



Subject card

Subject name and code	Linear algebra, PG_00045352						
Field of study	Data Engineering						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2022/2023		
Education level	first-cycle studies	Subject group			Obligatory subject group in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			English		
Semester of study	1	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Magdalena Musielak				
	Teachers		dr Magdalena Musielak dr Ewa Kozłowska-Walania				
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						
WET1 (Data Engineering) - Mathematics 2022/23 (M.Musielak) - Moodle ID: 25005 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=25005							
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		5.0		40.0	75
Subject objectives	Students obtain competence in using methods of linear algebra and knowledge how to solve simple problems that are found in the field of engineering, in particular connected to data engineering.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U05] Uses matrix calculus in the theory of systems of linear equations, uses differential, integer and vector calculus, performs operations on complex numbers and determines polynomial elements.		Student names the basic algebraic structures, performs basic operations on complex numbers, finds the real and complex roots of polynomials, evaluates determinants and solves matrix equations, solves systems of equations, and analyzes problems in three dimensional analytic geometry.		[SU4] Assessment of ability to use methods and tools		
	[K6_K01] is aware of quickly changing trends and the resulting need for further education and self-improvement in the area of the performed profession of an engineer with IT and economic-financial skills.		Student recognizes the importance of skillful use of basic mathematical apparatus in the context of engineering studies.		[SK2] Assessment of progress of work		
	[K6_W01] has basic knowledge in the field of mathematics, including mathematical analysis, algebra, geometry, probability calculus, statistics and numerical methods, necessary to formulate and solve simple tasks in the field of IT		Student has basic knowledge of linear algebra, useful in formulating and solving simple problems in the field of data engineering.		[SW1] Assessment of factual knowledge		

Subject contents	<ul style="list-style-type: none"> • Binary operations. Basic algebraic structures: group, ring, field, linear space. • Elements of modular arithmetic, tables of addition and multiplication modulo n. Inverse modulo n. Field \mathbb{Z}_p. • Field of complex numbers. Geometrical interpretation of complex numbers. Complex arithmetic. Complex roots. Simple equations in complex domain. • Ring of polynomials over field K. Roots of polynomials. Fundamental theorem of algebra. Polynomial factorization. Polynomial arithmetic with coefficients from field $K=\mathbb{Z}_p$. Synthetic division. • Matrices and determinants. Inverse matrix. Matrix equations. • Systems of linear equations. Cramers theorem. Gaussian elimination. • Vectors in \mathbb{R}^3, dot, cross, and mixed products. Applications of vector products. • Line and plane in 3D space vector, normal, parametric, canonical, intercept forms. 											
Prerequisites and co-requisites	No requirements											
Assessment methods and criteria	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Subject passing criteria</th> <th style="width: 25%;">Passing threshold</th> <th style="width: 25%;">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Final comprehensive test</td> <td>50.0%</td> <td>90.0%</td> </tr> <tr> <td>Class participation</td> <td>0.0%</td> <td>10.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Final comprehensive test	50.0%	90.0%	Class participation	0.0%	10.0%
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Final comprehensive test	50.0%	90.0%										
Class participation	0.0%	10.0%										
Recommended reading	Basic literature	<ul style="list-style-type: none"> • T.Jankowski, <i>Linear algebra</i>, Publishing House of Gdansk University of Technology, Gdańsk, 2001. • <i>Elements of Linear Algebra</i>, Moodle course (by M.Łapińska and M.Musielak) • J.Topp, <i>Algebra</i>, Publishing House of Gdansk University of Technology, Gdańsk, 2005. • eCourse in Matrix Algebra: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=2388 										
	Supplementary literature	<ul style="list-style-type: none"> • K.Binmore, J.Davies, <i>Calculus</i>, Cambridge University Press, 2007. • T.Jurlewicz, Z.Skoczylas, <i>Algebra i geometria analityczna</i>, GiS, Wrocław 2008 • C.Meyer, <i>Matrix analysis and applied linear algebra</i>, SIAM 2005 • H. Anton, <i>Calculus with analytic geometry</i>, Wiley & Sons, 1989 										
	eResources addresses											
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Solve the matrix equation $AX=B$, where A and B are given. 2. Use Cramer formulas to find the y: $x+2y+2z+3t=3$, $3y+t=1$, $5x-2y+t=1$, $4x-5y+2t=1$. 3. Find all the roots of the equation $z^3 - 8i=0$. Express them in algebraic form. 4. Factor the polynomial $W(z)=z^3-iz^2-2iz-2$, knowing that one of its roots is $z_1=i$. 5. Find the normal equation of the plane passing through the point $P=(1,-1,3)$ and parallel to the vectors $a=[1,1,0]$ and $b=[0,1,1]$. 6. Determine the relative position of the lines $l_1 : x=1+t, y=-2-t, z=3+2t$ and $l_2: x=4+s, y=-2+2s, z=4-3s$. 											
Work placement	Not applicable											