Z1-PU7	WYDANIE N1

(*faculty stamp*)

COURSE DESCRIPTION

1. Course title: SOFT COMPUTING, Fuzzy data analysis	**2. Course code SC_FDA**
3. Validity of course description: 2018/2019	
4. Level of studies: MSc programme	
5. Mode of studies: intramural studies	
6. Field of study: CONTROL, ELECTRONIC AND INFORMATION ENGINEERING (MACRO)	(FACULTY SYMBOL) RAU-2
7. Profile of studies: ACADEMIC	
8. Programme: DATA SCIENCE	
9. Semester: 1	
10. Faculty teaching the course: Faculty of Automatic Control, Electronics and Computer Science	
11. Course instructor: Dr hab. inż. Ewa Straszecka	
12. Course classification: common courses	
13. Course status: compulsory ~~/elective~~	
14. Language of instruction: English	
15. Pre-requisite qualifications: Computer programming, Optimization methods, Numerical methods, Statistics and probability theory, Algorithms and data structures.	
16. Course objectives: The aim of the course is making students familiar with modeling, classification and generally data analyses based of formalisms of fuzzy sets theory. Data analysis scenarios, based on fuzzy sets are illustrated by many applications, in biomedicine, engineering, automatic control, electronics, informatics.	

17. Description of learning outcomes:

Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Student understands basic notions of fuzzy set, interval set, t-norm.	Credit	Lecture	K2A_W01, K2A_W02
2.	Student is able to relate problems of modeling uncertainty in concrete cases to the formalisms of fuzzy sets.	Credit	Lecture	K2A_W04, K2A_W07
3.	Student is able to relate basic notions of Dempster-Shafer theory to representation of knowlegde extracted from data.	Credit	Lecture	K2A_W08, K2A_W10
4.	Student is able to create membership function represented knowledge and data.	Project tasks	Project	K2A_U08, K2A_U10
5.	Student knows properties of norms, conorms, measures of membership grades and is able to use them for information aggregation.	Project tasks	Project	K2A_U07, K2A_U08

6.	Student is able to fit uncertainty measures to the desired tool of computer aided decision.	Project tasks	Project	K2A_U11, K2A_U12, K2A_U23, K2A_K01
7.	Student is able to extract fuzzy rules from data.	Project tasks	Project	K2A_U16, K2A_U17, K2A_K03
8.	Student is able to choose a suitable software tools for construction of systems of computer aided decision making.	Project tasks	Project	K2A_U18, K2A_K07
9.				

18. Teaching modes and hours

Lecture 15 / ~~BA /MA Seminar / Class /~~ Project 15 / ~~Laboratory~~

19. Syllabus description:

Lecture:

1. Introductory issues. Importance of fuzzy data analyses for applications in biomedical engineering, biocybernetics, automatic control, electronics, information technologies.
2. Theory of sets: fuzzy sets, interval fuzzy sets, intuitionistic sets (t-norms, implications, cardinality of sets)
3. The Dempster-Shafer theory for fuzzy focal elements (basic definitions, uncertainty vs. imprecision, different concepts of fuzzy focal elements)
4. Representation of heuristics (medical indexes transformed into computer diagnosis support tools, analysis of medical databases, expert knowledge representation)
5. Membership functions construction and extraction of fuzzy focal elements based on data
6. Using fuzzy rules for decision support (diagnosis support using fuzzy sets, interval fuzzy sets, and the Dempster-Shafer theory)
7. Fuzzy systems and neural networks used for common or diverse solutions.

Project:

1. Designing membership functions from data and heuristic knowledge
2. Suggesting uncertainty and imprecision measures appropriate for practical tasks of decision
3. support
4. Evaluating significance of fuzzy rules
5. Creating decision support systems

20. Examination: semester NO

21. Primary sources:

H.J. Zimmerman, (2001), Fuzzy set theory and its applications, Springer,
A. Piegat, (2001) Fuzzy modeling and control, Springer

22. Secondary sources:

T.J. Ross, (2010), Fuzzy logic with engineering applications, Wiley,
Czogała E., Łęski J.M., (2000), Fuzzy and Neuro-Fuzzy Intelligent Systems, Springer

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	15/15
2	Classes	/
3	Laboratory	/
4	Project	15/15
5	BA/ MA Seminar	/
6	Other	/
	Total number of hours	30/30

24. Total hours: 60

25. Number of ECTS credits: 2

26. Number of ECTS credits allocated for contact hours: 1

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 1

26. Comments:

Approved:

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(date, Instructor's signature)

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(*date , the Director of the Faculty Unit signature)*