



Faculty of Health, Science and Technology
Physics

Syllabus

Quantum physics in the real world

Course Code:	FYGA29
Course Title:	Quantum physics in the real world <i>Kvantfysik i verkligheten</i>
Credits:	4.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has only upper-secondary level entry requirements (G1N)

Major Field of Study:
FYA (Physics)
TKA (Engineering Physics)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2020-05-28, and is valid from the Spring semester 2020 at Karlstad University.

Prerequisites

General admission requirements

Learning Outcomes

Upon completion of the course, students should be able to:

- give an account of the origins of quantum theory from different perspectives,
- describe the phenomenology of quantum physics: how quantum physics structures and explains the experimental results specified below,
- describe and explain the quantum physics applications specified below, especially in terms of explaining the structure of the periodic table based on the atomic model,
- perform calculations in simplified quantum mechanical model systems, and

- give an account of aspects of quantum physics philosophy.

Content

The history of quantum physics, based on biographies of Einstein, Bohr, Fermi, Dirac, and especially Heisenberg.

The phenomenology of quantum physics: the double-slit experiment with low intensity, the photoelectric effect, the Zeeman effect, radioactivity, chemical allotropy, particle beams, and particle detectors.

The applications of quantum physics: the structure and quantum chemistry of the periodic table, information technology, solar cells, nuclear power, nuclear weapons, medical radiation physics and the MRI camera, quantum computers.

The philosophy of quantum physics: "interpreting" quantum physics, the "problem of measuring", wave-particle duality, non-locality, the ontology of quantum conditions, quantum physics and information theory, the relation of quantum physics to other theoretical frameworks, such as for instance relativity theory.

Reading List

See separate document.

Examination

Assessment is based on a written exam and hand-in assignments.

If students have a decision from Karlstad University entitling them to special pedagogical support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades

One of the grades Fail (U), Pass (G), or Distinction (VG) is awarded in the examination of the course. For students in Engineering programmes, the grades Fail (U), Pass (3), Pass with Some Distinction (4), or Pass with Distinction (5) are used.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.