GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Linear Algebra, PG_00068319		
Field of study	Automatic Control, Cybernetics and Robotics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
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	4.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Mathematics Center -> Vice-Rector For Education		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Robert Fidytek	
	Teachers	dr Robert Fidytek mgr Katarzyna Kiepiela	

Lesson types

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	3.0	37.0	100

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_W01] knows and understands, to an advanced extent, mathematics necessary to formulate and solve simple issues related to the field of study	Student defines the basic concepts of linear algebra and analitic geometry necessary to solve simple engineering problems in the domain of education.	[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 uses basic notions and formulas of matrix and vector calculus. Student analyses a given problem from analitic geometry. Student uses complex numbers.	[SU4] Assessment of ability to use methods and tools

Subject contents

Course content – lecture

Complex numbers group and field, the field of complex numbers, algebraic, trigonometric, and exponential forms of complex numbers, operations on complex numbers, algebraic roots, roots of polynomials.
Vector spaces definition and examples of vector spaces, linear dependence, basis and dimension of a vector space, isomorphism of vector spaces.
Matrices and determinants basic operations, properties of determinants, the ring of matrices, inverse matrix, rank of a matrix.
Systems of linear equations Gaussian elimination method, matrix and determinant methods, KroneckerCapelli theorem.
Euclidean spaces inner product, orthogonal bases, orthogonal matrix, isomorphism of Euclidean spaces.
Analytic geometry in space vectors and basic vector operations, scalar, vector, and mixed products, plane and line, their mutual position in space, pencil of planes.
Eigenvalues and eigenvectors of a matrix.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Final test	50.0%	100.0%

Recommended reading

Basic literature	1. Besala P., Matematyka zeszyt 3, Politechnika Gdańska 2. Długosz J., ,,Funkcje zespolone. Teoria, przykłady, zadania, Oficyna Wydawnicza GiS 3. Jurlewicz T., Skoczylas Z., Algebra i geometria analityczna. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS 4. Jurlewicz T., Skoczylas Z., Algebra i geometria analityczna. Przykłady i zadania, Oficyna Wydawnicza GiS 5. Jurlewicz T., Skoczylas Z., Algebra i geometria analityczna. Kolokwia i egzaminy, Oficyna Wydawnicza GiS
Supplementary literature	1. Jankowska K., Jankowski T., Zbiór zadań z matematyki, Wydawnictwo Politechniki Gdańskiej 2. Kajetanowicz P., Wierzejewski J., ,,Algebra z geometrią analityczną", Wydawnictwo Naukowe PWN
eResources addresses	

Example issues/ example questions/ tasks being completed

1. Prove that in a field K the equation ax = b has exactly one solution for a different from 0.

2. Find the cube root of the number (2-2i)^2. Present the results in exponential form and mark them on the complex plane.

3. For which values of the parameter m does the system of equations
(2 m)x + y + 2z = 0
2x + (1 m)y + 2z = 0
2x + y + (2 m)z = 0
have nonzero solutions? Find these solutions for the smallest among the determined values of m.

4. Find the orthogonal projection of the line
l: x/2 = (y 1)/1 = (z + 1)/2
onto the plane
π: x y + 2z 4 = 0.
Express the sought line in parametric form.

5. Determine the matrix X from the equation:
(3BA)^(-1) * B * X = B,
where
A = [[1, 2], [0, 1]]
B^(-1) = [[2, 0], [2, 2]].

Practical activites within the subject

Not applicable

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