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 2025	Academic year of realisation of subject	2025/2026
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 -> Wydziały Politechniki Gdańskiej		
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_W02] demonstrates advanced preparation in methods and techniques for formulating and solving problems	Student knows the main theorems, methods and tools presented during the lecture and knows how top use them.	[SW1] Assessment of factual knowledge
[K6_U04] formulates logical solutions to complex or unstructured problems	Student is able to analyze a problem and choose, from the methods presented during the class, the tools necessary for its correct solution.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task

<table>
<tr><td>Subject contents</td><td>

- 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.

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<tr><td>Prerequisites and co-requisites</td><td>No requirements</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<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>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>

- 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

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<tr><td>Supplementary literature</td><td>

- 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

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<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>

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.

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<tr><td>Work placement</td><td>Not applicable</td></tr>
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