

PHYS-415

**Particle physics I**

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Cursus	Sem.	Type
Ing.-phys	MA1, MA3	Opt.
Physicien	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Oral
Workload	120h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Courses	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Summary**

Presentation of particle properties, their symmetries and interactions. Introduction to quantum electrodynamics and to the Feynman rules.

**Content****Introduction:**

The Standard Model, a step toward the Grand Unification.

Particle detection, accelerators, natural radioactivity, cosmic rays. Particle physics and Astrophysics and Cosmology.

Relativity, equations of Klein-Gordon and Dirac.

**Properties of particles:**

Mass, charge, lifetime, spin, magnetic moment,...

**Symmetries and conservation laws:**

Invariance under space translation and rotation, parity, time reversal and charge conjugation. Violation of parity and CP, CPT theorem. Isospin.

**QED:**

Introduction to QED. The Feynman rules. The form factors.

**Learning Prerequisites****Recommended courses**

Nuclear and Particle Physics I and II, Quantum mechanics I and II

**Learning Outcomes**

By the end of the course, the student must be able to:

- Analyze sub-microscopical phenomena

**Teaching methods**

Ex cathedra and exercises in class

**Assessment methods**

oral exam (100%)

**Resources**

**Websites**

- <http://lphe.epfl.ch/~bay>