

# Syllabus

for course at advanced level

**Elementary Particle Physics**  
**Elementarpartikelfysik**

**7.5 Higher Education  
Credits**  
**7.5 ECTS credits**

<b>Course code:</b>	FK7062
<b>Valid from:</b>	Autumn 2017
<b>Date of approval:</b>	2017-01-16
<b>Department</b>	Department of Physics
<b>Main field:</b>	Physics
<b>Specialisation:</b>	A1N - Second cycle, has only first-cycle course/s as entry requirements

## Decision

This course plan has been established by the Board of Science at Stockholm University on 2017-01-16.

## Prerequisites and special admittance requirements

Admission to the course requires knowledge equivalent to passed courses (excluding introductory courses) of 45 credits in mathematics and 60 credits in physics, where the courses Quantum Mechanics, 7.5 credits (FK5020) and Atomic and Molecular Physics, 7.5 credits (FK5023) should be included. Additionally, requires knowledge equivalent to upper secondary school English B/English 6.

## Course structure

Examination code	Name	Higher Education Credits
HELA	Elementary Particle Physics	7.5

## Course content

Particle physics is about the fundamental particles in Nature. The course explains how the nucleons are built up of quarks and demonstrates the existence of quarks. The standard model of particle physics describes interactions between the known quarks, leptons and gauge bosons via the three known fundamental forces. The course discusses the standard model and shows how Feynman diagrams can be used to illustrate processes and compute cross sections. Remaining questions of the standard model are examined and theories beyond the standard model are discussed. Additionally, different experimental methods applied in Particle Physics are discussed.

## Learning outcomes

It is expected that the student after taking the course will be able to:

- describe and explain the difference between different types of particles and relate these with experimental outcomes
- compute four-vectors of particles in collisions and decays, draw Feynman diagrams to compute cross, life times and branching ratios
- analyze particle processes, identify allowed and forbidden processes by applying conservation laws
- describe and explain the standard model of particle physics and concepts such as gauge interaction, spontaneous symmetry breaking and the Higgs boson, and how these are related to experiments
- describe the need for theories beyond the standard model and how these can be tested experimentally with particle physics experiments.

## **Education**

Instruction consists of lectures, group work and exercises.

The course will be given in English if requested by any student enrolled.

## **Forms of examination**

a. The course is examined as follows: knowledge assessment takes the form of written and oral exams. If the instruction is in English, the examination may also be conducted in English.

b. Grades will be set according to a seven-point scale related to the learning objectives of the course:

A = Excellent

B = Very good

C = Good

D = Satisfactory

E = Adequate

Fx = Fail, some additional work required

F = Fail, much additional work required

c. The grading criteria will be distributed at the beginning of the course.

d. In order to pass the course, a minimum grade of E is required.

e. Students who receive a failing grade on a regular examination are allowed to retake the examination as long as the course is still provided. The number of examination opportunities is not limited. Other mandatory course elements are equated with examinations. A student who has received a passing grade on an examination may not retake the examination to attain a higher grade. A student who has failed the same examination twice is entitled to have another examiner appointed, unless there are special reasons to the contrary. Such requests should be made to the department board.

The course includes at least two examination opportunities per year when the course is given. At least one examination opportunity will be offered during a year when the course is not given.

f. Students awarded the grade Fx are given the opportunity to improve their grade to E. The examiner decides the supplementary assignments to be performed and the pass mark criteria. The supplementary assignments will take place before the next examination session.

## **Interim**

Students may request that the examination be conducted in accordance with this course plan even after it has ceased to be valid. However, this may not take place more than three times over a two year period after course instruction has ended. Requests must be made to the departmental board. The provision also applies in the case of revisions to the course plan (and the revisions of the course literature).

## **Limitations**

The course may not be included in examinations in combination with course Elementary Particle Physics, 7.5 credits (FK7003), or equivalent.

## **Misc**

The course can be included as part of the master's programs offered at the Physics department, but is also offered as a separate course.

## **Required reading**

The course literature is decided by the department board and published on the Department of Physics's website at least two months before the start of the course.