



UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Fisica Teorica I

2021-1-F1701Q080

Aims

Introduction to the basic concepts of Relativistic Quantum Field Theory as a tool for the study of Fundamental Interaction.

Contents

Formulation of a relativistic quantum theory in terms of particles and fields. Perturbation theory, Feynman diagrams and main processes of quantum electrodynamics.

Detailed program

Relativistic wave equations.

Symmetry and conservation laws.

Field quantization.

Invariant perturbation theory.
Feynman diagrams.

Relativistic kinematics, reference systems, phase space, cross section.

Tree level processes in quantum electrodynamics (QED).

Prerequisites

Good knowledge of Classical and Quantum Mechanics at the level of a Bachelor in Physics. Basic knowledge of Special Relativity (Lorentz transformations and basic relativistic kinematics); the structure of Lorentz group and the covariant formalism are discussed during the course.

Teaching form

Lessons (28 hours) and exercise classes (22 hours). The lectures will be in english.

During the Covid-19 emergency all the lectures will be recorded and will appear on the e-learning page on the scheduled day. The lectures will be on streaming (still with recording) when possible and required by the students.

Textbook and teaching resource

The course is mostly based on:

M.E. Peskin, D.V. Schroeder, An Introduction to Quantum Field Theory, Avalon publishing

Other useful textbooks:

F. Mandl, G. Shaw, Quantum Field Theory, II Edition, Wiley ed.

M.D. Schwartz, Quantum Field Theory and The Standard Model, Cambridge Univ. press

S. Weinberg, Quantum Theory of Fields I and II Cambridge Univ. press.

Ramond, Field Theory: a modern primer, Avalon publishing. (utile per Poincare' e teorie di gauge)

Good online lectures (google it!):

Niklas Beisert, Quantum Field Theory (ETH, Zurich)

David Tong, Quantum Field Theory (Cambridge)

Riccardo Rattazzi, Quantum Field Theory (EPFL Lausanne)

Sidney Coleman, [Notes on Quantum Field Theory, https://arxiv.org/abs/1110.5013](https://arxiv.org/abs/1110.5013)

Semester

first semester, eight hours per week.

Assessment method

Oral exam concerning the topics discussed during the course. The student will be also asked to solve a simple exercise related to the content of the course (for example, evaluation of a cross section or formal manipulations using fields).

During the Covid-19 emergency exams will be online. Dates and instructions to participate as spectators will be posted on the e-learning page.

Office hours

Students may come to my office any time. If needed (and in the Covid emergency), send an e-mail to fix an appointment.
