



Subject card

Subject name and code	Relativistic quantum mechanics, PG_00064607						
Field of study	Relatywistyczna mechanika kwantowa						
Date of commencement of studies	February 2026	Academic year of realisation of subject			2025/2026		
Education level	second-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	1	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Division of Electron Collisions Physics -> Institute of Physics and Applied Computer Science -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Paweł Możejko					
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	0.0	0.0	45
	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	45	5.0		50.0		100
Subject objectives	Students become acquainted with selected topics in relativistic quantum mechanics.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W02] has enhanced, theoretically-founded, detailed knowledge of selected field of physics, and sufficient knowledge of related fields of science or technology	A student is familiar with selected topics in advanced quantum mechanics.			[SW1] Ocena wiedzy faktograficznej		
	[K7_U04] can formulate and test hypotheses related to research problems	A student is familiar with selected topics in advanced quantum mechanics.			[SU1] Ocena realizacji zadania [SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu [SU4] Ocena umiejętności korzystania z metod i narzędzi		
	[K7_W01] has extended and systematized knowledge of the leading of physics.	A student is familiar with selected topics in advanced quantum mechanics.			[SW1] Ocena wiedzy faktograficznej		
Subject contents	Course content – lecture 1. Problems of Quantum Mechanics I. 2. Klein-Gordon equation 3. The pi-meson atom problem with the Zeeman effect - solution of the Klein-Gordon equation 4. Dirac equation 5. Relativistic invariance of the Dirac equation 6. Solution of the Dirac equation for free particles 7. Solution of the Dirac equation for the hydrogen atom 8. Time dependent perturbation theory 9. Creation and annihilation operators 10. Quantization of the electromagnetic field 11. Interaction of light with atomic systems						

Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam mark	50.0%	100.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. A.S. Dawydow "Mechanika Kwantowa " (PWN, Warszawa, 1969) 2. J. D. Bjorken, S. D. Drell, Relatywistyczna teoria kwantów (PWN, Warszawa, 1985) 3. My colorful lecture notes - quantum mechanics 4. W. Greiner, Relativistic quantum mechanics, Springer, Berlin, 1994 	
	Supplementary literature	<ol style="list-style-type: none"> 1. Pauling, L: Introduction to Quantum Mechanics: With Applications to Chemistry (Dover) 2. S. Kryszewski "Mechanika kwantowa" Wyd. UG 	
	eResources addresses		
Example issues/ example questions/ tasks being completed	<p>Klein-Gordon equation and its solutions.</p> <p>Dirac equations and its solutions.</p>		
Practical activities within the subject	Not applicable		

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