

WROCLAW UNIVERSITY OF TECHNOLOGY – PHD STUDIES

FACULTY OF	
SUBJECT CARD	
Course name in Polish	Zaawansowana mechanika kwantowa
Course name in English	Zaawansowana mechanika kwantowa
Course language	Polish
University-wide general course type: 1) <u>basic course (mathematics, physics, chemistry, other)</u> 2) humanity course 3) managerial skills 4) English language 5) other modern language Departmental course developing professional skills: 1) specialized course 2) interdisciplinary course 3) seminar (interdisciplinary, specialized, departmental)	
Type of course (obligatory, <u>optional</u>)	
Educational effects according to ZW 26/2017: P8U_W, P8S_WG, P8S_UW	
Subject code FZP9081	

*delete as applicable

	Lecture	Laboratory	Seminar
Number of hours of organized classes in University (ZZU)	30		
Number of hours of total student workload (CNPS)			
Form of crediting	Exam **	Exam / crediting with grade*	Oral presentation
Number of ECTS points	6		
including number of ECTS points for practical (P) classes			
including number of ECTS points for direct teacher-student contact (BK) classes	2		

*delete as applicable **In case of didactic courses also inspections and evaluation classes

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES
1. Ability to use the formalism of mathematical analysis and algebra 2. Foundations of quantum mechanics and ability to use its formalism 3. Ability to make use of literature resources, including research papers

SUBJECT OBJECTIVES	
C1	A student will learn advanced topics and methods of quantum mechanics
C2	
C3	
C4	

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SUBJECT EDUCATIONAL EFFECTS**Relating to knowledge:**

PEK_W01 A student will have knowledge on advanced quantum mechanics

PEK_W02 A student will have knowledge on selected applications of the advanced methods of quantum mechanics

PEK_W03 A student will be able to apply her/his knowledge on quantum mechanics in the study of physical problems

Relating to skills:

PEK_U01 Has skills related to the methodology of advanced theoretical research in quantum mechanics

Relating to social competences:

PEK_K01

PEK_K02

...

PROGRAM CONTENTS

Form of classes – lecture		Number of hours
Lec 1	Permutations and symmetry of many-particle states	2
Lec 2	Creation and annihilation operators	2
Lec 3	Observables in the occupation number representation	2
Lec 4	Field operators	2
Lec 5	Momentum representation; spin	2
Lec 6	Addition of angular momenta	3
Lec 7	Transformation of observables; tensors	3
Lec 8	Wigner-Eckart theorem	3
Lec 9	Dirac equation	2
Lec 10	Electromagnetic field: minimal coupling	2
Lec 11	Non-relativistic limit; Pauli equation	2
Lec 12	Foldy-Wouthuysen transformation	2
Lec 13	Relativistic corrections to the hydrogen atom	3
Total hours		30

Form of classes – laboratory		Number of hours
Lab 1		
Lab 2		

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Lab 3		
Lab 4		
...		
	Total hours	

Form of classes – seminar		Number of hours
Sem 1		
Sem 2		
Sem 3		
Sem 4		
...		
	Total hours	

TEACHING TOOLS USED	
N1	lecture with problem-oriented discussion
N2	exercises as homework
...	

EVALUATION OF ACHIEVED SUBJECT EDUCATIONAL EFFECTS		
Evaluation: F – forming (partial) C – concluding	Educational effect number	Way of evaluating achievement of educational effects
F1	PEK_W01, PEK_W02, PEK_W03, PEK_U01	Homework
F2	PEK_W01, PEK_W02, PEK_W03, PEK_U01	Final test
...		
C =0.4*F1+0.6*F2		

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PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] F. Schwabl, Advanced Quantum Mechanics;
- [2] J. J. Sakurai, Modern Quantum Mechanics,

SECONDARY LITERATURE:

- [1] L. Schiff, Quantum Mechanics;
- [2] R. Shankar, Principles of Quantum Mechanics

SUBJECT SUPERVISOR

(NAME AND SURNAME, E-MAIL ADDRESS)

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