SH2203 Experimental Particle Physics 7.5 credits

Experimentell partikelfysik

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for SH2203 valid from Spring 2020

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Physics

Specific prerequisites

The student is expected to pass the course in Subatomic Physics (SH2103) or equivalent course before commencing the course in Particle Physics. The course is aimed primarily at students in the final year of physics studies, and especially for students following the master's program in Modern Physics. It is assumed that the student has passed an introduction to quantum mechanics before beginning the course in Particle Physics.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After completing the course, the student will have acquired the following knowledge:

- Be able to provide a non-mathematical description of the Standard Particle Physics Model, which includes the smallest constituents of matter and the forces acting between these particles. This includes the quantum mechanical properties of the particles, and how to draw up the Feynman charts to describe the interactions between them.
- Be able to describe how particles interact with matter, and how this determines how particle detectors work. Be able to explain how the large composite detectors used to study collisions from the major harron collider at CERN work and how a combination of information from different subdetectors is used to determine the type, direction, amount of motion and energy of the particles.
- Explain how the most important elemental particles decompose, and how this determines how particle collision analysis is performed.

Course contents

Particle physics studies the elemental particles in the universe and the forces that act between these particles. In order to study the smallest lengths of scale requires enormous high energy, and therefore particle physics is also called high energy physics. This course introduces the subject by focusing on the phenomenological aspects of the elementary particle theory, which is called the Standard Model for Particle Physics. The course also deals with the experimental pieces of the subject, and how data is analyzed. Overall, this gives 3 (5) an overall picture of our understanding of how the world around us works at the smallest lengths

Course literature

The basic concepts and theoretical ideas in the course are covered by the recommended book for the course:

- B. R. Martin and G. Shaw, Particle Physics, 3rd edition, J. Wiley & Sons.
  A similar book, but with a more rigorous treatment of the theoretical aspects, is
- D. Perkins, Introduction to High Energy Physics, 4th edition, Cambridge University Press.

Examination

- INLA - Assignment, 7.5 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Completion of the course will lead to grades A-F being awarded. There are three components to the examination, as detailed below:

1. Three home assignments.
2. A written report and a presentation at the student seminar day.
3. Oral examination (if grade A is sought).

Each component is described in more detail below, along with the grading scheme.
To achieve grades B-Fx, only the first two components of the examination have to be completed successfully. To be considered for grade A, the oral examination is also mandatory.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.