



Subject card

Subject name and code	Linear Algebra, PG_00037109						
Field of study	Economic Analytics						
Date of commencement of studies	October 2020	Academic year of realisation of subject				2020/2021	
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 type and method 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						
WZiE - AG - Algebra liniowa 2020/2021 (N.Jarzębkowska) - Moodle ID: 6801 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=6801							
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 student's 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_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.			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment	
	[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.			[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge	

Subject contents	<p>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.</p>		
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%	25.0%
	Written exam	50.0%	50.0%
	Class activity	50.0%	25.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 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. Moodle resources 	
	Supplementary literature	<ol style="list-style-type: none"> 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. Małłoka M., Wojcieszyn B., Matematyka z elementami zastosowań w ekonomii, Wydawnictwo Wyższej Szkoły Bankowej w Poznaniu 	
	eResources addresses	Uzupełniające https://enauczanie.pg.edu.pl/moodle/course/view.php?id=6801 - Learning materials.	
Example issues/ example questions/ tasks being completed	<p>Discuss the relation between the line l and the plane S.</p> <p>Find the rank of the matrix A.</p> <p>Check linear dependence of given system of vectors.</p> <p>Solve the systems of linear equations using the back substitution method.</p> <p>Solve the systems of linear equations by Cramer rule.</p> <p>Formulate the Kronecker-Capelli theorem.</p> <p>Find eigenvalues and eigenvectors of symmetric matrix A.</p>		

Work placement	Not applicable
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