Obuda University John von Neumann Faculty of Informatics			Institute of Applied Mathematics	
Name and code: *NMXGI1SMNE* *Machine Intelligence*			**Credits*:4*** *2019/20 year II. semester*	
Subject lecturers: Marta Takacs				
Prerequisites (with code):	-			
Weekly hours:3	Lecture:3	Seminar.:	Lab. hours:	Consultation:
Way of assessment:	exam			

Course description:

Goal: The goal of the course is to give introduction to the soft computing technologies, fuzzy systems, neural networks and hybrid systems. The acquired topics qualify the students to model relevant problems in fuzzy rule base environment, with different operator families, and to construct neural networks taking in account different learning rules. The students will be familiar with ANFIS system construction not only based on theoretical background of them, but also using related software tools (Matlab for example). The student becomes familiar with the basic machine learning rules and how to apply them in the classification, cluster and big data algorithms.

Course description: Fuzzy set theory. Fuzzy based approximate reasoning and fuzzy control. Neural networks, Anfis systems. Learning rules. Classification and cluster algorithms. Big data – basic theoretical background.

Lecture schedule

Education week	*Topic*
1.	An introduction to fuzzy sets. Operations on fuzzy sets
2.	Fuzzy relations, Fuzzy implications
3.	The theory of approximate reasoning
4.	Fuzzy rule-based systems, Fuzzy reasoning scheme
5.	Fuzzy logic controllers. Efficiency of different fuzzy systems
6.	1st meantime exam
7.	Neural networks. The perceptron learning rule
8.	The delta learning rule with semilinear activation function. The winner-take-all learning rule
9.	The error back-propagation learning rule. Efficiency of neural networks
10.	Implementing fuzzy IF-THEN rules by trainable neural nets. Fuzzy neuron. Hybrid neural nets. ANFIS architecture.
11.	Neuro-fuzzy classifiers. Big data algorithms
12.	2nd meantime exam
13.	Individual project presentation
14.	Replacements possibility

Midterm requirements

Two meantime exams, related to the theoretical basics (20+20 points). Individual project, constructed ANFIS model, or other MI based model with a description of the system in a paper of about 5-10 pages. The project should be presented as an oral presentation at the 13th week. (at best 10 points). For the semester verification (subscription) it is necessary to upload the project documentation on the Moodle system and to achieve the 30% of the points on the meantime exams.

The student can prepare/develop homework during the semester (and upload them to the Moodle system), which can be counted towards the end-of-year grade.

Final grade calculation methods

The final grade is calculated as follows:
Meantime exams: 2*20 points, individual project - at best 10 points, (homework at best extra 40 points).
Final exam - at best 50 points.

Achieved result	Grade
89%-100%	excellent (5)
76%-88<%	good (4)
63%-75<%	average (3)
51%-62<%	satisfactory (2)
0%-50<%	failed (1)

Type of exam

Oral/written answer from the theoretical background (at best 50 points, 70% of the whole result).

Type of replacement

At the first week of the exam period the student has possibility to present his missed individual project and meantime exams.

References

Obligatory:
http://uni-obuda.hu/users/fuller.robert/nfs.html

Recommended:

1. Carlsson, Christer, Fuller, Robert, *Fuzzy Reasoning in Decision Making and Optimization,* ISBN 978-3-7908-1805-5
2. The weekly recommended web sources related to the actual topics