科目ナンバリング							
授業科目名<英訳>	ILAS Seminar-E2 :The wonderful world of quantum physics（素晴らしき量子物理の世界） ILAS Seminar-E2 :The wonderful world of quantum physics			担当者所属職名・氏名	理学研究科　講師　PETERS,Robert		
群	少人数群	単位数	2単位	週コマ数	1コマ	授業形態	ゼミナール（対面授業科目）
開講年度・開講期	2024・前期	受講定員(1回生定員)	25 (15) 人	配当学年	主として1回生	対象学生	全学向
曜時限	月5	教室	1共21			使用言語	英語
キーワード	quantum mechanics / particles and wave / quantum phenomena / superconductivity						

[授業の概要・目的]

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.

[到達目標]

- 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.

[授業計画と内容]

The course will be adapted to the level of the students. Therefore, the number of weeks may change.

- Introduction to experiments on atoms and quantum-particles which have changed the beliefs of physicists 100 years ago (4-6 weeks)
  - 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)
  - quantum tunneling
  - quantum teleportation
  - quantum computing

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

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- superconductivity
- magnetism

[履修要件]

特になし

[成績評価の方法・観点]

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

[教科書]

使用しない

[参考書等]

（参考書）
授業中に紹介する

[授業外学修（予習・復習）等]

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

[その他（オフィスアワー等）]

Office hour: After the course