GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Algebra II, PG_00021036		
Field of study	Mathematics		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Obligatory subject group in the field of study 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	3	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Differential Equations and Mathematical Applications -> Faculty of Applied Physics and Mathematics		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Piotr Bartłomiejczyk	
	Teachers	dr hab. Piotr Bartłomiejczyk	

Lesson types and methods of instruction	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	5.0	35.0	100

Subject objectives	The aim of the subject is to introduce main facts and theorems in higher algebra, especially in Galois' theory and its algebraic and geometric applications.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U09] Is able, at an advanced level and covering modern mathematics, to apply and present in speech and in writing the methods of at least one selected branch of mathematics: mathematical and functional analysis, theory of differential equations and dynamical systems, algebra and number theory, geometry and topology, calculus probability and statistics, discrete mathematics and graph theory, logic and set theory.	Student can find normal subgroup, algebric extension and solve algebraic equation.	[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K7_U02] Has the ability to check the correctness of conclusions in constructing formal proofs, sees formal structures related to the basic areas of mathematics in mathematical issues and understands the importance of their properties.	Student can find normal subgroup, algebric extension and solve algebraic equation.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K7_U01] Has the ability to construct mathematical reasoning: proving theorems and refuting hypotheses by constructing and selecting counterexamples, has the ability to express mathematical content in speech and in writing, in mathematical texts of various types.	Student can find normal subgroup, algebric extension and solve algebraic equation.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject
[K7_W02] Has good understanding of the role and importance of mathematical reasoning structure.	Student knows main facts and theorems of group, ring and fields theory and of Galois theory.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_W01] Has enhanced knowledge of basic branches of mathematics.	Student knows main facts and theorems of group, ring and fields theory and of Galois theory.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

Subject contents

1. Groups, , cosets, normal subgroups.
2. Permutation group and its properties.
3. Rings and fields.
4. Field of complex numbers. Algebraic elements and their degrees.
5. Factorisation of polynomials, indecomposable polynomials, Eisenstein's criterion.
6. Algebraic extension of field. Base and degree of extension.
7. Algebraic and transcendental numbers.
8. Field of algebraic numbers. Field of polynomial's factorisation.
9. Primitive element of extension. Automorphism of fields.
10. Galois group of extension. Galois extension.
11. Galois theorems.
12. Solvable, cyclic and abelian extension.
13. Solving algebraic equations, solvable groups.
14. Equations unsolvable by roots.
15. Constructible extensions. Unfeasibility of some classic constructions.

Prerequisites and co-requisites

Linear algebra.

Algebra I.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Exercises	50.0%	60.0%
Lecture	50.0%	40.0%

Recommended reading	Basic literature	J. Rotman, Galois theory, Springer, 1998 J. Bewersdorff, Galois theory for beginners, AMS, 2006
	Supplementary literature	J. S. Milne, Fields and Galois Theory, http://www.jmilne.org/math/CourseNotes/FT.pdf.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Find classes of conjugacy for permutation group. Find factorisation of polynomial in complex numbers field. Find algebraic extension of some field.	
Work placement	Not applicable	