M083	**Algebra**	L	S	E	ECTS
		2	0	2	6

The aim of the course. The objective of this course is to familiarize students with basic algebraic structures and their properties. During lectures we will introduce and analyze basic concepts and prove their properties and their mutual links, accompanied by numerous examples, with special emphasis on the examples seen in the previously taken courses. During exercises students should adopt techniques of examining the properties of abstract algebraic structures and problem solving.

Prerequisites. Linear algebra I and II.

Course content.
1. Groups. Gruopoid, semigroup, monoid, group. Group homomorphisms and isomorphisms. Finite groups, Lagrange theorem. Normal subgroups and quotient groups, isomorphism theorems. Groups of permutations, action of groups, Cayley theorem. Cyclic groups. Sylow theorems. Solvable groups.
2. Rings and module. Rings and ideals. Quotient rings. Ring homomorphisms and isomorphisms. Skew fields and fields. Ring of polynomials. Modules and vector spaces.
3. Integral domains. Quotient fields. Maximal ideals and prime ideals. Principal ideal domains.
4. Factorial rings. Prime and irreducible elements in the rings. Factorisation in rings of polynomials, Gauss lemma and Eisenstein criterium.
5. Field extensions. Degree of an extansion and finite extensions. Algebraic extensions. Minimal polynomial. Splitting fields. Finite fields. Algebraic closure. Ruler and compass constructions.
6. Galois theory. Field automorphisms. Galois group of an extension. Galois group of a polynomial.. Separabile polynomials and separabile extensions. Normal extensions. Fundamental theorem of Galois theory. Solvability in radicals.

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Analyze algebraic structures and distinguish basic properties of groups, rings, fields and vector spaces.
2.	Apply the properties of cyclic and permutation groups when solving tasks.
3.	Solve tasks using the Lagrange theorem, Sylow theorems and the Chinese remainder theorem.
4.	Analyze mappings of algebraic structures with emphasis on isomorphism theorems.
5.	Examine the reducibility of polynomials over a given ring.
6.	Analyze the field extensions and determine the corresponding Galois group.

RELATING THE LEARNING OUTCOMES, ORGANIZATION OF THE EDUCATIONAL PROCESS AND ESTIMATION OF THE LEARNING OUTCOMES.

Organization of the educational process	ECTS	Learning outcomes **	Student activities*	The method of estimate	Points	
					Min	max
Lecture attendance	1	1-6	Lecture attendance, discussion, team work and independent work on given tasks.	Attendance sheets, tracking activities	0	4
Written exam (preliminary exam)	2	1-6	Prepairing for the written exam.	Evaluation	25	48
Final exam	3	1-6	Repetition of the subject matter.	Oral exam	25	48
Total	6				50	100

Teaching and evaluation of knowledge. Attending lectures and exercises is required. The exam consists of written and oral part, and can be taken after completion of lectures and exercises. During the semester students can take preliminary exams that replace written exam.

Can the course be taught in English: Yes.

Basic literature:

1. T.W. Hungerford, Algebra, Springer-Verlag, New York, 1974.
2. H. Kraljević, Algebra, script, available at the web pages of Department of Mathematics, University of Osijek, 2007.

Additional literature:

1. S. Lang, Algebra, Springer-Verlag, New York, 2002.
2. I. Stewart, Galois Theory, Chapmann and Hall, London, 2004.