GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Linear Algebra, PG_00047356		
Field of study	Informatics		
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 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	mgr inż. Dorota Żarek mgr Magdalena Kamer-Plichta mgr inż. Wojciech Dąbrowski dr Magdalena Musielak mgr Mariusz Kaczmarek	

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	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. Horners scheme. Fundamental theorem of algebra.
Matrices and determinants. Matrix operations. Invertible matrices. Laplaces formula for determinants. Properties of determinants.
Methods of matrix inversion.
Systems of linear equations. Cramers 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
Tests	50.0%	100.0%

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	Adresy na platformie eNauczanie: WETI (Informatyka) - Matematyka 2023/24 (M.Musielak) - Moodle ID: 31223 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=31223

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 z3 - 8i=0. Give their algebraic form.
4. Find the linear factorization of the polynomial W(z)=z3-iz2-2iz-2, knowing that one of the roots is z1=i .
5. Find the general equation of the plane passing thrugh 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 : l1 : x=1+t, y=-2-t, z=3+2t i l2: x=4+s, y=-2+2s, z=4-3s.

Work placement

Not applicable