Program	Type of studies (cycle)	Third cycle
	Name of the program	Doctoral Studies in Mathematical and Computer Science

Course

Course title	**Selected chapters of fuzzy logic**

Course code	Semester	Course status	ECTS credits	Contact hours
CS 603	II	Elective	10	30

Aims and intended learning outcomes	The goal is to introduce formal definitions of fuzzy functonal and multivalued dependencies based on conformance build upon suitably selected similarity relations. We prove that fuzzy dependencies are consistent with classical ones, and that the corresponding inference rules are sound, and their set complete. We intorduce a valuation, so attributes, as well as the logic operations betweeen them, are considered as fuzzy formulas. In short, we attach fuzzy formulas to fuzzy dependencies. We introduce the notation of active fulfillment of fuzzy dependency by fuzzy instance.We derive the result about replacement, which enables us to replace a two-element fuzzy instance, which actively satisfies fuzzy multivalued dependency, by another one. We prove the equivalence: fuzzy instance satisfies fuzzy deopendency if and only if the attached fuzzy formula is correct whenever each of fuzzy formulas contained in the corresponding attached set of fuzzy formulas is correct. The equivalence provides avoiding the weaknesses of the classical approach to the subject (number of rules, selection, consumption of time, uncertainty of outcome), and enables positioning into environment where our steps can be automated (by the resoultion principle and a sfotware). The derived theory is generalized to the case of vague functional and muntivalued dependencies.

Course content/topics

- Fuzzy dependencies, fuzzy logic, formulas and equivalences.
- Reichenbach's and some f-generated implications in fuzzy relation databases.
- Continuous maps in fuzzy relations.
- Fuzzy dependencies and g-generated fuzzy implications in fuzzy relations.
- Klir-Yuan fuzzy implication.
- Wilmott's fuzzy implication in fuzzy databases
- Fuzzy functional and multivalued dependencies for Frank's class of additive generators.
- Soundness and completeness of inference rules for new vague functional dependencies.
- Soundness of inference rules for new vague multivalued dependencies.
- Completeness.
- Vague functional and multivalud dependencies and the resolution principle.
- Axiomatization in vague relations via Lukasiewicz fuzzy implication.
- New vague dependencies as a result of automation.
- Applications of h-generated fuzzy implications.

LITERATURE

[1] Dž. Gušić, *Aksiomatizacija fuzzy i vague funkcionalnih i višeznačnih zavisnosti u relacijama baza podataka*, PMF UNSA, Sarajevo, 2021.

[2] Y. Shi, *A deep study of fuzzy implications*, Ph.D. dissertation, Faculty of Science, Ghent University, Ghent, 2009

[3] M. Baczynski and B. Jayaram, *Fuzzy implications*, Springer - Verlag, Berlin -Heidelberg, 2008

Grading

	Criterion	Points	Cut-off points
1.	Written assignment		
2.	Project		
3	Final exam		
	Total	100	55