

Subject card

Subject name and code	Clifford Algebras, PG_00210514						
Field of study	Informatics						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2026/2027		
Education level	Master's studies		Subject group				
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		Polish Polish Classes can be conducted in English		
Semester of study	2		ECTS credits		2.0		
Learning profile	academic		Assessment form		credit		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Ewa Tyszkowska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	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	30		0.0		20.0	50
Subject objectives	The aim of the course is to familiarize students with the basic issues related to the theory of Clifford algebras, e.g. definitions of Clifford algebras, theorem on their universality, basis of Clifford algebras, Pin and Spin groups and their vector representations.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[INFMU2_W01] has in-depth knowledge of the branches of mathematics necessary for the study of computer science; has a good understanding of the role and importance of the construction of mathematical reasoning		The student uses his/her knowledge of mathematics to understand the content of the lecture, including being able to trace mathematical proofs and check their correctness.		[SW2] presentation/project/paper/report		
	[INFMU2_U10] is able to determine the directions of further learning and implement the process of self-education, and motivate others in this regard		The student supplements his/her knowledge of Clifford algebras based on additional readings.		[SU2] presentation/project/paper/report		
Subject contents	Tensor product of vector spaces. Exterior algebra. Definition of a quadratic form. Definition of a Clifford algebra. Universality theorem of a Clifford algebra. Basis of a Clifford algebra. Pin and Spin groups. Vector representations of Pin and Spin groups. Spinor representation of the Clifford algebra $C(Q)$. Dirac matrices. Spinor representation of the algebra $C(Q)_+$. Pauli matrices. Classification of real Clifford algebras.						

Prerequisites and co-requisites	Basic knowledge of linear algebra		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	written report on a selected topic	51.0%	100.0%
Recommended reading	Basic literature	Od liczb zespolonych do tensorów, spinorów, algebr Liego i kwadryk, Jacek Komorowski, PWN	
		Clifford Algebras, Clifford Groups and a Generalization of the Quaternions: The Pin and Spin Groups, Jean Gallier,	
		Spin Geometry, Jose Figuerora-O'Farrill	
	Supplementary literature	A tutorial on Conformal Groups, Ian R. Porteous	
		Mobius Transformations in Several Dimensions, P. L. Waterman	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Classification of Real Clifford Algebras		
	Examples of Low-Dimensional Clifford Algebras and Their Spin Groups		
Work placement	Not applicable		

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