Faculty of Science

FYST98, Physics: Modern Subatomic Physics, 7.5 credits

Fysik: Modern subatomär fysik, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2025-05-23. The syllabus comes into effect 2025-05-23 and is valid from the spring semester 2026.

General information

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

Language of instruction: Swedish and English
If needed, the course is given in English.

Main field of study	*Specialisation*
Physics	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

The overall outcome for the course is that the student should acquire knowledge of the current research frontier in basic subatomic physics, and be able to, in writing as well as orally, present a subtopic within this field and its current status to an international audience.

Knowledge and understanding

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

- describe the research frontline in current subatomic physics
- describe the basic working principle of a spallation neutron source
- describe the basic production methods for radioactive beams and explain why they are used in current nuclear physics experiments

- describe how the quark–gluon plasma is studied in modern high-energy nuclear physics
- explain the basic principles for radiation detectors used in current experiments in subatomic physics and neutron science
- explain at least one topic in current subatomic physics in greater detail.

Competence and skills

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

- describe the research frontier in current subatomic physics and the experimental methods used in the field
- orally and in writing describe the status of a current subtopic in subatomic physics and/or the experimental methods applied within that topic
- discuss the relation between different subfields of subatomic physics especially concerning the experimental methods and setups used in the field.

Judgement and approach

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

- account for the content of research papers presenting results of experiments in subatomic physics
- argue for the use of different detector technologies in use in current experiments in subatomic physics
- propose detection methods to use for different types of radiation
- estimate experimental parameters based on simulations.

Course content

The course addresses

- the principal design and functioning of neutron spallation sources
- design and function of radiation detectors used in current subatomic physics
- the use of neutron beams for the study of fundamental physics
- the research frontier in low energy nuclear physics and nuclear astrophysics, esp. using radioactive ion beams and related detector systems
- high-energy nuclear physics, especally the study of the quark–gluon plasma and experimental methods used in the field
- basic simulation techniques used in subatomic physics.

Course design

The teaching consists of lectures, seminars and project work. Participation in seminars and project work is compulsory.

Assessment

Assessment takes the form of an oral presentation of the project at the end of the course, as well as in writing during the course by hand-ins and a project report.

Students who do not pass a regular 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.

Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
For a Pass grade on the whole course, the student must pass the written assignments, the project report and the oral presentation.

The grading scale for the written assignments, the project report and the oral presentation is Fail, Pass, Pass with Distinction.

The grade for the whole course is determined by an average of the results on the components included in the assessment.

Entry requirements

Admission to the course requires 75 credits in physics and 45 credits in mathematics, or a Degree of Bachelor of Science in Physics or equivalent – in both cases including knowledge equivalent to FYSB22 Physics: Basic Quantum Mechanics, 7.5 credits.

General entry requirements and English 6/B.

Further information

Assumed prior knowledge: The teaching assumes that the student has acquired knowledge equivalent to FYSC22, Nuclear Physics, 7.5 credits.

The course replaces FYST16 Modern Subatomic Physics, 7.5 credits and cannot be credited in a degree together with this.

The course is in its entirety given together with FKFN30, Modern Subatomic Physics, 7.5 credits, which is a course at the Faculty of Engineering (LTH).

The course is given by the Department of Physics, Lund University.