Faculty of Science

FYST62, Physics: Modern Experimental Particle Physics, 7.5 credits

Fysik: Modern experimentell partikelfysik, 7,5 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2022-06-09 to be valid from 2022-06-09, spring semester 2023.

General Information

The course is an elective course at second-cycle level for a degree of Master of Science (120 credits) in physics. The course is developed for students at the master's level in physics. The course is open to students from other programmes, provided that they fulfil the requirements on prior knowledge.

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

The overarching aim of the course is that the student, on completion of the course, should have acquired an comprehensive overview of current problems in experimental particle physics and how they are explored with different experiments, as well as what current and future trends in the field are.

Knowledge and understanding

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

- explain on an advanced level current problems in experimental particle physics,
- explain on an advanced level the experimental programme at Large Hadron Collider (LHC) on CERN,
- describe several modern front line experiments in particle physics,
- Describe current and future trends in modern experimental particle physics.

Competence and skills

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

- independently search and acquire information necessary for a review or an analysis of a given problem within the subject area of the course,
- communicate results of the project work orally and participate in discussions at presentations of the other students' project work,
- independently solve calculation exercises relevant for the subjects of the course, including among others Feynman diagrams and calculations with 4-vectors.

Judgement and approach

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

- analyse the relevance and research potential of particle physics experiment,
- interpret scholarly journal publications within the subject area of the course,
- suggest an applicable approach or solution for a stated problem within the subject area of the course.

Course content

The course addresses current problems in particle and astroparticle physics and focuses on current and planned experiments in the subject area. Typical questions that the course covers are: The status of the Standard Model of particle physics and its precision measurements, heavy-ion physics as well as physics beyond the Standard Model (e.g. neutrinos, dark matter). An essential aspect of the course is the experimental perspective i.e. primarily the Large Hadron Collider and its experiments, but also non-LHC-based experiments and methods, particularly ESS-related ones.

Course design

The teaching consists of lectures, exercises and a computer exercise. Participation in exercises and project work and related course activities is compulsory. If possible, the course includes a visit to some research centre, e.g. ESS. The study visit is not compulsory.

Assessment

Examination during the course takes place in the form of written assignments connected to the exercises, and orally in the form of a presentation of the computer exercise. In addition, there is a written examination at the end of the course. For students who have not passed the regular exam, an additional exam opportunity is offered 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.
To pass the whole course, approved examination, passed written assignments, passed presentation of the computer exercise and participation in all compulsory components are required.

The final grade is determined by the aggregated results of the different assessed components. In the final grade, the different components are given weights according to their relative importance i.e. based on the number of credits.

Entry requirements

Admission to the course requires 120 credits within scientific studies, of which 75 credits need to be in physics and 45 credits in mathematics, or a Degree of Bachelor in physics - in both cases including knowledge equivalent to FYSC24 Particle physics, cosmology and accelerators, 7.5 credits, and English 6/B.

Further information

This course replaces FYST17, Modern experimental particle physics, 7.5 credits, and cannot be counted together with that course.

The following courses are recommended before or in parallel with the course: FYSN21 Physics experiments in research and society, 7,5 credits, FYSN15 Experimental tools, 7,5 credits and FYTN18 Theoretical particle physics, 7,5 credits. Knowledge in programming (preferably in Python) is advantageous.

The course is offered at the Department of Physics, Lund University.

Subcourses in FYST62, Physics: Modern Experimental Particle Physics

Applies from V23

2301 Exam, 5,5 hp
Grading scale: Fail, Pass, Pass with distinction
2302 Exercises, 2,0 hp
Grading scale: Fail, Pass, Pass with distinction