

DESCRIPTION OF THE COURSE OF STUDY

Course code	0541.6.MAT1.C.ATL	
Name of the course in	Polish	Algebra z teorią liczb
	English	Algebra and Number Theory

1. LOCATION OF THE COURSE OF STUDY WITHIN THE SYSTEM OF STUDIES

1.1. Field of study	mathematics
1.2. Mode of study	full-time studies
1.3. Level of study	Undergraduate (Bachelor)
1.4. Profile of study*	general academic profile of studies
1.5. Person/s preparing the course description	dr Elżbieta Zajac
1.6. Contact	ezajac@ujk.edu.pl

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

2.1. Language of instruction	Polish and English
2.2. Prerequisites*	

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Form of classes	lectures / classes	
3.2. Place of classes	classes in the UJK teaching room	
3.3. Form of assessment	Exam (lectures), graded credit (classes)	
3.4. Teaching methods	Lectures – information lecture, discussions Classes - discussions, solving problems	
3.5. Bibliography	Required reading	Kostrikin A.I., <i>Introduction to algebra</i>
	Further reading	

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

<p>4.1. Course objectives (<i>including form of classes</i>)</p> <p>C1. Introduction into abstract algebra methods including group theory, ring theory and fields</p> <p>C2. Applying algebraic methods to number theory</p> <p>C3. Developing the student skills of using algebraic methods and doing characterization of algebraic structures.</p> <p>...</p>

4.2. Detailed syllabus (including form of classes)

Lectures

1. *Groups, subgroups, cosets and Lagrange Theorem.*
2. *Normal subgroups, quotient groups, group homeomorphism and isomorphism, the group isomorphism theorem*
3. *Cyclic groups, abelian groups and solvable groups, direct sums of groups and their application*
4. *Permutation groups and Cayley's theorem*
5. *Rings, subrings, ideals and ring homeomorphisms, the ring isomorphism theorem*
6. *Integral domains, divisibility, prime elements and factorization*
7. *Principal ideal domains, unique factorization domains and Euclidean domains*
8. *The ring of integers: the algebraic characterization, congruences,*
9. *Number theory: Euler theorem and its application, solving of some Diophantine equations*
10. *Polynomial rings, polynomial divisibility, irreducible polynomials, decomposition of polynomials, polynomial roots*
11. *Fields, subfields, field extension, algebraic extension of a field*
12. *Algebraically closed fields and fundamental theorem of algebra*
13. *Construction of finite fields*

Classes

1. Example of group structures. Describing cosets of a group for a given subgroup. Applying of Lagrange theorem
2. Identifying normal subgroups of a group. Applying isomorphism theorem to characterize quotient groups.
3. Recognizing and characterizing cyclic, abelian and solvable groups. Using direct sums. Prooving some algebraic properties.
4. Identifying ring structures, their subrings and ideals, giving examples. Applying the ring isomorphism theorem to characterize a quotient ring.
5. Characterizing properties of some ring elements.
6. Characterizing some integral domains, proving that they are (or aren't) Euclidean "principal ideal" or "unique factorization
7. Describing congruences in the ring of integers, proving some rules of divisibility
8. Applying Euler theorem find a remainder in an integer division
9. Using Euclid algorithm to solve Diophantine equation $ax+by=c$
10. Describing polynomials, finding roots of a polynomial, polynomial factorization
11. Examples of fields and subfields,
12. Construction of finite fields

4.3 Intended learning outcomes

Code	A student, who passed the course	Relation to learning outcomes
within the scope of KNOWLEDGE:		
...W01	identifies an algebraic structure of a group, a rings or a field, describes the application of the basic theorems of the group theory, the ring theory and the field theory	MAT1A_W01 MAT1A_W02 MAT1A_W03 MAT1A_W05 MAT1A_W11
...W02	describes the application of algebraic methods in characterization algebraic structures and in solving some problems in number theory	MAT1A_W03 MAT1A_W04 MAT1A_W05 MAT1A_W06 MAT1A_W07 MAT1A_W09 MAT1A_W11
within the scope of ABILITIES:		
...U01	describes properties of an algebraic structure (group, ring or field)	MAT1A_U01 MAT1A_U02 MAT1A_U08 MAT1A_W11
...U02	determines and characterizes quotient algebras (groups, rings)	MAT1A_U01 MAT1A_U02 MAT1A_U08 MAT1A_W07 MAT1A_W09 MAT1A_W1
U03	describes properties of a polynomial uses algebraic methods to solve some problems in number theory	MAT1A_U01 MAT1A_U02 MAT1A_U08 MAT1A_W07 MAT1A_W09 MAT1A_W11
within the scope of SOCIAL COMPETENCE:		
...K01	asks precise questions to better understand the subject, develops own examples.	MAT1A_K02

4.4. Methods of assessment of the intended learning outcomes

Teaching outcomes (code)	Method of assessment (+/-)																							
	Exam oral/written*			Test*			Project*			Effort in class*			Self-study*			Group work*			Others* e.g. standardized test used in e-learning					
	Form of classes			Form of classes			Form of classes			Form of classes			Form of classes			Form of classes			Form of classes					
	L	C	...	L	C	...	L	C	...	L	C	...	L	C	...	L	C	...	L	C	...	L	C	...
...W01- W03	x									x			x											
...U01-U03	x			x						x			x											
...K01										x			x											

*delete as appropriate

4.5. Criteria of assessment of the intended learning outcomes

Form of classes	Grade	Criterion of assessment
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lecture (L) (including e-learning)	3	at least 50% and no more than 60% of the total number of points possible
	3,5	more than 60% and no more than 70% of the total number of points possible
	4	more than 70% and no more than 80% of the total number of points possible
	4,5	more than 80% and no more than 80% of the total number of points possible
	5	more than 90% of the total number of points possible
classes (C)* (including e-learning)	3	at least 50% and no more than 60% of the total number of points possible
	3,5	more than 60% and no more than 70% of the total number of points possible
	4	more than 70% and no more than 80% of the total number of points possible
	4,5	more than 80% and no more than 80% of the total number of points possible
	5	more than 90% of the total number of points possible
others (...)* (including e-learning)	3	at least 50% and no more than 60% of the total number of points possible
	3,5	more than 60% and no more than 70% of the total number of points possible
	4	more than 70% and no more than 80% of the total number of points possible
	4,5	more than 80% and no more than 80% of the total number of points possible
	5	more than 90% of the total number of points possible

5. BALANCE OF ECTS CREDITS – STUDENT’S WORK INPUT

Category	Student's workload	
	Full-time studies	Extramural studies
<i>NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER /CONTACT HOURS/</i>		
<i>Participation in lectures*</i>	45	
<i>Participation in classes, seminars, laboratories*</i>	45	
<i>Preparation in the exam/ final test*</i>	2	
<i>Others (please specify e.g. e-learning)*</i>		
<i>INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/</i>	83	
<i>Preparation for the lecture*</i>	13	
<i>Preparation for the classes, seminars, laboratories*</i>	40	
<i>Preparation for the exam/test*</i>	30	
<i>Gathering materials for the project/Internet query*</i>		
<i>Preparation of multimedia presentation</i>		
<i>Others *</i>		
TOTAL NUMBER OF HOURS	175	
ECTS credits for the course of study	7	

**delete as appropriate*

Accepted for execution (date and legible signatures of the teachers running the course in the given academic year)

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