

Subject card

Subject name and code	Linear Algebra II, PG_00155251						
Field of study	Mathematical Modeling and Data Analysis						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2024/2025		
Education level	Bachelor's 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		Polish polish		
Semester of study	2		ECTS credits		5.0		
Learning profile	academic		Assessment form		exam		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Błażej Szepietowski				
	Teachers		dr hab. Błażej Szepietowski				
			dr hab. Ewa Tyszkowska				
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		5.0		60.0	125
Subject objectives	The aim of the course is to familiarize students with the basic methods and theorems of linear algebra and with selected concepts of general algebra.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[MMiADL3_W07] knows and understands the construction of mathematical theories, can use mathematical formalism to build and analyse simple mathematical models in other fields of science	knows and understands the role and importance of axioms in the construction of mathematical theories	[SW4] test/exam - oral or written
	[MMiADL3_K04] is ready to understand and appreciate the importance of intellectual honesty in own and other people's actions; is ready to act ethically	understands and appreciates the importance of intellectual honesty	[SK8] observation of student's independent or team work
	[MMiADL3_K09] is ready to critically evaluate arguments, find gaps in reasoning, and constructively criticise other people's reasoning	is able to critically evaluate arguments, find gaps in reasoning and conduct constructive criticism of other people's reasoning	[SK8] observation of student's independent or team work
	[MMiADL3_W08] knows and understands well the role and importance of proof in mathematics, as well as the concept of the significance of assumptions	knows and understands the role and importance of proof in mathematics, as well as the concept of the importance of assumptions	[SW4] test/exam - oral or written
	[MMiADL3_U08] is able to plan a way to solve a given problem and make a correct record of this solution, providing accurate and precise justifications for the correctness of their reasoning	is able to plan a way to solve a specific practical problem within the scope of program content and prepare a correct record of this solution, providing strict and precise justification for the correctness of his reasoning	[SU3] text preparation/written work [SU4] test/exam - oral or written
	[MMiADL3_W03] knows the basic concepts, methods and theorems of linear algebra and analytical geometry as well as basic examples both illustrating specific concepts in these fields, and allowing to refute incorrect hypotheses or unauthorized reasoning; knows the selected concepts of general algebra	knows and understands the basic concepts, methods and theorems in the field of program content presented during the lecture	[SW4] test/exam - oral or written
	[MMiADL3_U07] can comprehensively, in speech and in writing, formulate definitions and theorems and present correct mathematical reasoning regarding the issues learned	can formulate definitions and theorems in an understandable way and present correct mathematical reasoning regarding the acquired issues	[SU4] test/exam - oral or written
	[MMiADL3_K01] is ready to accept the limitations of his/her own knowledge and understands the need for further education	knows the limitations of their own knowledge and understands the need for further education	[SK1] oral statement/conversation/discussion
	[MMiADL3_U01] correctly uses the learned concepts of mathematical logic and set theory	is able to correctly use the acquired concepts within the program content when solving practical problems	[SU4] test/exam - oral or written [SU6] demonstration of practical skills
	[MMiADL3_W01] knows the basic concepts, methods and theorems of mathematical logic and set theory	knows and understands the basic concepts, methods and theorems in the field of program content presented during the lecture	[SW4] test/exam - oral or written
	[MMiADL3_K02] is ready to precisely formulate questions to deepen his/her own understanding of a given topic or to find missing elements of reasoning	can precisely formulate questions to deepen the topic	[SK1] oral statement/conversation/discussion
	[MMiADL3_U03] correctly uses the concepts of linear algebra and geometry, is able - at a simple and medium level of difficulty - to apply the theorems and methods of these fields, and is able to interpret the results obtained; correctly uses the concepts of general algebra	is able to correctly use the acquired concepts within the program content when solving practical problems	[SU4] test/exam - oral or written [SU6] demonstration of practical skills
	[MMiADL3_K06] is ready to formulate opinions on basic mathematical issues	is able to formulate opinions on the mathematical issues learned	[SK1] oral statement/conversation/discussion

Subject contents	1. Linear mappings. Examples of linear maps, kernel, image, structure of linear maps. Matrices of linear maps. Transition matrices. 2. Eigenvalues and eigenvectors. Characteristic polynomial. 3. Bilinear mappings and scalar products. Symmetrical bilinear mappings and their associated quadratic forms. Form matrices. Determinacy of the quadratic form. 4. Elements of geometry in Euclidean spaces - angle between vectors, orthogonality, norm, distance. Euclidean, normed, metric spaces. Gram-Schmidt orthogonalization. 5. Basics of general algebra: binary operation on a set, associativity, commutativity, neutral and inverse elements. 6. Groups. Definitions and examples, order of an element, cyclic groups, subgroup, order of a subgroup, Lagrange's theorem.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	observation of student's attitude	100.0%	0.0%
	short tests	50.0%	30.0%
	tests	50.0%	30.0%
	egzamin	50.0%	40.0%
Recommended reading	Basic literature	J. Topp, Algebra liniowa, Wyd. PG, Gdańsk 2005 J. Rutkowski, Algebra liniowa w zadaniach, PWN , 2008.	
	Supplementary literature	B. Gleichgewicht, Algebra, Oficyna Wydawnicza GiS, Wrocław 2002; A. Białynicki-Birula, Zarys algebry, PWN Warszawa 1987;	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Not applicable		
Work placement	Not applicable		

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