Analysis  |                                |                         |                           |             |
| 3  | Random-Number and Random-Variate Generation   |                                |                         |                           |             |
| 4  | Monte Carlo Simulation Examples   |                                |                         |                           |             |
| 5  | Dynamic Simulation Examples   |                                |                         |                           |             |
| 6  | Discrete-Event Simulation in Arena - Basic Operations Validation  |                                |                         |                           |             |
| 7  | Discrete-Event Simulation in Arena - Detailed Operations  |                                |                         |                           |             |
| 8  | Output Analysis - Terminating Simulations   |                                |                         |                           |             |
| 9  | Discrete-Event Simulation in Arena - Intermediate Modeling  |                                |                         |                           |             |
| 10   | Output Analysis - Steady State Simulations  |                                |                         |                           |             |
| 11   | Discrete-Event Simulation in Arena - Entity Transfer  |                                |                         |                           |             |
| 12   | Sample Applications I   |                                |                         |                           |             |
| 13   | Sample Applications II  |                                |                         |                           |             |
| 14   | Arena Process Analyzer  |                                |                         |                           |             |
| <b>Evaluation Methods</b>  |   | <b>Weight(%)</b>               |                         |                           |             |
| Midterm Exam   |   | 30                             |                         |                           |             |
| General Exam   |   | 70                             |                         |                           |             |
| <b>Resources</b>   |   |                                |                         |                           |             |
| J. Banks, J.S. Carson, B.L. Nelson and D.M. Nicol, Discrete-Event System Simulation, 3rd Edition, Prentice Hall, 2001  |   |                                |                         |                           |             |
| W.D. Kelton, R.P. Sadowski and D.A. Sadowski, Simulation with Arena, 2nd Edition, McGraw-Hill, 2002 3. S.H. Ross, Simulation, 2nd Edition, Academic Press,1997 |   |                                |                         |                           |             |