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, Spring Semester of the Academic year 2022.*				
Subject lecturer: Sinan Koçak				
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.	The concept of fuzzy logic
2.	Introduction to Fuzzy sets, Crisp vs Fuzzy Types of Fuzzy sets, Membership functions
3.	Operation on fuzzy sets, t-norm, complements t-conorm, combination of operations continued
4.	Fuzzy logic inference process
5.	Decision making models. Basic algorithms of fuzzy inference.
6.	**Test 1**
7.	Exploring the possibilities of fuzzy modeling in Matlab. Development of Mamdani type fuzzy system in Matlab Fuzzy Logic Toolbox.
8.	Situational model of decision making the basic features. Development of Sugeno fuzzy system in Matlab Fuzzy Logic Toolbox
9.	Fuzzification and defuzzification operations. Exploring Simulink simulation features.
10.	Control models in the form of a fuzzy controller.
11.	Project presentation
12.	Project presentation
13.	**Test 2**
14.	**Retake**

Course requirements

Education week	*Topic*
6	Test 1
11	Project presentation
12	Project presentation
13	Test 2
14	Retake

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 both tests and project work are successful (at least 50%), as a prerequisite for obtaining a **signature**.

Midterm grade is calculated in the following way: **30% Test 1 + 30% Projects and HomeWorks + 40% Test 2**

Achieved result	Grade
89%-100%	excellent (5)
76%-88<%	good (4)
63%-75<%	average (3)
51%-62<%	satisfactory (2)
0%-50<%	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.