



## DEPARTMENT OF PHYSICS

### **FYM355 Standard model of particle physics, 7.5 credits**

Standardmodellen för partikelfysik, 7,5 högskolepoäng

*Second Cycle*

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#### **Confirmation**

This course syllabus was confirmed by Department of Physics on 2020-05-04 to be valid from 2020-07-01, autumn semester of 2020.

*Field of education:* Science 100%

*Department:* Department of Physics

#### **Position in the educational system**

The course is elective within the master program in physics.

The course can be part of the following programmes: 1) Complex Adaptive Systems, Master's Programme (N2CAS) and 2) Physics, Master's Programme (N2PHY)

*Main field of studies*

Physics

*Specialization*

A1N, Second cycle, has only first-cycle course/s as entry requirements

#### **Entry requirements**

Bachelors degree in physics or equivalent. Recommended: Introductory course in Quantum Field Theory

Applicants must prove their knowledge of English: English 6/English B from Swedish Upper Secondary School or the equivalent level of an internationally recognized test, for example TOEFL, IELTS.

#### **Learning outcomes**

Aim: To present the Standard Model of particle physics, which is a quantum field theory describing how the known elementary particles interact via the electromagnetic,

weak and strong force. A key element in this theory is the Higgs mechanism, and the associated Higgs particle. The purpose of the course is to provide the students with a working knowledge of the basic concepts and features of the Standard Model, including its predictions (which have been verified with unprecedented accuracy) as well as its experimental and theoretical shortcomings.

Learning outcomes (after completion of the course the student should be able to)

- Understand the underlying principles and structure of the Standard Model of particle physics, with particular emphasis on the Higgs mechanism and the properties of the Higgs boson.
- Work out predictions of the Standard Model and compare them with experimental data.
- Understand the key open questions in particle physics and the motivation for physics beyond the Standard Model.

### **Course content**

- Overview of the LHC and its experiments
- The Standard Model and its description of how the known elementary particles interact via the electroweak and strong force.
  
- Chiral fermions
- Non-abelian gauge theories
- Symmetry breaking
- Examples of Standard Model processes. Particle production and decays.
- Description of how the discovery of a Higgs boson was made and how physics beyond the Standard Model is currently being searched for.

### **Form of teaching**

- Lectures.
- Home assignments.
- Oral exam.

*Language of instruction:* English

**Assessment**

The final grade is based on the homework and a voluntary oral exam (for a higher grade).

A student who has taken two exams in a course or part of a course without obtaining a pass grade is entitled to the nomination of another examiner. The student needs to contact the department for a new examiner, preferably in writing, and this should be approved by the department unless there are special reasons to the contrary (Chapter 6 Section 22 of the Higher Education Ordinance).

If a student has received a recommendation from the University of Gothenburg for special educational support, where it is compatible with the learning outcomes of the course and provided that no unreasonable resources are required, the examiner may decide to allow the student to sit an adjusted exam or alternative form of assessment.

In the event that a course has ceased or undergone major changes, students are to be guaranteed at least three examination sessions (including the ordinary examination session) over a period of at least one year, but no more than two years, after the course has ceased/been changed. The same applies to placements and professional placements (VFU), although this is restricted to just one additional examination session.

**Grades**

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

**Course evaluation**

The results of and possible changes to the course will be shared with students who participated in the evaluation and students who are starting the course.