University of Gdańsk

Subject card

Subject name and code	Galois Theory, PG_00206855						
Field of study	Mathematics						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
Education level	Master's studies		Subject group		Obligatory subject group in the field of study Optional subject group Subject group related to scientific research in the field of study		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		5.0		
Learning profile	academic		Assessment form		exam		
Conducting unit	Institute of Mathematics -> Faculty of Mathematics, Physics and Informatics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Michał Stukow				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	60		3.0		62.0	125
Subject objectives	Learning the selected algebraic concepts and theorems developed from classical construction problems in the plane using compasses and rulers and in connection with the search for algebraic formulas for the roots of polynomials.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[MATMU2_U01] is able to construct mathematical reasoning: prove theorems, formulate, test and refute hypotheses by constructing and selecting counterexamples, choosing, if necessary, methods and tools from various areas of mathematics	He has some habits of abstract thinking and some ability to perceive mathematics from a higher point of view - in particular, he sees connections between problems in various areas of mathematics close to algebra and is able to establish and use them.	[SU4] test/exam - oral or written
[MATMU2_W01] knows and understands in depth the theory of selected areas of mathematics or related fields, the complex relationships between them and their development trends	Knows the concepts and theorems of field theory and group theory presented in lectures and recognizes the connections between them in the context of classical problems of constructing points in a plane using compasses and rulers and finding formulas for the roots of polynomials.	[SW4] test/exam - oral or written
[MATMU2_W03] knows and understands to a deep degree a selected field of theoretical or applied mathematics and is able to understand the formulations of issues in this field that are still at the research stage and knows the connections between issues in this field and other areas of mathematics	Knows the concepts and theorems of field theory and group theory presented in lectures and recognizes the connections between them in the context of classical problems of constructing points in a plane using compasses and rulers and finding formulas for the roots of polynomials.	[SW4] test/exam - oral or written

Subject contents

Elements of group theory. Solvable groups, permutation groups, simplicity of alternating groups.

Elements of field theory. Various types of field extensions, the construction of the algebraic closure of a field, the fields of decomposition of a family of polynomials and their uniqueness, primitives of extensions.

Galois theory. Automorphisms of fields, the Galois group of extensions. Fundamental theorems of Galois theory.

Applications to the theory of equation solving. Historical notes. Radical expansions and their characterization using Galois groups. Formulas for the roots of polynomials of degree up to 4 and a proof that general formulas for the roots of equations of degree greater than 4 do not exist - examples.

Applications to geometric constructions. Historical notes. Fundamental theorem on the constructibility of points using compass and straightedge. The problem of angle trisection, squaring the circle, and doubling the cube. Roots of one expressed by radicals of degree 2, Fermat-Gauss primes, constructibility of n-gons.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
egzam	51.0%	40.0%
observation of the student's attitude	51.0%	0.0%
tests	51.0%	60.0%

Recommended reading

Basic literature	1. A. Białynicki-Birula, *Zarys Algebry,* PWN 1987. 2. J. Browkin, Wybrane zagadnienia algebry. PWN W-wa, 1970. 3. M. Bryński, J. Jurkiewicz, *Zbiór zadań z algebry,* PWN 1985. 4. S. Lang, Algebra, PWN 1973.
Supplementary literature	none
eResources addresses	

Example issues/ example questions/ tasks being completed

n/a

Work placement

Not applicable

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