

## DESCRIPTION OF THE COURSE OF STUDY

<b>Course code</b>	0541.6.MAT1.C.AM3	
<b>Name of the course in</b>	Polish	<b>Algebra abstrakcyjna I</b>
	English	<b>Abstract algebra I</b>

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

<b>1.1. Field of study</b>	mathematics
<b>1.2. Mode of study</b>	full-time studies
<b>1.3. Level of study</b>	Undergraduate (Bachelor)
<b>1.4. Profile of study*</b>	general academic profile of studies
<b>1.5. Person/s preparing the course description</b>	dr Elżbieta Zajac, dr hab. Wojciech Jabłoński
<b>1.6. Contact</b>	<a href="mailto:ezajac@ujk.edu.pl">ezajac@ujk.edu.pl</a> , <a href="mailto:wojciech.jablonski@ujk.edu.pl">wojciech.jablonski@ujk.edu.pl</a>

### 2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

<b>2.1. Language of instruction</b>	English
<b>2.2. Prerequisites*</b>	Linear Algebra, Introduction to Mathematics

### 3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

<b>3.1. Form of classes</b>	lectures and classes	
<b>3.2. Place of classes</b>	classes in the UJK teaching room	
<b>3.3. Form of assessment</b>	Graded credit (lectures), graded credit (classes)	
<b>3.4. Teaching methods</b>	Lectures – information lecture Classes - discussions, workshops, solving problems	
<b>3.5. Bibliography</b>	<b>Required reading</b>	A. I. Kostrikin, <i>Wstęp do algebry</i> , cz. 1: <i>Podstawy algebry</i> , PWN. Warszawa 2012. A. I Kostrikin, <i>Wstęp do algebry</i> , cz. 3: <i>Podstawowe struktury algebraiczne</i> , PWN Warszawa 2017. J. Rutkowski, <i>Algebra abstrakcyjna w zadaniach</i> , PWN Warszawa 2012.
	<b>Further reading</b>	J. Browkin, <i>Teoria ciał</i> , PWN Warszawa 1977. J. Browkin, <i>Wybrane zagadnienia algebry</i> , PWN. Warszawa 1968. B. Gleichgewicht, <i>Algebra</i> , Oficyna Wydawnicza GiS. Wrocław 2002. A. I. Kostrikin, <i>Zbiór zadań z algebry</i> , PWN Warszawa 2005.

### 4. OBJECTIVES, SYLLABUS CONTENT AND INTENDED LEARNING OUTCOMES

<p><b>4.1. Course objectives (including form of classes)</b></p> <p><b>Lectures:</b> C1 – introducing students to basic concepts and methods of universal algebra and group theory.</p> <p><b>Classes:</b> C2 – developing the ability to apply concepts and methods of abstract algebra, particularly group theory. C3 – developing habits of independent learning, improving one’s own working methods, and formulating questions that deepen understanding of the subject.</p>
<p><b>4.2. Detailed syllabus (including form of classes)</b></p> <p><b>Lectures:</b> Elements of universal algebra: concept of (abstract) algebra and algebraic signature; subalgebras, homomorphisms of algebras, congruences, and products of algebras. Elements of group theory: groups and subgroups; transformation groups; cosets and Lagrange’s theorem; normal subgroups; quotient groups; group homomorphisms; group actions on sets and Cayley’s theorem; cyclic, abelian and solvable groups; direct products of groups and algebraic sums of subgroups; Sylow theorems and the classification of finite abelian groups.</p> <p><b>Classes:</b> Examples of various algebras and their properties. Properties of groups and subgroups. Applications of Lagrange’s theorem. Normal subgroups and quotient groups. Cyclic and abelian groups. Solvability of groups. Consequences of the isomorphism theorems for groups.</p>

#### 4.3. Intended learning outcomes

Code	A student, who passed the course	Relation to learning outcomes
within the scope of <b>KNOWLEDGE:</b>		
W01	Knows and understands advanced concepts of universal algebra (algebra, subalgebra, homomorphism, congruence, direct product) and their examples	MAT1A_W01 MAT1A_W02 MAT1A_W03 MAT1A_W05 MAT1A_W11
W02	Knows and understands definitions and theorems of group theory	MAT1A_W01 MAT1A_W02 MAT1A_W03 MAT1A_W05 MAT1A_W11
W03	Explains principles of constructing algebraic objects as quotient structures or direct products and their relation to group theory	MAT1A_W03 MAT1A_W04 MAT1A_W05 MAT1A_W06 MAT1A_W07 MAT1A_W09 MAT1A_W11
within the scope of <b>ABILITIES:</b>		
U01	Verifies properties of operations and characterizes algebraic structures, in particular groups	MAT1A_U01 MAT1A_U02 MAT1A_U08
U02	Identifies subgroups, applies Lagrange's theorem, constructs quotient groups, and verifies cyclicity, commutativity and solvability	MAT1A_U01 MAT1A_U02 MAT1A_U08
U03	Identifies group homomorphisms, applies isomorphism theorems and constructs direct sums of groups	MAT1A_U01 MAT1A_U02 MAT1A_U08
within the scope of <b>SOCIAL COMPETENCE:</b>		
K01	Analyses logical correctness of statements and formulates precise questions	MAT1A_K01 MAT1A_K02

#### 4.4. Methods of assessment of the intended learning outcomes

Teaching outcomes (code)	Method of assessment (+/-)								
	Test*			Effort in class*			Self-study*		
	Form of classes			Form of classes			Form of classes		
	L	C	..	L	C	..	L	C	...
W01	+			+	+		+	+	
W02	+			+	+		+	+	
W03	+			+	+		+	+	
U01		+		+	+		+	+	
U02		+		+	+		+	+	
U03		+		+	+		+	+	
K01	+	+		+	+		+	+	

#### 4.5. Criteria of assessment of the intended learning outcomes

Form of	Grade	Criterion of assessment
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<b>classes</b>		
<b>lectures (L)</b>	<b>3</b>	at least 50% and no more than 60% of the total number of points possible
	<b>3,5</b>	more than 60% and no more than 70% of the total number of points possible
	<b>4</b>	more than 70% and no more than 80% of the total number of points possible
	<b>4,5</b>	more than 80% and no more than 90% of the total number of points possible
	<b>5</b>	more than 90% of the total number of points possible
<b>classes (C)*</b>	<b>3</b>	at least 50% and no more than 60% of the total number of points possible
	<b>3,5</b>	more than 60% and no more than 70% of the total number of points possible
	<b>4</b>	more than 70% and no more than 80% of the total number of points possible
	<b>4,5</b>	more than 80% and no more than 90% of the total number of points possible
	<b>5</b>	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>	<b>60</b>	
<i>Participation in lectures*</i>	30	
<i>Participation in classes, seminars, laboratories*</i>	30	
<i>INDEPENDENT WORK OF THE STUDENT/NON-CONTACT HOURS/</i>	<b>40</b>	
<i>Preparation for the lecture*</i>	10	
<i>Preparation for the classes, seminars, laboratories*</i>	20	
<i>Preparation for the exam/test*</i>	10	
<i>TOTAL NUMBER OF HOURS</i>	<b>100</b>	
ECTS credits for the course of study	<b>4</b>	

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

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