



LECTURE COURSE IN THE QUANTUM UNIVERSE RESEARCH SCHOOL

Winter Term 2024/2025

Quantum Field Theory I

Timo Weigand

Course Description:

This course offers an introduction to the basic concepts of relativistic Quantum Field Theory, the central framework for the formulation of modern theories in both particle physics and cosmology. It understands fundamental particles as quantum excitations of fields in a relativistic spacetime, thus combining the key ideas of Quantum Theory and Special Relativity.

The content of the course is structured as follows:

- (1) Canonical quantisation of the free scalar field
- (2) Perturbation theory and interactions for scalar fields
- (3) Canonical quantisation of the Spin 1/2 field
- (4) Quantum Electrodynamics: Tree-level and 1-loop renormalisation

Prerequisites:

Theoretical Classical Mechanics
Theoretical Electrodynamics and Special Relativity
Theoretical Quantum Mechanics

Literature:

Peskin, Schröder: An introduction to Quantum Field Theory, ABP 1995
Schwartz: Quantum Field theory and the Standard Model, Cambridge 2014
Itzykson, Zuber: Quantum Field Theory, Dover 1980
Weinberg: Quantum Field Theory I, Cambridge 1995
Banks: Modern Quantum Field Theory, Cambridge 2008
Srednicki: Quantum Field Theory, Cambridge 2007

More information will be provided on the course Moodle page.

Date and Place: Wed, 11:45–12:45, Lecture Hall, Building 61, Bahrenfeld
Thu, 09:00–10:30, Lecture Hall, Building 61, Bahrenfeld

Problem Classes: Mon, 09:15–10:45, 2, Building 2a, Bahrenfeld
Tue, 13:30–15:00, Hörsaal, Building 61, Bahrenfeld

Starting on: 16 October 2024
