

Subject card

Subject name and code	Linear Algebra I, PG_00155235						
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	1		ECTS credits		5.0		
Learning profile	academic		Assessment form		exam		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Michał Stukow				
	Teachers		dr Ewa Kozłowska-Walania dr hab. Michał Stukow dr Marek Halenda dr hab. Maciej Mroczkowski				
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_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_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_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 scope of program content presented during the lecture	[SW4] test/exam - oral or written
	[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
	[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_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_K09] is ready to critically evaluate arguments, find gaps in reasoning, and constructively criticize other people's reasoning	is ready to critically evaluate arguments, find gaps in reasoning and constructively criticize other people's reasoning	[SK8] observation of student's independent or team work
	[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	The student knows and understands the basic concepts, methods and theorems in the scope of program content presented during the lecture	[SW4] test/exam - oral or written
	[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_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_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_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_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

Subject contents	1. Field of complex numbers, geometric interpretation and trigonometric form of complex numbers, roots of complex numbers.2. Cartesian product of sets and the construction of Euclidean spaces R^n . Elements of analytical geometry, operations on vectors, equations of lines and planes, basic properties of the dot product. 3. Systems of linear equations and methods of solving them - Gauss-Jordan elimination method.4. Matrices and operations on them. Inverse matrix and algorithm for determining the inverse matrix. Matrix equations and their relationship with systems of linear equations.5. The concept of abstract linear space over a field. Linear independence of vectors, linear subspaces generated by vector systems, basis and dimension of a linear space. Rank of a system of vectors, rank of a matrix. Rank calculation methods and applications.6. Matrix determinant. Properties and methods of calculating determinants. Applications of determinants.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	observation of the student's attitude	100.0%	0.0%
	wejściówki	50.0%	30.0%
	test	50.0%	30.0%
	egzam	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	A. Białynicki-Birula, Algebra liniowa z geometrią, PWN W-wa, 1976 G. Banaszak, W. Gajda, Elementy algebry liniowej (cz. I i II) Wyd. Naukowo-Techniczne, Warszawa, 2002 - Zbiór zadań z algebry, praca zbiorowa pod red. A.I. Kostrikin, PWN W-wa, 1995.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Not applicable		
Work placement	Not applicable		

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