University of Gdańsk

Subject card

Subject name and code	Algebra and Logic, PG_00210396		
Field of study	Medical Physics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Bachelor's studies	Subject group	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	1	Language of instruction	Polish
Semester of study	2	ECTS credits	4.0
Learning profile	academic	Assessment form	credit
Conducting unit	Institute of Theoretical Physics and Astrophysics -> Faculty of Mathematics, Physics and Informatics -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Adrian Kołodziejski	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	0.0	45.0	0.0	0.0	0.0	45

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	45	0.0	30.0	75

Subject objectives

The aim of the course is to introduce students to the fundamental concepts and methods of linear algebra and mathematical logic used in physics and medical physics.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[FIZMEDL3_W03] Knows and understands at an advanced level the most important topics of higher mathematics, including statistics, to the extent necessary for the quantitative description, understanding and modelling of physical and medical processes.	The student is familiar with the fundamental concepts and theorems of linear algebra and mathematical logic and understands their significance in the description and modelling of physical and medical problems.	[SW4] test/exam - oral or written
[FIZMEDL3_W01] Knows and understands at an advanced level the phenomena, principles, laws and theories specific to physics and biophysics.	The student is familiar with the mathematical structures and methods used for the formal description of physical and biophysical phenomena, laws, and models.	[SW4] test/exam - oral or written
[FIZMEDL3_K01] He is ready for a critical evaluation of his own knowledge and the information he receives, and understands the need for further education and for improving professional and personal competencies.	The student is prepared to critically evaluate their own solutions to mathematical problems and to further develop the competences necessary for the description of physical and medical phenomena.	[SK1] oral statement/conversation/ discussion
[FIZMEDL3_U01] He can formulate, analyse, and solve complex problems in physics and medicine, using mathematical formalism, based on the physical phenomena, principles, and theories he has learned.	The student is able to apply methods of linear algebra and mathematical logic to analyse and solve mathematical problems that form the basis for the description of physical and medical phenomena.	[SU5] implementation of a problem task

Subject contents	1. Elements of mathematical logic: propositional calculus, logical connectives, truth tables, tautologies, implication, equivalence, quantifiers, and basic methods of logical reasoning. 2. Elements of set theory: set operations, relations, functions, equivalence relations, and order relations. 3. Matrices and matrix operations. Matrix determinants and their properties. 4. Systems of linear equations. Gaussian elimination and the Kronecker–Capelli theorem. 5. Vector spaces. Basis, dimension, linear independence, linear combinations, and linear subspaces. 6. Linear transformations and their matrix representations. 7. Eigenvalues and eigenvectors of matrices. Matrix diagonalization and its applications in physics. 8. Inner product, orthogonality, and the Gram–Schmidt orthonormalization process. 9. Quadratic forms and their classification. 10. Applications of linear algebra and mathematical logic in physics, medical physics, and data analysis.
Prerequisites and co-requisites	

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
tests	51.0%	100.0%

Recommended reading

Basic literature	1. G. Strang, Introduction to linear algebra, Wellesley : Wellesley-Cambridge 2003, 2. W. Marek, J. Onyszkiewicz, Elementy logiki i teorii mnogości w zadaniach, PWN 2006
Supplementary literature	1. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1. Definicje, twierdzenia, wzory, GIS 2005 2. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 1. Przykłady i zadania, GIS 2005 3. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 2. Definicje, twierdzenia, wzory, GIS 2002 4. T. Jurlewicz, Z. Skoczylas, Algebra liniowa 2. Przykłady i zadania, GIS 2002
eResources addresses	

Example issues/ example questions/ tasks being completed	not applicable
Work placement	Not applicable

Document generated electronically. Does not require a seal or signature.