

COURSE OFFERED

Name of the course	Polish	Mechanika Kwantowa
	English	Quantum Mechanics

1. LOCATION OF THE COURSE OF STUDY WITHIN THE EDUCATION SYSTEM

1.1. Section¹	Section of Exact and Natural Sciences
1.2. Discipline²	Physical Sciences
1.3. Type of education	Stationary
1.4. Level of education	PhD School/ 3 year
1.5. Person preparing the course description	prof. dr hab. Francesco Giacosa
1.6. Contact	fgiacosa@ujk.edu.pl

2. GENERAL CHARACTERISTICS OF THE COURSE OF STUDY

2.1. Type of course³	specialized subjects in the discipline
2.2. Language of the course	English

3. DETAILED CHARACTERISTICS OF THE COURSE OF STUDY

3.1. Type of classes⁴	Lecture and excercises
3.2. The number of hours⁵	30 (15h lecture + 15h excercises)
3.3. Location of classes	UJK, WNSiP
3.4. Type of assessment	Exam (lecture), pass with grade (excercises)
3.5. Didactic methods	Oral lectures, problem solving
3.6. Literature	basic 1 J. J. Sakurai, Modern Quantum Mechanics 2 R. MacKenzie , Path integral methods and applications, quantph/0004090
	supplementary Quantum field theory in a nutshell, A. Zee, first chapter.

4. OBJECTIVES, SYLLABUS CONTENT AND INTENDEND LEARNING OUTCOMES

4.1. Course objectives (including the form of classes) Description of the most important features and formalism of modern quantum mechanics. Understanding the mathematical tools related to advanced quantum mechanics (focused on path integrals). Developing skills to solve exercises
Syllabus content 1. Recall of the fundaments of QM: Schroedinger equation and its properties. 2. Recall of the fundaments of QM: Heisenberg formalism and its properties. 3. Path integral in QM; formal derivation.

¹ Section of Humanities:, Social Sciences, Section of Exact and Natural Sciences, Section of Medical and Health Sciences, Section of Arts.

² History,Linguistics, Literary Studies, Medical Sciences, Health Sciences, Political and Administrative Sciences, Legal Sciences, Security Sciences, Pedagogy, Communication and Media Studies, Management and Quality Studies, Biological Sciences, Chemical Sciences, Physical Sciences, Earth and related Environmental Sciences, Visual Arts and Artwork Conservation, Musical Arts.

³ General courses, domain specific subjects in the section, disciplinary subjects in the sections, specialized subjects in the discipline.

⁴ Classes, lecture, seminar.

⁵ Consistent with the education program at the Doctoral School
Jan Kochanowski University in Kielce.

4. Examples of path integrals: free case, two-slit experiment.
5. Link of path integral to Quantum Field Theory.
6. Link of path integral to thermodynamics.
7. Perturbation theory and asymptotic series.
8. Recall of electrodynamics and the Aharonov-Bohm effect.
9. Spin: operators, commutations properties.
10. Composition of spins.

1. SUBJECT LEARNING OUTCOMES

Learning outcomes	A doctoral student who has passed the subject:	Reference to the learning outcomes of Doctoral School (according to the training program at the Doctoral School)
in the area of KNOWLEDGE:		
W01	The doctoral student has advanced knowledge of development trends in disciplines related to the research theme being pursued	SD_W02
in the area of SKILLS:		
U01	The doctoral student is capable of utilizing knowledge from various disciplines to identify, formulate, and creatively solve complex problems or undertake research tasks.	SD_U03
in the area of SOCIAL COMPETENCE:		
K01	The doctoral student can independently conduct scientific research activities, adhering to the principles of public ownership of research results outcomes and ensuring intellectual property protection.	SD_K04

2. METHODS OF ASSESSMENT OF THE INTENDED LEARNING OUTCOMES

SUBJECT LEARNING OUTCOMES	METHOD OF ASSESSMENT (+/-)																				
	Oral/written exam			Test			Project			activity in class			Own work			Group work			Others		
	The type of classes			The type of classes			The type of classes			The type of classes			The type of classes			The type of classes			The type of classes		
	L	E	S	L	E	S	L	E	S	L	E	S	L	E	S	L	E	S	L	E	S
W01	x				x																
U01	x				x																
K01	x				x																

3. CRITERIA OF ASSESSMENT OF THE INTENDED LEARNING OUTCOMES

Form of classes	Grade	Criterion of assessment
	3,0	51-60% correct exercises with exam

Lecture (L) ⁶	3,5	61-70% correct exercises with exam
	4,0	71-80% correct exercises with exam
	4,5	81-90% correct exercises with exam
	5,0	91-100% correct exercises with exam
Exercises (E)	3,0	51-60% correct exercises with test
	3,5	61-70% correct exercises with test
	4,0	71-80% correct exercises with test
	4,5	81-90% correct exercises with test
	5,0	91-100% correct exercises with test

Accepted for execution

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⁶ Niepotrzebne usunąć.