

PHYS-415

Particle physics I

Shchutska Lesya

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
Hours	4 weekly
Courses	2 weekly
Exercises	2 weekly
Number of positions	

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%)

Supervision

Assistants Yes

Resources

Bibliography

Mark Thomson, "Modern Particle Physics" (2013)

Ressources en bibliothèque

- [Mark Thomson, "Modern Particle Physics" \(2013\)](#)

Websites

- <http://pdg.lbl.gov/>

Moodle Link

- <https://moodle.epfl.ch/course/view.php?id=14833>