GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Quantum mechanics II, PG_00031919		
Field of study	Technical Physics		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2023/2024
Education level	second-cycle studies	Subject group	Optional subject group 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	5.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Zakład Fizyki Zderzeń Elektronowych -> Instytut Fizyki i Informatyki Stosowanej -> 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	30.0	0.0	0.0	0.0	60

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	60	8.0	57.0	125

Subject objectives

Students become acquainted with selected topics in nonrelativistic and 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 intermediate quantum mechanics.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>1) Problems of Quantum Mechanics I.

2) Approximative methods of solving the Schroedinger equation - variation principle

3) The ground state of the helium atom

4) The Ritz method

5) Multi-electron systems - Hartree-Fock equations

6) Hydrogen-like ion and hydrogen molecule

7) Born-Oppenheimer approximation

8) Klein-Gordon equation

9) the pi-meson atom problem with the Zeeman effect - solution of the Klein-Gordon equation

10) Dirac equation

11) Relativistic invariance of the Dirac equation

12) solution of the Dirac equation for free particles

13) solution of the Dirac equation for the hydrogen atom

14) interaction of light with atomic systems

15) quantization of the electromagnetic field</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</td></tr>
<tr><td>Supplementary literature</td><td>A. S. Davydov, Quantum mechanics, 2nd ed., Pergamon, Oxford, 1976</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Mechanika kwantowa II - Moodle ID: 38281
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38281</td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>Born-Oppenheimer approximation

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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