Óbudai University **Donát Bánki Faculty of Mechanical and Safety Engineering**	**Institute of Mechatronics and Vehicle Engineering**

Course name and Neptun-code: Modeling and Simulation, BMXSTE3MNE **Credits*: 3***

Full time, 1st Semester of the Academic year 2022/23.

Faculties in which the subject is taught: **MSc in Mechatronics**				
Supervised by: **Dr. Frigyik Béla András**	Lecturers: **Dr. Frigyik Béla András**			
Prerequisites conditions: (Neptun Codes) **BMXAME1MNE**				
Lessons per week:	Theory: **2**	Practice (in Auditorium): **0**	Lab: **1**	Consultation:
Exam type (s,v,f):	**oral exam**			

The Syllabus

Aim: Students will learn the basics of the theory of modeling and simulation used in mechatronics. They will acquire skills to help them apply this knowledge in practice and run systems that facilitate the creation of these kind of models.

Schedule

Weeks	Topics
1.	Introduction to modeling and simulation. Why do we simulate? Simulation environment.
2.	Goal of modeling and simulation: when do we need a model and how to get one
3.	Required tools: Review of Linear Algebra, Analysis and numerical tools, and introduction to stochastic methods
4.	Traffic and highways model: Macroscopic simulation I.
5.	Traffic and highways model: Macroscopic simulation II.
6.	Traffic and highways model: Microscopic simulation I.
7.	Traffic and highways model: Microscopic simulation II.
8.	Traffic and highways model: Stochastic approach I.
9.	National holiday
10.	Traffic and highways model: Stochastic approach II.
11.	Population dynamics: Role of dynamical systems in modeling
12.	Control Engineering: Basics and example
13.	Fuzzy set theory and rule-based fuzzy system
14.	Chaos theory: Introduction and a simple model

Requirements

Weeks	Tests

The evaluation criterias

Classes and tests will be held in person. Any change due to the pandemic situation will be announced in the Moodle course.

All main areas of the course are evaluated by test papers. The course is to be considered successfully completed if and only if both tests are written with mark minimum 2 (40%), as a prerequisite for obtaining a **signature**.

Based on the Study Regulations III.6.(4), the student may receive an **offered grade** if they have written both tests successfully.
All matters which are not covered in this document, the Study and Examination Rules and the provisions of the Study Regulations, valid at Óbuda University, prevails.

The semester closing method (method of examination: written, oral, testing, etc.).

Oral exam: Weekly presentations

Literature:

- Bungartz et al. Modeling and Simulation. eBook. ISBN 978-3-642-39524-6.
- Mathworks Inc. Matlab 2020a

Quality Assurance: Student questionnaire at the end of the semester