Obuda University Donát Bánki Faculty of Mechanical and Safety Engineering			Institute of Mechatronics and Vehicle Engineering	
Name and Neptun-code: Fuzzy Logic in Engineering Applications BMKTNFLBNE **Credits*:*** 3 *Full time, Autumn Semester of the Academic year 2022/2023.*				
Subject lecturer: Edit Laufer				
Prerequisites (with code):				
Weekly hours:	Lecture: **1**	Seminar.:0	Lab. hours: **1**	Consultation:0
Requirement:	Midterm grade			
Syllabus:				
Aim: Fuzzy set theory is an approach used to solve problems that cannot be solved by classical set theory or probability theory. This course's primary objective is to teach students the fundamental concepts of fuzzy set theory and fuzzy logic used in engineering applications. Besides, aiming to show students the mathematical modelling methods of complex dynamic engineering objects and controlling the systems using fuzzy logic; Training in mathematical models of engineering objects and processes of control based on fuzzy logic; Training in the development and mathematical study models based on fuzzy logic.				
Course description: The course starts with an introduction to the theory of fuzzy sets, fuzzy logic, and fuzzy engineering systems with applications to optimization and decision making. The course provides deep ideology and mathematical methodology in fuzzy engineering systems —moreover, teaching fuzzy logic soft computing programming in Matlab Fuzzy Toolbox.				

Lecture schedule	
Education week	*Topic*
1.	Soft computing methods. Fuzzy logic. Neural networks. Genetic algorithms. Application of fuzzy logic in engineering systems and decision making.
2.	Conventional set theory. Introduction to Fuzzy sets. Membership functions
3.	Operation on fuzzy sets, fuzzy intersection (t-norm), fuzzy union (t-conorm)
4.	Aggregation operators. Implication and inference. Defuzzification methods.
5.	Mamdani type inference system. Matlab Fuzzy Logic toolbox.
6.	Practical examples.
7.	Takagi-Sugeno model.
8.	Hierarchical systems.
9.	**Test**
10.	Project task assignment
11.	Project task
12.	Project task
13.	**Retake test**
14.	**Project presentation**

Course requirements

Education week	*Topic*
9	Test
13	Retake test
14	Project presentation

The participation is governed by TVSZ III.23.§ (1)-(4).

All main areas of the course are evaluated by tests. The course is to be considered successfully completed if and only if test and project work are successful (at least 40%), as a prerequisite for obtaining a **signature**.

Signature is **denied** if the student cannot justify the absence for the test, failed to submit the project task, or absences exceed the number of classes specified in TVSZ.

During the semester, the signature requirements can be **replaced** in the following cases: the laboratory test failed; illness.

Midterm grade is calculated in the following way: **50% Test + 50% Projects**

Achieved result	Grade
85%-100%	excellent (5)
70%-84%	good (4)
55%-69%	average (3)
41%-54%	satisfactory (2)
0%-40%	failed (1)

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.).

Midterm grade

Literature

Mandatory:

Recommended: J.ROSS, Timothy. Fuzzy Logic With Engineering Application, 2010.
Sivanandam, S. N., Sai Sumathi, and S. N. Deepa. *Introduction to fuzzy logic using MATLAB*. Vol. 1. Berlin: Springer, 2007.
C. Mathworks, Adaptive Fuzzy Inference System Toolbox, Mathworks 2020.
Chakraverty, Snehashish, Deepti Moyi Sahoo, and Nisha Rani Mahato. *Concepts of soft computing: fuzzy and ANN with programming*. Springer Singapore, 2019.