Course: General algebra

Course instructors: Miroslav D. Ćirić, Andreja P. Tepavčević

Course type: Elective

Credit points ECTS: 12

Prerequisites: No

Course objectives:
Acquiring advanced knowledge of basic concepts of universal algebra and basic universal algebraic constructions, ordered sets, lattices, semigroups, groups, rings and modules.

Learning outcomes:
Upon completion of the course, the student should master advanced knowledge in the field of universal algebra, ordered sets, networks, semigroups, groups, rings and modules, and be able to apply this knowledge in scientific research in these or other areas.

Course description (outline):
Ordered sets, ideals and filters, isotonic functions, residuated functions, closure and opening operators, Galois connections, lattices, sublattices and homomorphisms, distributive and modular lattices, complete lattices, algebraic lattices, algebraic operations, definition and examples of algebras, subalgebras, congruences and quotient algebras, homomorphisms and isomorphisms, basic algebraic constructions, direct and subdirect products, pullback products, products associated with direct products, direct and inverse limits, operators on classes of algebras, varieties of algebras, terms and term algebras, free algebras, equational logic (equational theories), completely invariant congruences, connections with model theory, semigroups, semigroups of transformations and relations, free semigroups, generating sets, monogenic semigroups, groups, homomorphisms of groups, normal subgroups and quotient groups, permutation groups, permutational representation of groups, direct product of groups, cyclic groups, Abelian groups, finitely generated Abelian groups, Sylow theorems and finite groups of small order, free groups, free product groups, group representations, rings, subrings, ring homomorphisms, ring congruences, ideals, quantitative rings, integral domains, unique factorization domains, main ideal domains, Euclidean domains, modules, submodules, homomorphisms of modules, free modules.

References:

1. S. Burris, H.P. Sankappanavar, A Course in Universal Algebra, Springer, New York, 1981.
2. G. Grätzer, Universal Algebra, Second edition, Springer, New York, 2008.
3. J. J. Rotman, An Introduction to the Theory of Groups, Springer, New York, 1994.
4. J. J. Rotman, Advanced Modern Algebra, Prentice Hall, 2003.
5. S. Crvenković, I. Dolinka, R. Sz. Madarász: Selected topics of general algebra - groups, rings, fields, lattices (in Serbian), Univerzitet u Novom Sadu, 1998.

Active teaching hours: 5	Theoretical classes: 5	Practice classes:

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*.