Faculty of Science

FYSN21, Physics: Quantum Physics in Research and Society, 7.5 credits

Fysik: Kvantfysik i forskning och samhälle, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2019-12-10 to be valid from 2019-12-10, autumn semester 2020.

General Information

The course is for second-cycle studies for a Degree of Master of Science (120 credits) with a specialisation in physics.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Physics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

An overarching theme of the course is to show that it is through the quantum physical nature of matter that we percieve our surroundings and that this applies to all scales from the micro- to macro-cosmos. Based on this, as well as the knowledge the student has acquired earlier within quantum physics, the course aims to train those competences that are especially important in the professional life. This includes exercises to lead and work in project groups as well as oral and written presentations with connection to the subject of physics where the focus is on the recipient and his or hers need to utilize relevant knowledge in difference to exercises where the knowledge acquired by the student is only reported.

Knowledge and understanding

Upon completion of the course, the student shall be able to:

- explain the basic concepts of quantum physics and how they are used in different parts of physics,

- describe a current research question from the quantum physical research front,
- describe the importance of quantum physics to society at large,
- describe the relationship between quantum physical models at different relevant scales.

Competence and skills

Upon completion of the course, the student shall be able to:

- within a limited time frame study a new sub-topic in physics and explain it,
- plan an experiment or a theoretical study, as well as analyzing and reporting the results of this work in the form a scientific article and in an oral presentation,
- write at a popular science level about the results of a physical study
- lead a project group within the subject of physics and work in such a group,
- present information that is targeted towards a specific group in the field of physics and adapt the
  presentation to that group.

Judgement and approach

Upon completion of the course, the student shall be able to:

- assess the amount of information that needs to be collected in order to perform a task in the best possible way within a given time frame,
- critically analyze scientific results,
- assess what a given recipient of information needs to know and is able to utilize, and based on this present scientific material in an appropriate way,
- give constructive oral and written feedback on the works of others,
- evaluate ethical questions from trials and studies and judge whether the latter are acceptable.

Course content

The course deals with concepts such as scattering, cross-section, wavelength, energy conversion and conservation laws that are common to different parts of quantum physics, but are used in different ways. These are discussed using the context that the current research front provides and are exemplified by the research done at the various units at the Department of Physics and the Department of Astronomy and Theoretical physics at Lund university. In addition the course also deals with how quantum physics is used in modern society, for example in the form of medical applications. A significant part of the course is devoted to scientific communication in written and oral form.

Course design

The course consists of lectures, seminars, practical as well as literature-based projects with written and oral presentation, including feedback on presentations made by other students. Most of the course work is done in groups. Pair-wise collection of information, interviewing active researchers, is also included. All parts of the course, except the lectures, are compulsory.

Assessment

The assessmnet is based on the written performance of students in hand-in assignments (6 credits) and oral presentations and discussions (1.5 credits).

Written assignments are also evaluated in terms of linguistic quality and correctness. In the event of shortcomings, recommendations for further studies are given.

Students who do not pass an assessment will be offered another opportunity for assessment soon thereafter.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
For a grade of pass on the whole course, the student must have passed the hand-in assignments and passed the oral presentations and discussions. Every part is given a percentage grade. The minimum grade to pass is 50% for all parts of the course.

For the grade pass with distinction, the percentage grades on the different modules are combined using the number of credits as weights. To pass with distinction the combined percentage grade has to be at least 80%.

Entry requirements

The prerequisites required for admission to the course are: general entry requirements, English 6/B and 90 credits in Physics, including knowledge corresponding to at least three of the following courses: FYSC11 Atomic and Molecular Physics, 7.5 credits, FYSC13 Solid State Physics, 7.5 credits, FYSC14 Particle Physics, Cosmology and Accelerators, 7.5 credits, or a Bachelor of Science in Physics.

Further information

The course may not be credited towards a degree together with FYSN11 Physics Experiments in Research and Society, 7.5 credits.

Subcourses in FYSN21, Physics: Quantum Physics in Research and Society

Applies from H20

2001 Hand-in assignments, 6,0 hp
Grading scale: Fail, Pass, Pass with distinction
2002 Oral presentations and discussions, 1,5 hp
Grading scale: Fail, Pass, Pass with distinction