UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Quantum Field Theory II

2122-1-F1701Q134

Aims

Complete the study of QFTs by developing the functional approach to gauge theories, which describe fundamental interactions. Deepen the knowledge of the main properties of QED and QCD. Become familiar with advanced topics in QFT.

Contents

Functional approach to gauge theories. Perturbative renormalization of QED and QCD. Renormalization group for gauge theories. Anomalies.

Detailed program

Gauge theories. Yang-Mills theories. Path integral formulation. Abelian and non-abelian cases.

Propagator of the gauge fields. Gauge fixing, Faddeev-Popov determinant and corresponding ghosts. BRST quantization.

Perturbative approach to path integral for gauge theories with scalar and fermionic matter. QED: Renormalization and beta functions for QED and QCD. Asymptotic freedom. Banks-Zaks fixed point.

Symmetries, Ward-Takahashi and Slavnov-Taylors identities. The case of QED and QCD.

Anomalies in QFT. Axial and chiral anomalies. Triangle anomaly.

Prerequisites

General Relativity, Theoretical Physics I,II, Quantum Field Theory I

Teaching form

Frontal lectures

Textbook and teaching resource

M.E. Peskin, D.V. Schroeder, An introduction to Quantum Field Theory

P. Ramond, Field Theory : A Modern Primer, 2nd Edition

M. Srednicki, Quantum Field Theory

S. Weinberg, The Quantum Theory of Fields I, II

Semester

Second semester

Assessment method

Oral exam

Office hours

By appointment, sending an e-mail to silvia.penati@unimib.it