GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Linear algebra, PG_00045352		
Field of study	Data Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2023/2024
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 Ewa Kozłowska-Walania	
	Teachers	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

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_W01] has advanced 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
[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_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

Subject contents	• Binary operations. Basic algebraic structures: group, ring, filed, linear space. • Elements of modular arithmetic, tables of addition and multiplication modulo n. Inverse modulo n. Field Zp. • 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=Zp.Synthetic division. • Matrices and determinants. Inverse matrix. Matrix equations. • Systems of linear equations. Cramers theorem. Gaussian elimination. • Vectors in R3, 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

Subject passing criteria	Passing threshold	Percentage of the final grade
Class participation	0.0%	10.0%
Final comprehensive test	50.0%	90.0%

Recommended reading

Basic literature	• T.Jankowski, *Linear algebra*, Publishing House of Gdansk University of Technology, Gdańsk, 2001. • *Elements of Linear Algebra,* Moodle course (by M.Łapińska and M.Musielak) • J.Topp, *Algebra,* 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	• K.Binmore, J.Davies, *Calculus,* Cambridge University Press, 2007. • T.Jurlewicz, Z.Skoczylas, *Algebra i geometria analityczna*, GiS, Wrocław 2008 • C.Meyer, *Matrix analysis and applied linear algebra*, SIAM 2005 • H. Anton, *Calculus with analytic geometry*, Wiley & Sons, 1989
eResources addresses	Adresy na platformie eNauczanie: WETI (Data Engineering) - Mathematics 2023/24 (E.Kozłowska-Walania) - Moodle ID: 31221 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=31221

Example issues/ example questions/ tasks being completed	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 z3 - 8i=0. Express them in algebraic form. 4. Factor the polynomialn W(z)=z3-iz2-2iz-2, knowing that one of its roots is z1=i . 5. Find the normal equation of the plane passing through the point P=(1,-1,3) and paralel to the vectors a = [1,1,0] and b=[0,1,1]. 6. Determine the relative position of the lines l1 : x=1+t, y=-2-t, z=3+2t and l2: x=4+s, y=-2+2s, z=4-3s.
Work placement	Not applicable