



Subject card

Subject name and code	Linear Algebra, PG_00047356						
Field of study	Informatics						
Date of commencement of studies	October 2021		Academic year of realisation of subject		2021/2022		
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	Full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish		
Semester of study	1		ECTS credits		3.0		
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 Magdalena Musielak				
	Teachers		dr Magdalena Musielak mgr inż. Dorota Żarek mgr inż. Wojciech Dąbrowski				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						
	Adresy na platformie eNauczanie: WETI (Informatyka) - Matematyka 2021/22 (M.Musielak) - Moodle ID: 15372 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=15372						
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		3.0		42.0	75
Subject objectives	Students obtain competence in the range of 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_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
	[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
Subject contents	Binary operations. Groups, rings and fields. Modular arithmetic. Complex numbers. Geometric interpretation. Basic operations. The polynomial ring. Roots of polynomials. Horner's scheme. Fundamental theorem of algebra. Matrices and determinants. Matrix 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-Capelly theorem. Gauss-Jordan elimination. Three-dimensional geometry. Cartesian coordinate system. Dot, cross and scalar triple products. Lines and planes in three-dimensional space.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Activity	0.0%	10.0%
	Final test	50.0%	90.0%
Recommended reading	Basic literature	• J. Topp - Algebra liniowa, Wydawnictwo PG, 2005 • T. Jurlewicz, Z. Skoczylas - Algebra i geometria analityczna. Definicje, twierdzenia i wzory., Oficyna wydawnicza GiS, 2006; • Jurlewicz, Z. Skoczylas - Algebra i geometria analityczna. Przykłady i zadania., Oficyna wydawnicza GiS, 2006	
	Supplementary literature	• Kajetanowicz P., Wierzejewski J., „Algebra z geometrią analityczną", Wydawnictwo Naukowe PWN • J. Długosz - Funkcje zespolone, GiS, 2002	
	eResources addresses	WETI (Informatyka) - Matematyka 2021/22 (M.Musielak) - Moodle ID: 15372 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=15372	
Example issues/ example questions/ tasks being completed	1. Solve the matrix equation $AX=B$, where A i B are given matrices. 2. Using the Cramer formula find the unknown y from the system of equations : $x+2y+2z+3t=3$, $3y+t=1$, $5x-2y+t=1$, $4x-5y+2t=1$. 3. Find all roots of the equation $z^3 - 8i=0$. Give their algebraic form. 4. Find the linear factorization of the polynomial $W(z)=z^3-iz^2-2iz-2$, knowing that one of the roots is $z_1=i$. 5. Find the general equation of the plane passing through the point $P=(1,-1,3)$ and parrarel to the vectors $a = [1,1,0]$ i $b=[0,1,1]$. 6. Discuss the relation between two given lines : $l_1 : x=1+t, y=-2-t, z=3+2t$ i $l_2: x=4+s, y=-2+2s, z=4-3s$.		
Work placement	Not applicable		