GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Relativistic quantum mechanics, PG_00064607		
Field of study	Technical Physics		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2024/2025
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		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Paweł Możejko	
	Teachers	dr hab. Paweł Możejko	

Lesson types and methods of instruction

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_W01] has extended and systematized knowledge of the leading of physics.	A student is familiar with selected topics in advanced quantum mechanics.	[SW1] Assessment of factual knowledge
[K7_U04] can formulate and test hypotheses related to research problems	A student is familiar with selected topics in advanced quantum mechanics.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
[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] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>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</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Exam mark</td><td>50.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>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</td></tr><tr><td>Supplementary literature</td><td>1. Pauling, L: Introduction to Quantum Mechanics: With Applications to Chemistry (Dover)
2. S. Kryszewski "Mechanika kwantowa" Wyd. UG</td></tr><tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Relatywistyczna mechanika kwantowa - Moodle ID: 45446
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=45446</td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Klein-Gordon equation and its solutions.

Dirac equations and its solutions.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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