

Subject card

Subject name and code	Algebra and Logic, PG_00210431						
Field of study	Nuclear safety and radiological protection						
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		
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		3.0		
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	30.0	0.0	0.0	0.0	30
	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	30		0.0		45.0	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 the description and analysis of problems in physics, nuclear safety, and radiation protection.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[BJORL3_W12] Has an advanced knowledge and understanding of the mathematical and statistical methods used in data analysis.		The student is familiar with the methods of linear algebra used in data analysis and understands their applications and limitations.		[SW4] test/exam - oral or written		
	[BJORL3_U04] Can use mathematical and computer apparatus to analyze and solve problems in radiological protection and nuclear safety.		The student is able to apply the methods of linear algebra and mathematical logic to analyse and solve problems that form the foundation of issues related to nuclear safety and radiation protection.		[SU4] test/exam - oral or written		
	[BJORL3_U10] Graduate applies mathematical and statistical methods to describe phenomena and analyze data.		The student is able to apply methods of linear algebra to solve systems of linear equations, analyse matrices, and describe selected physical problems and analyse data.		[SU4] test/exam - oral or written		
	[BJORL3_W04] Has an advanced knowledge and understanding of selected techniques in advanced mathematics to the extent necessary to describe phenomena at the subatomic level and to solve problems in nuclear physics and chemistry.		The student is familiar with the fundamental concepts and methods of linear algebra and mathematical logic used in the mathematical description of problems in physics.		[SW4] test/exam - oral or written		

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, and functions. 3. Matrices and matrix operations. Matrix determinants and their basic properties. 4. Systems of linear equations. Gaussian elimination and the Kronecker–Capelli theorem. 5. Vector spaces. Basis, dimension, linear independence, and linear combinations. 6. Linear transformations and their matrix representations. 7. Eigenvalues and eigenvectors of matrices. Basic applications in the description of physical phenomena. 8. Inner product and vector orthogonality. 9. Basic applications of linear algebra and mathematical logic in physics, nuclear safety, radiation protection, and the analysis of measurement data.								
Prerequisites and co-requisites									
Assessment methods and criteria	<table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>tests</td><td>51.0%</td><td>100.0%</td></tr></table>	Subject passing criteria	Passing threshold	Percentage of the final grade	tests	51.0%	100.0%		
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Example issues/ example questions/ tasks being completed	not applicable								
Work placement	Not applicable								

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