

Course number	U-LAS70 10002 SE50					
Course title (and course title in English)	ILAS Seminar-E2 :The wonderful world of quantum physics (素晴らしい量子物理の世界) ILAS Seminar-E2 :The wonderful world of quantum physics		Instructor's name, job title, and department of affiliation	Graduate School of Science Associate Professor,PETERS,Robert		
Group	Seminars in Liberal Arts and Sciences		Number of credits	2	Number of weekly time blocks	1
Class style	seminar (Face-to-face course)	Year/semesters	2025 ・ First semester		Quota (Freshman)	15 (15)
Target year	Mainly 1st year students	Eligible students	For all majors		Days and periods	Mon.5
Classroom	23, Yoshida-South Campus Bldg. No. 1				Language of instruction	English
Keyword	quantum mechanics / particles and wave / quantum phenomena / superconductivity					
[Overview and purpose of the course]						
We will start with an introduction to crucial experiments 100 years ago, which have changed the beliefs of the physicists about small particles and atoms. From there, we will understand the differences between macroscopic and microscopic world and the basic concepts of modern quantum theory. In the second part of the course, we will look at quantum phenomena and applications of them such as quantum teleportation, quantum computing, entanglement, magnetism, and superconductivity.						
[Course objectives]						
<ul style="list-style-type: none"> - Catching a glimpse of the bizarre behavior of the quantum world. - Seeing the differences between macroscopic and microscopic world - Becoming familiar with the basic concepts of quantum physics - Revealing the mysteries behind quantum phenomena such as magnetism, superconductivity, and entanglement. 						
[Course schedule and contents]						
The course will be adapted to the level of the students. Therefore, the number of weeks may change.						
<ul style="list-style-type: none"> - Introduction to experiments on atoms and quantum-particles which have changed the beliefs of physicists 100 years ago (4-6 weeks) <ul style="list-style-type: none"> - light as wave and particle - electrons as waves - double slit experiment for electrons - the development of modern quantum mechanics - Heisenberg uncertainty-principle - why quantum mechanics is weird - Applications of quantum phenomena (3-4 weeks) <ul style="list-style-type: none"> - quantum tunneling - quantum teleportation - quantum computing 						

Continue to ILAS Seminar-E2 :The wonderful world of quantum physics (素晴らしい量子物理の世界) (2)						

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- Quantum phenomena in atoms, molecules, larger bodies (5-7 weeks)
 - atoms
 - why more is different (many body physics)
 - molecules
 - superconductivity
 - magnetism

[Course requirements]

None

[Evaluation methods and policy]

Attendance, participation (50%) and assignment (50%)

[Textbooks]

Not used

[References, etc.]

(**References, etc.**)

Introduced during class

[Study outside of class (preparation and review)]

The students will be asked to prepare short talks, which will be given during the course.

[Other information (office hours, etc.)]

Office hour: After the course

[Essential courses]