PHYS-741

Gauge Theories and the Standard Model

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Cursus	Sem.	Type
Physics		Obl.

Language of teaching	English
Credits	4
Session	
Exam	Multiple
Workload	120h
Hours	**56**
Courses	28
Exercises	28
Number of positions	

Frequency

Every year

Remark

Every year / Next time: Fall 2017

Summary

The goal of this course is to explain the conceptual and mathematical bases of the Standard Model of fundamental interactions and to illustrate in detail its phenomenological consequences.

Content

- Introduction to non-abelian gauge theories
- Higgs mechanism and massive gauge theories
- The Standard Model:
    1. From Fermi theory to the development of the Standard Model (SM)
    2. The structure of the SM: multiplet content and anomaly cancellation
    3. Mass generation, Flavor and discrete symmetries (C,P,T)
    4. Quantum Chromodynamics (basics)
    5. Tests of the SM: flavor and electroweak precision measurements
- Open questions and an overview on what may lie ahead: hierarchy problem, dark matter, unification

Keywords

fundamental interactions, particle phenomenology
gauge theories, Higgs mechanism,

Learning Prerequisites

Required courses

Relativistic Quantum Fields I et II, Advanced Quantum Mechanics,
Advanced Quantum Field Theory,

Recommended courses

General Relativity, Cosmology

Expected student activities

Develop a conceptually and mathematically accurate picture of the theory of fundamental interactions. Understand how the structure of the Standard Model follows from basic principles, critically appreciate its phenomenological adequacy and the questions it leaves open.

Resources

Bibliography

M. Peskin and Daniel Schroeder, An Introduction to Quantum Field Theory
S. Weinberg, Quantum Field Theory, Volumes I and II
R. Barbieri, Ten Lectures on the ElectroWeak Interactions

Références suggérées par la bibliothèque

- The quantum theory of fields / Weinberg . Vol1
- Lectures on the electroweak Interactions / Barbieri
- An introduction to Quantum Field Theory / Peskin, Schroeder
- The quantum theory of fields / Weinberg . Vol2