Level: bachelor

Course title: Algebra 2 (M4-06)

Status: obligatory

ECTS: 8

Requirements: none

Learning objectives

Understanding the basic algebraic structures and laws through a detailed systematization of the structures of numbers. Introduction to the problems and techniques related to number theory and polynomials as well as introductory concepts from linear algebra.

Learning outcomes

Knowing and understanding the basic algebraic structures, analysing the structures and properties of numbers. Solving problems by mathematical induction, solving systems of Diophantine and congruence equations, finding zeros of polynomials. Solving systems of linear equations, working with matrices and determinants. Understanding general properties of the algebraic structures, numbers, polynomials, matrices, and recognizing these in other areas of mathematics. Solving problems of number theory and problems with polynomials.

Syllabus

Theoretical instruction

Axiomatic foundation and structure of natural numbers. Groupoids, semigroups. Construction of the structure and properties of integers. Groups, subgroups, normal subgroups, homomorphism, congruence. Ring, subring, ideal. Divisibility and congruences in the ring of integers. GCD, Euclidean algorithm, LCM, prime numbers, basic theorem of arithmetic, the Chinese Remainder Theorem, Fermat's little theorem, Euler and Wilson's theorem. Diophantine equations. Residue rings. Integral domain and field. Fields of rational and real numbers. Vector space R^n. Complex numbers. Polynomials. Roots of polynomials, irreducible polynomials. Factorisation, basic theorem of algebra. Systems of linear equations, Gaussian algorithm. Determinants, Cramer's rule. Matrix, square matrix rings.

Practical instruction

Work on concrete examples and solving problems in algebraic structures, identifying substructures, congruences. Using elements of number theory to solve various problems. Solving Diophantine and congruence equations. Procedures for determining roots of polynomials and solving typical problems that use numbers and polynomials. Solving and discussion of systems of linear equations. Basic problems with determinants and matrices.

Weekly teaching load				Other: 0
Lectures: 3	Exercises: 3	Other forms of teaching: 0	Student research: 0	