Study programmes: Bachelor studies – Informatics

Course name: M141 - Algebra 2

Lecturers: Milan Bozić, Aleksandar Lipkovski, Dragana Todorić, Zoran Petrović

Status: Optional

ECTS: 6

Attendance prerequisites: M105, M106, M120, M140

Course aims: Acquisition of advanced general and specific knowledge of algebra.

Course outcome: Upon completion of the course, students have advanced knowledge of algebra and elementary number theory. They have acquired the fundamental notions, main constructions and basic theorems of group theory, ring theory and elementary number theory. They are qualified to solve problems from the mentioned areas and follow advanced courses in which algebra plays an important part.

Course content:

-Groups. Normal subgroups and quotient groups; isomorphism theorems. Direct product decomposition. Nilpotent and solvable groups. Group actions. Class equation; p-groups and Sylow theorems. Semidirect product. Generators and relations. Groups of small order.

-Rings. Consequences of axioms. Characteristic of a ring. Zero divisors and integral domains. Ideals and congruences. Quotient ring, ring Z_n. Prime and maximal ideals. Intersection, sum and product of ideals. Quotient ring, the isomorphism theorem for rings (factoring of ring Z_n, Chinese remainder theorem). Principal ideals, prime and irreducible elements, coprime elements. Euclidean and principal ideal domains (Z, F[x]). Unique factorization domains.

-Fields. Field extensions, degree of a field extension. Gauss's lemma and irreducibility of polynomials over the rationals. Field of fractions. Algebraic and transcendental elements over a field, simple extensions. Compass-and-straightedge constructions (doubling the cube, angle trisection, squaring the circle). Constructions of regular polygons. Splitting field of a polynomial. Algebraically closed fields. Solving cubic and quartic equations. Historical overview of development of algebra.

Literature:

1. G. Kalajdžić, Algebra, Matematički fakultet, Beograd, 1998.
2. Ž. Mijajlović, Algebra, Milgor, Beograd, 1998.
3. N. Božović, Ž. Mijajlović, Uvod u teoriju grupa, Naučna knjiga, Beograd, 1990.
4. A. Clark, Elements of Abstract algebra, Dover Publ. Co. New York, 1984.
5. A. Baker, A concise introduction to the theory of numbers, Cambridge Univ. Press., 1984.

Number of hours:	**Lectures:**	**Tutorials:**		
4	2	2		

Teaching and learning methods: Frontal / Interactive / Tutorials / Lectures / Exercises

Assessment (maximal 100 points)

Course assignments	**points**	**Final exam**	**Points**
Lectures	-	Written exam	-
Exercises / Tutorials	-	Oral exam	-
Colloquia	30	Written-oral exam	70
Essay / Project	-		