



## DEPARTMENT OF PHYSICS

### **FYM310 Symmetry, 7.5 credits**

Symmetri, 7,5 högskolepoäng

*Second Cycle*

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#### **Confirmation**

This course syllabus was confirmed by Department of Physics on 2019-03-11 to be valid from 2019-03-11, spring semester of 2019.

*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. Course in special relativity.

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**

The purpose of the course is to give a basic knowledge in classical field theory, with special focus on symmetries, global and local. This provides a preparation for continued studies of e.g. gravity and quantum field theory.

On successful completion of the course the student will be able to:

After completed course, the student is expected to master basic elements of classical, including relativistic, field theory for different kinds of fields. In particular, an understanding of global and local symmetries in field theories is expected.

### **Course content**

Discrete symmetries, CPT;

Continuous symmetries: Lie groups and algebras and their representations;

Rotational symmetries, Lorentz and Poincaré algebras;

Basic classical, incl. relativistic, field theory;

Action principle, Hamiltonian formulation;

Noether's theorem;

Currents and charges, the stress tensor;

Gauge theory: minimal coupling, covariant derivatives, topological properties;

Spinors, the Dirac equation

### **Form of teaching**

Lectures

*Language of instruction:* English

### **Assessment**

Home assignments

If a student, who has failed the same examined element on two occasions, wishes to change examiner before the next examination session, such a request is to be submitted to the department in writing and granted unless there are special reasons to the contrary (Chapter 6, Section 22 of Higher Education Ordinance).

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, though at most two years after the course has ceased/been changed. The same applies to work experience and 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.