COURSE OFFERED IN THE DOCTORAL SCHOOL

Code of the course	4606-ES-000000O-0287	Name of the course	Polish	**Wprowadzenie do Filozofii Mechaniki Kwantowej**	
			English	**Introduction to the Philosophy of Quantum Mechanics**	
Type of the course	Specialistic courses (przedmioty specjalnościowe)				
Course coordinator	dr hab Antonio Vassallo		Course teacher	dr hab Antonio Vassallo	
Implementing unit	WAiNS	Scientific discipline / disciplines*	philosophy		
Level of education	Doctoral studies	Semester	Winter		
Language of the course	English				
Type of assessment	Grading	Number of hours in a semester	30	ECTS credits	2
Minimum number of participants	12	Maximum number of participants	40	Available for students (BSc, MSc)	Yes

Type of classes		Lecture	Auditory classes	Project classes	Laboratory	Seminar
Number of hours	in a week	2				
	in a semester	30				

* does not apply to the Researcher's Workshop

1. Prerequisites

High-school level knowledge of physics and mathematics.

2. Course objectives

The goal of this course is to introduce the students to contemporary philosophical debates in the philosophy of quantum physics, and to build the analytical and critical skills needed to contribute to these debates. The main research question driving the discussion will be "What is the structure of the natural world according to quantum physics?" Consequently, a number of possible responses to this question will be analyzed, each leading to a different physical interpretation of the formalism of quantum theory. Pros and cons of these interpretations will be considered and assessed against the background of the state-of-the-art research on the topic.

3. Course content (separate for each type of classes)

Lecture

During each class, the students will be presented with specific research topics, and will be invited to engage in group activities (e.g., debates, exercises) aimed at developing an understanding of the conceptual nuances involved in the discussion. In addition, the students will receive homework assignments in the form of questionnaires and readings to be discussed during the classes.

The research topics explored are:

- Eight Experiments Showing the Quantumness of the World.
- The Quantum Physics Formalism.
- The Wavefunction and the Quantum State.
- The Collapse Interpretation and the Problem of Local Beables.
- The Pilot Wave Interpretation.
- The Many Worlds Interpretation.
- Quantum Physics Meets Relativity Theory: An Introduction to Quantum Field Theory.

4. Learning outcomes

Type of learning outcomes	Learning outcomes description	Reference to the learning outcomes of the WUT DS	Learning outcomes verification methods*
Knowledge			
K01	The students will know and understand the conceptual issues arising from the quantum formalism, and how the most important interpretations of quantum theory solve these issues.	SD_W2	Active participation during classes and homework.
K02	The students will know and understand how the fundamental concepts and laws of quantum mechanics are arrived at via different types of empirical experimentation.	SD_W3	Active participation during classes and homework.
K03	The students will know and understand the standards of conceptual clarity that are required to carry out and interpret the results of the research in fundamental physics.	SD_W4	Active participation during classes and homework.
Skills			
S02	The students will be able to communicate their knowledge of a complex topic in a clear and articulate way.	SD_U4	Active participation during classes and homework.
S01	The students will be able to identify and critically engage with the current state of a particular scientific or philosophical debate, and form a reasoned view about it.	SD_U5	Active participation during classes and homework.
Social competences			
SC01	The students will be ready to critically evaluate the strengths and weaknesses of any interpretation of quantum physics, and suggest possible improvements.	SD_K1	Active participation during classes and homework.

*Allowed learning outcomes verification methods: exam; oral exam; written test; oral test; project evaluation; report evaluation; presentation evaluation; active participation during classes; homework; tests

5. Assessment criteria
50% Active participation during classes. 50% Homework.

6. Literature
Primary references: [1] T. Maudlin – "Philosophy of Physics: Quantum Theory." Princeton University Press, 2019. [2] D. Albert - "Quantum mechanics and experience." Harvard University Press, 1992. Secondary reference: [1] P.J. Lewis – "Quantum Ontology: A Guide to the Metaphysics of Quantum Mechanics." Oxford University Press, 2016.

7. PhD student's workload necessary to achieve the learning outcomes**		
No.	Description	Number of hours
1	Hours of scheduled instruction given by the academic teacher in the classroom	30
2	Hours of consultations with the academic teacher, exams, tests, etc.	5
3	Amount of time devoted to the preparation for classes, preparation of presentations, reports, projects, homework	25
4	Amount of time devoted to the preparation for exams, test, assessments	
	Total number of hours	**60**
	ECTS credits	**2**

** 1 ECTS = 25-30 hours of the PhD students work (2 ECTS = 60 hours; 4 ECTS = 110 hours, etc.)

8. Additional information	
Number of ECTS credits for classes requiring direct participation of academic teachers	1
Number of ECTS credits earned by a student in a practical course	1