UNIVERSITY
OF WARMIA AND MAZURY
IN OLSZTYN

Faculty of Mathematics and Computer Science

Course title: ALGEBRA I

ECTS credit allocation (and other scores): 4,5

Semester: autumn

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Natural sciences

Language: English

Number of hours per semester: 30 lectures + 30 classes = 60 hours

Course coordinator/ Department and e-mail: Erasmus coordinator Anna Szczepkowska/ WMiI, anna.szczepkowska@matman.uwm.edu.pl

Type of classes: classes and lectures

Substantive content

CLASSES:

Examples of algebraic structures , groups , subgroups , normal divisors of groups, groups of isometries of regular polygons and the Euclidean plane . Examples of homomorphisms of groups and applications of the theorem about homomorphism . Groups of transformations and permutations . Examples of action of groups on sets. Sylowa subgroups . Aplications of foundamental theorem of finite Abelian groups . Solvable and nilpotent groups, examples . Examples of rings, subrings , homomorphisms of ring, ideals (including the prime and maximal), quotient rings. The use of assertions about homomorphism of rings to study ideals. The field of fractions of the ring. The properties of the rings of polynomials . Distribution on irreducible polynomials . Prime and irreducible elements of the rings . Unique factorization and Gauss rings, examples. Euclidean algorithm, Euclidean rings.

LECTURES:

Examples of algebraic structures , groups , subgroups , normal divisors of groups, groups of isometries of regular polygons and the Euclidean plane . Examples of homomorphisms of groups and applications of theorem about homomorphism . Groups of transformations and permutations . Examples of actions of groups on sets. Sylow subgroups . Applications of the fundamental theorem of finite Abelian groups . Solvable and nilpotent groups, examples . Examples of rings, subrings , homomorphisms of ring, ideals (including the prime and maximal), quotient rings. The use of assertions about homomorphism of rings to study ideals. The field of fractions of the ring. The properties of the rings of polynomials . Distribution on irreducible polynomials . Prime and irreducible elements of the rings . Unique factorization and Gauss rings, examples. Euclidean algorithm, Euclidean rings.

Learning purpose:
Knowledge of the concepts and theorems of classical algebra. The ability to see structures in other branches of mathematics. The use algebra to solve problems in geometry, combinatorics and mathematical analysis. Preparation for further education in the field of algebra.

On completion of the study programme the graduate will gain:

Knowledge:

The student knows the basic theorems of abstract algebra. Understand the place and importance of this

subject among others mathematical objects, recognizes algebraic structures in other branches of mathematics. He knows basic examples both illustrating specific mathematical concepts, as well as allowing refute false hypothesis or incorrect reasoning.

Skills:

The student is able to formulate a comprehensible statements and definitions in the field of abstract algebra. Can create new algebraic structures by constructing quotient structures and Cartesian products. He sees the presence of structures algebraic (groups, rings, fields) in a variety of mathematical topics, not necessarily directly related to the algebra.

Social Competencies:
The student knows the limits of their knowledge and understands the need for further education, can independently search information in the bibliography.

Basic literature:

1) J. A. Gallion, Contemporary abstract algebra, Cengage Learning, 8 edition,, wyd. -, 2012 ; 2) J. J. Rotman, A first course in abstract algebra,, wyd. Pearson/Prentice Hall, 2006 ; 3) J. N. Herstein, Abstract algebra, wyd. Wiley, 3 edition, 1996

Supplementary literature:

1) D. S. Dummit, R. M. Foote, Abstract algebra, wyd. Wiley, 3 edition, 2003

The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 2,52 ECTS points,

Student's independent work: 1,98 ECTS points,