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 2021/22.

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):	**written 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.	Types of models. ODE, PDE, State Machines, Hybrid. Gene expression model. FIR model. Engineering examples.
3.	Basics of signal processing, z-transform, Laplace space, Stability analysis, Lyapunov's method.
4.	Basics of graph theory, finite state machine in graph environment.
5.	Network model of Barabássy-Albert.
6.	Basics of stochastic processes, description of randomness. Uncertainty analysis, propagation.
7.	Criticality in networks. Fractal and chaos theory. Applications in mechanical engineering.
8.	Modeling and simulation in practice, Requirements analysis. Concept of End-User and its role in mechatronic modeling. Examples, problems, Team Work.
9.	Simulation environment in engineering practice.
10.	General simulation languages. Introduction of MATLAB's simulink, example exercise: Fault tree with fuzzy distribution.
11.	Simulation and modeling in HDS environment, basic concepts, syntax.
12.	Fuzzy Fault Tree analysis in HDS environment.
13.	**Midterm**
14.	**Retake**

Requirements

Weeks	Tests
13	Midterm

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.).

Written exam

Literature:

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

Quality Assurance: