Course: Fuzzy sets and systems

Course instructors: Jelena M. Ignjatović, Ivana Z. Micić

Course type: Elective

Credit points ECTS: 12

Prerequisites: No

Course objectives:

Introduction to the basic ideas, concepts and results of the theory of fuzzy sets and systems, to the algebraic fundamentals of fuzzy logic, as well as to practical applications of fuzzy sets and methods for solving fuzzy relation equations and inequa-tions.

Learning outcomes:

After completing the course, the student should master the basic ideas, concepts and results of the theory of fuzzy sets and systems, and be able to independently apply these ideas, concepts and results in scientific research within the same or some other scientific field.

Course description (outline):

Fuzzy sets: Concept of fuzzy set, set and algebraic operations on fuzzy sets, Principle of extension, fuzzy relations, composi-tion of fuzzy relations, fuzzy orderings, fuzzy equivalences and fuzzy equalities, fuzzy partitions, fuzzy functions, extensio-nality, fuzzy matrices, fuzzy closures. Algebraic basics of the fuzzy logic: residuated lattices, Heyting algebras, BL-algebras, MV-algebras, Gödel algebras, triangular norms on a unit interval, Łukasiewicz, product and Gödel norm.

Applications of fuzzy sets: Uncertainty modeling, fuzzy logic and approximate reasoning, fuzzy control, fuzzy data analysis, fuzzy clustering, fuzzy decision making, fuzzy languages and fuzzy automata, fuzzy algebraic structures, fuzzy relational systems, fuzzy graphs, fuzzy topological spaces. Effective procedures for solving szstems of fuzzy relation equations and inequations.

References:

- 18. R.Belohlavek, Fuzzy Relational Systems: Foundations and Principles, Kluwer Academic Publishers, New York, 2002.
- 19. R. Belohlavek and V. Vychodil, Fuzzy Equational Logic, Springer, Berlin/Heidelberg, 2005.
- 20. G. Gerla, Fuzzy Logic: Mathematical Tools for Approximate Reasoning, Kluwer, Dodrecht, 2001.
- 21. G. J. Klir, B. Yuan, Fuzzy Sets and Fuzzy Logic, Theory and Application, Prentice-Hall, Englewood Cliffs, NJ. 1995.
- 22. L.-X. Wang, A Course in Fuzzy Systems and Control, Prentice-Hall International, Inc., 1997.

Active teaching hours: 5	Theoretical classes: 5	Practice classes:
Methods of teaching.		

Methods of teaching:

The lectures use classical teaching methods with the use of modern information and communication technologies and interaction with students. Students' knowledge is tested through homework and defense of seminar papers. The final oral exam checks the comprehensive understanding of the presented material.

Grading structure (100 points)

Activity during the lectures: 10 points; homework and seminars: 20 points; oral exam: 70 points.