



Subject card

Subject name and code	Linear algebra with geometry, PG_00034519						
Field of study	Technical Physics						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2022/2023		
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 Joanna Cyman					
	Teachers	dr Joanna Cyman dr Maryna Shcholokova					
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_U01		A student understands the value independent development of knowledge. He independently solves exercises that consolidate knowledge.		[SU2] Assessment of ability to analyse information		
	K6_W03		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		

Subject contents	<p>Complex numbers. Operations on complex numbers. Solving algebraic equations in the complex space. Different forms of a complex number. Geometric interpretation, Gaussian plane. Exponentiation, nth root. The basic theorem of algebra.</p> <p>Matrix calculus. Matrix operations.. Determinants. Laplace expansion. Inverse matrix. Row of matrices, elementary transformations of matrix. Systems of linear equations. Cramer's rule. The existence of solutions of the system of linear equations, the Kronecker-Capelli theorem.</p> <p>Analytic geometry in space.Vectors. Scalar product, orthogonal vectors. Vector product, mixed product and its geometric interpretation. Equations of plane and line in R^3. Conical curves.</p> <p>Vector space. The base and dimension of space. Linear transformations. The kernel and image of transformation. Linear transformation matrix. Values and eigenvectors. Euclidean spaces. Gram–Schmidt process.</p>														
Prerequisites and co-requisites	Basic knowledge of mathematics in the field of secondary school.														
Assessment methods and criteria	<table border="1" data-bbox="450 586 1489 721"> <thead> <tr> <th data-bbox="450 586 794 622">Subject passing criteria</th> <th data-bbox="794 586 1139 622">Passing threshold</th> <th data-bbox="1139 586 1489 622">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="450 622 794 658">exercises</td> <td data-bbox="794 622 1139 658">50.0%</td> <td data-bbox="1139 622 1489 658">6.0%</td> </tr> <tr> <td data-bbox="450 658 794 694">colloquia</td> <td data-bbox="794 658 1139 694">50.0%</td> <td data-bbox="1139 658 1489 694">54.0%</td> </tr> <tr> <td data-bbox="450 694 794 721">egzamination</td> <td data-bbox="794 694 1139 721">50.0%</td> <td data-bbox="1139 694 1489 721">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	exercises	50.0%	6.0%	colloquia	50.0%	54.0%	egzamination	50.0%	40.0%
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Example issues/ example questions/ tasks being completed	1. Mark on the complex plane the set described by inequality: $2 < (3+4i)z+i < 3$. 2. Solve a system of equations: $4x+y+3z-t=5$ $2x-y+3z+2t=2$ $3x+y+2z-t=1$ $5x+y+4z+2t=0$.														
Work placement	Not applicable														