

Subject card

Subject name and code	Paradoxes of Quantum Mechanics, PG_00193431						
Field of study	Quantum Information Technology						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2026/2027		
Education level	Master'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			English		
Semester of study	1	ECTS credits			2.0		
Learning profile	academic	Assessment form			credit		
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Paweł Mazurek				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	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	15		0.0		35.0	50
Subject objectives	The aim of the course is to offer basic knowledge about striking quantum mechanical effects that contradict classical common sense.						
Learning outcomes	Course outcome		Subject outcome			Method of verification	
	[QITL3_U02] is able to use their knowledge of quantum information technologies – formulate and solve complex and unusual problems and perform tasks innovatively in unpredictable conditions by appropriately selecting sources and information derived from them, evaluating, critically analyzing, synthesizing, creatively interpreting, and presenting this information.						
	[QITL3_W01] knows and understands in depth selected facts, objects, and phenomena, as well as the methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of quantum information technologies.						

Subject contents	<p>Quantum interference and superposition.</p> <p>No-cloning, its relation with uncertainty.</p> <p>Quantum teleportation and dense coding.</p> <p>Theoretical scheme and experimental realizations.</p> <p>Elitzur-Vaidman bomb tester.</p> <p>Entanglement, and Schrodinger paradox.</p> <p>Local realism, GHZ paradox, Bell inequalities, nosignaling boxes and monogamy of quantum (and - supraquantum) correlations.</p> <p>Contextuality and Peres-Mermin paradox applied philosophy: communication complexity from Bell inequalities.</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	presentation	51.0%	100.0%
Recommended reading	Basic literature	Literature: Nielsen and Chuang, Quantum Computation and Quantum information; John Preskill, Lecture notes; John Watrous, Lecture notes; Buhrman et al, Non-locality and communication complexity, https://arxiv.org/abs/0907.3584v1	
	Supplementary literature	None.	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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