

Subject card

Subject name and code	Physical Implementations of Quantum Information, PG_00159199						
Field of study	Quantum Information Technology						
Date of commencement of studies	October 2024		Academic year of realisation of subject		2025/2026		
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	2		Language of instruction		English		
Semester of study	3		ECTS credits		2.0		
Learning profile	academic		Assessment form				
Conducting unit							
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Michał Horodecki				
	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		15.0	30
Subject objectives	To familiarize the students with experimental platforms relevant for implementations of quantum information techniques.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[QITL3_U02] has the skills to plan and conduct basic and advanced research and calculations in the area of quantum information theory or its applications	Student can plan and conduct theoretical research in quantum information and physics in a regime which is accessible in available experimental settings.	[SU4] test/exam - oral or written
	[QITL3_W01] has extended knowledge in the field of general physics and advanced knowledge in the area of quantum information theory; knows the history of the development of quantum information theory and its importance for the progress of science, knowledge of the world and social development	Student knows history of experimental realisation of quantum systems	[SW4] test/exam - oral or written
	[QITL3_U01] is able to apply the scientific method in solving physical problems and reasoning in the field of quantum information theory	Student can verify security of quantum communication protocols based on their experiental realisation	[SU4] test/exam - oral or written
	[QITL3_W03] knows advanced experimental, observational and numerical techniques allowing to plan and perform a complex physical experiment or computer simulation	Student knows details and challanges behind physical implementations of quantum systems in optical and solid state architectures. Implementations of quantum information in with quantum optics, with ions and neutral cold atoms, as well as spins in semiconductor quantum dots, NV centers and molecules.	[SW4] test/exam - oral or written
	[QITL3_K02] is aware of the decisive role of experiment in the verification of physical theories; is aware of the existence of the scientific method in acquiring knowledge	Student knows details of experimental validation of Bell non-locality in optical systems.	[SK4] test/exam - oral or written
Subject contents	Implementations of quantum information in with quantum optics, with ions and neutral cold atoms, as well as spins in semiconductor quantum dots, NV centers and molecules.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	essay	51.0%	100.0%
Recommended reading	Basic literature	Quantum computation and quantum information, Michael A. Nielsen & Isaac L. Chuang, Cambridge : Cambridge University Press, 2000	
	Supplementary literature	None.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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