

Study programme(s): Mathematics (MA), Master in Mathematics Teaching(MP)			
Level: master			
Course title: Universal Algebra (MA-18)			
Lecturers: Petar V. Marković, Nebojša M. Mudrinski			
Status: elective			
ECTS: 5			
Requirements: none			
Learning objectives: Introducing students to ideas, methods and proof techniques of Universal algebra and allowing them to get coherent global understanding of the mathematical concepts learned in earlier algebra courses.			
Learning outcomes: <i>Minimal:</i> Students ought to recognize the common ideas found in previously learned concepts and theorems about groups, rings and vector spaces, to master the concepts of homomorphism, subalgebra and Cartesian product, and to become proficient in manipulation of identities. <i>Desired:</i> Students should understand the idea underlying the whole first half of the course and get a glimpse of the basic methods and techniques used in this area of algebra.			
Syllabus: <i>Theoretical instruction</i> Basic concepts and special classes of lattices. Syntax and semantics of algebras. Subalgebras. Isomorphism and homomorphism. Congruences. Isomorphism theorems. Cartesian and subdirect product. Free algebras. Varieties and equational classes. Equational logic. Mal'cev properties. Ultrafilters and ultraproducts. Jonsson's Lemma. Finite basis problems. Baker's Theorem. <i>Practical instruction</i> Covering graph of a lattice. Distributive and modular lattices, Boolean algebras. Invariants of the three fundamental class operators. Congruence lattice. Construction of a free algebra, manipulation with identities. Identities and congruence lattices. Ultraproduct constructions. Congruence distributive varieties.			
Literature 1. P. C. Мадарас, Од скупова до универзалних алгебри, Универзитет у Новом Саду, 2006. 2. S. Burris, H. P. Sankappanavar, A Course in Universal Algebra, Springer-Verlag, New York, 1981. 3. R. N. McKenzie, G. F. McNulty, W. F. Taylor, Algebras, Lattices, Varieties, I, Wadsworth and Brooks/Cole, Monterey, 1987.			
Weekly teaching load			Other: 0
Lectures: 3	Exercises: 1	Other forms of teaching: 0	Student research: 0
Teaching methodology Lectures are presented using classical teaching methods. Exercises are used to practice and analyse typical problems and their solutions. The ability of application of theoretical knowledge is checked through independent solving of exercises on a mid-course colloquium, and on the end-term one. Only the students who score at least 25 points at the colloquia qualify for the final exam. The final exam is oral and the student is supposed to demonstrate general understanding of the presented theoretical material.			
Grading (maximum number of points 100)			
Pre-exam obligations	points	Final exam	Points
Colloquia	50	Oral exam	50