



Subject card

Subject name and code	Linear algebra with geometry, PG_00034519						
Field of study	Technical Physics						
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	2	ECTS credits				5.0	
Learning profile	general academic profile	Assessment form				exam	
Conducting unit	Department of Probability Theory and Biomathematics -> Faculty of Applied Physics and Mathematics						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Maciej Kuna				
	Teachers		dr Maciej Kuna				
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: 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	Getting to know the basic knowledge in the field of linear algebra and analytic geometry.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[K6_W03] Has systematized knowledge of higher mathematics, including algebra, analysis, probability theory and numerical methods, allowing for basic description, understanding and modelling of physical phenomena and some technical processes.		Student has basic knowledge in the field of linear algebra and analytical geometry; knows complex numbers, matrix calculus, vector algebra. He knows different methods of solving problems with complex numbers, matrices, solving systems of linear equations and methods of analytic geometry in space R^3 , in the scope necessary in the work of an engineer.			[SW1] Assessment of factual knowledge	
	[K6_U01] Can learn independently, obtain information from literature, databases and other properly selected sources.		A student understands the value independent development of knowledge. He independently solves exercises that consolidate knowledge.			[SU2] Assessment of ability to analyse information	
Subject contents	1. Definition of group and homomorphism of groups. Examples. 2. Definition of field, ring and homomorphism of fields. Examples. 3. Field of complex numbers. 4. Definition of linear space. Linear independence. Basis. 5. Basic constructions in linear space. 6. Linear space of matrices. Determinant and rank of matrices. 7. Homomorphisms of linear spaces - linear operators. 8. Matrix of linear operator. 9. Linear problems. Kronecker-Capelli theorem. 10. Invariants of automorphisms of linear spaces. 11. Inner product spaces. 12. Unitary and hermitian operators. 13. Affine spaces. 14. R^n as affine space. 15. Quadric surfaces.						
Prerequisites and co-requisites	Basic knowledge of mathematics in the field of secondary school.						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exercises	50.0%	6.0%
	egzamination	50.0%	40.0%
	colloquia	50.0%	54.0%
Recommended reading	Basic literature	J.Komorowski: Od liczb zespolonych do tensorów, spinorów, algebr Liego i kwadryk. PWN Warszawa 1978R.S. Ingarden L. Górniewicz: Algebra liniowa dla fizyków. Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika Toruń 2000B. Gleichgewicht: Algebra. Oficyna Wydawnicza GiS Wrocław 2004	
	Supplementary literature	A. Romanowski: Algebra Liniowa. Wydawnictwo Politechniki Gdańskiej Gdańsk 2003S.Przybyło A. Szlachtowski: Algebra i geometria afiniczna w zadaniach. Wydawnictwa Naukowo-Techniczne warszawa 1983	
	eResources addresses	Adresy na platformie eNauczanie: Algebra liniowa z geometrią 2024 - Moodle ID: 37586 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=37586	
Example issues/ example questions/ tasks being completed	Definition of linear space and examples.Theorem of Kronecker- Capelli		
Work placement	Not applicable		