GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Linear Algebra, PG_00037109
Field of study	Economic Analytics

Date of commencement of studies	October 2021	Academic year of realisation of subject	2021/2022
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study
Mode of study	Full-time studies	Mode of delivery	blended-learning
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	6.0
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 inż. Natalia Jarzębkowska
	Teachers	dr inż. Natalia Jarzębkowska

Lesson types and methods of instruction	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: 30.0						
	Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=18352 Adresy na platformie eNauczanie: WZiE - AG - Algebra linowa 2021/2022 (N.Jarzębkowska) - Moodle ID: 18352 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=18352						

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	14.0	76.0	150

Subject objectives	The aim of this subject is to obtain the students competence in the range of using the basic methods of linear algebra. Furthermore, the student is able to use this knowledge to solve theoretical and practical problems that can be found in the various fields of the economy.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W02] Knows how to describe economic phenomena using quantitative methods with the use of IT tools.	Student defines the basic concepts of linear algebra. Student defines basic notions of matrix and vector calculus. Student analyzes problems of analytical geometry. Student knows and understands the concept of complex numbers. Student combines knowledge of mathematics with knowledge from other fields. Student is able to process the acquired information, analyze and interpret it, draw conclusions and reason opinions.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
	[K6_U08] Has the ability to use mathematical and IT tools to analyse economic phenomena and make decisions by economic entities.	Student applies the basic concepts and rules of matrix calculus. Student determines eigenvalues and eigenvectors of matrices. Student solves systems of linear equations using different methods. Student examines the linear independence of vectors. Student examines the position of lines and planes in space. Student recognizes certain curves and analyzes relations between objects. Student performs calculations on complex numbers. Student uses methods of linear algebra to solve economical problems.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools

Subject contents	LECTURES and TUTORIALS: Polynomials. Roots of a polynomial. Matrices. Matrix operations. Determinants and their properties. Linear systems. Gauss method. Reduced echelon form. Gauss-Jordan reduction. Cramer's rule, Kronecker-Capelli theorem. Eigenvalues and eigenvectors. Vectors. Vector length and angle. Linear geometry of 3-space. Vector spaces and subspaces. Linear independence. Basis and dimension. Linear maps. Complex numbers. Conics and quadrics. Quadratic forms. Sylvester's criterion. LSM.

Prerequisites and co-requisites	Knowledge of high school mathematics.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Midterm tests	50.0%	30.0%
	Class activity	50.0%	20.0%
	Written exam	50.0%	50.0%

Recommended reading	Basic literature	1. Jurlewicz T., Skoczylas Z., Algebra liniowa 1, 2, Definicje, twierdzenia wzory, Wydawnictwo GiS, Wrocław
		2. Jurlewicz T., Skoczylas Z., Algebra liniowa 1, 2, Przykłady i zadania, Wydawnictwo GiS, Wrocław
		3. Jankowska K., Jankowski T., Zbiór zadań z matematyki, PG Gdańsk
		4. Gurgul H., Suder M., Matematyka dla kierunków ekonomicznych, Oficyna a Wolters Kluwer business, Warszawa
		5. E-learning platform resources

	Supplementary literature	1. Batóg B., Bieszk-Stolorz B., Foryś I., Guzowska M., Herbelein K., Matematyka dla kierunków ekonomicznych, Wydawnictwo Difin, Warszawa
		2. Banaś J., Podstawy matematyki dla ekonomistów, Wydawnictwa Naukowo-Techniczne, Warszawa
		3. Matłoka M., Wojcieszyn B., Matematyka z elementami zastosowań w ekonomii, Wydawnictwo Wyższej Szkoły Bankowej w Poznaniu
	eResources addresses	WZiE - AG - Algebra linowa 2021/2022 (N.Jarzębkowska) - Moodle ID: 18352 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=18352
Example issues/ example questions/ tasks being completed	Discuss the relation between the line l and the plane S. Find the rank of the matrix A . Check linear depedence of given system of vectors. Solve the systems of linear equations using the back substitution method. Solve the systems of linear equations by Cramer rule. Formulate the Kronecker-Capelli theorem. Find eigenvalues and eigenvectors of symmetric matrix A.
Work placement	Not applicable