



## Subject card

Subject name and code	Linear Algebra, PG_00058913						
Field of study	Informatics						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2024/2025		
Education level	first-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	Part-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			8.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Mathematics Center -> Vice-Rector for Education						
Name and surname of lecturer (lecturers)	Subject supervisor	dr Anna Niewulis					
	Teachers	mgr Katarzyna Kiepiela dr Anna Niewulis					
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		15.0		125.0	200
Subject objectives	Students obtain competence in using methods of linear algebra and knowledge how to solve simple problems that can be found in the field of engineering.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	Student names the basic algebraic structures, uses the basic operations on complex numbers, knows various methods to solve problems in matrix algebra, is able to determine the number of solutions of a system of equations. Student analyses problems from analytical three-dimensional geometry. Student uses the basic methods of linear algebra to formulate and solve simple problems in the field of informatics	[SW1] Assessment of factual knowledge
	[K6_U01] can apply mathematical knowledge to formulate and solve complex and non-typical problems related to the field of study and perform tasks, in an innovative way, in not entirely predictable conditions, by:n- appropriate selection of sources and information obtained from them, assessment, critical analysis and synthesis of this information,n- selection and application of appropriate methods and toolsn	Student is able to determine whether a given set with binary operations is an algebraic structure, performs binary operations using modular arithmetic, determines the real and complex roots of polynomials, and performs operations on polynomials using modular arithmetic. Student solves problems in matrix algebra: calculates the determinants, solves matrix equations and systems of linear equations - using various methods. Student is able to use scientific software to solve problems from analytical three-dimensional geometry. Student is able to process the acquired information, analyze and interpret it, draw conclusions and reason opinions.	[SU4] Assessment of ability to use methods and tools
Subject contents	Binary operations. Algebraic structures: groups, rings and fields. Modular arithmetic. Complex numbers. Geometric interpretation. Basic operations. Polar and exponential form. Natural power and n-th root of complex number. The polynomial ring. Roots of polynomials. Horner's scheme. Fundamental theorem of algebra. Matrices and determinants. Matrices operations. Invertible matrices. Laplace's formula for determinants. Properties of determinants. Methods of matrix inversion. Systems of linear equations. Cramer's theorem. Rank of matrix. Kronecker-Capelli theorem. Gauss-Jordan elimination. Three-dimensional geometry. Cartesian coordinate system. Dot, cross and scalar triple products. Lines and planes in three-dimensional space. Basic geometric transformations on a plane and space.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Tests	50.0%	100.0%
Recommended reading	Basic literature	T. Jurlewicz, Z. Skoczylas - Algebra i geometria analityczna. Definicje, twierdzenia i wzory., Oficyna wydawnicza GiS, 2006; T. Jurlewicz, Z. Skoczylas - Algebra i geometria analityczna. Przykłady i zadania., Oficyna wydawnicza GiS, 2006  J. Topp - Algebra liniowa, Wydawnictwo PG, 2005	
	Supplementary literature	J. Długosz - Funkcje zespolone, GiS, 2002	
	eResources addresses	Adresy na platformie eNauczenie:	

<p>Example issues/ example questions/ tasks being completed</p>	<ol style="list-style-type: none"> <li>1. Discuss the existence of the solution for the given system of linear equations.</li> <li>2. Discuss the relation between two given lines <math>l_1</math> and <math>l_2</math>.</li> <li>3. Find all roots of the equation <math>z^3 - 8i = 0</math>. Give their algebraic form.</li> <li>4. Show that the points <math>A, B, C, D</math> do not lie in a plane.</li> <li>5. Solve the matrix equation <math>AX=B</math>, where <math>A</math> i <math>B</math> are given matrices.</li> <li>6. Find the remainder of the division of two polynomials over the field modulo 5</li> </ol>
<p>Work placement</p>	<p>Not applicable</p>