



Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

CHAMPP

CENTER IN HAMBURG FOR
ASTRO-, MATHEMATICAL AND
PARTICLE PHYSICS

LECTURE COURSE IN THE QUANTUM UNIVERSE RESEARCH SCHOOL

Winter Term 2024/2025

Advanced Particle Physics

Roman Kogler, Matthias Schröder

Course Description:

The course covers the Standard Model of particle physics and its limitations, mostly from an experimental point of view. It includes the derivation of the Lagrangian of the Standard Model and explicit calculations of cross sections and decay rates, and confronts predictions with experimental data. After an introduction into the Dirac theory, gauge symmetries, conservation laws and Feynman diagrams we will discuss more advanced topics like QED, QCD, electroweak unification and the Higgs mechanism. The discussion is accompanied by experimental aspects, explaining the major discoveries in the 20th and 21st century, for example the discovery of the Higgs boson at the Large Hadron Collider (LHC) at CERN. Some emphasis will be placed on the shortcomings of the Standard Model and possible extensions. Exercises will include analytical calculations as well as symbolic computational methods and numerical simulations on the computer. By the end of the course, students will be familiar with the concepts of elementary particle physics and understand the connection between theory and experiment on a quantitative level. The course is a basis for more advanced lectures such as Quantum Field Theory or Experiments on Physics beyond the Standard Model.

Prerequisites:

Physik V (Bachelor course on nuclear and particle physics)

Literature:

see list on STiNE

Date and Place: Tue, 09:15–10:45, SR 1083, Notkestr. 9, Bahrenfeld
Fri, 14:15–15:45, SR 1083, Notkestr. 9, Bahrenfeld

Problem Classes: Fri, 12:15–13:45 / 16:00–17:30, SR 4064, Notkestr. 9

Starting on: 15 October 2024
