UNIVERSITÀ DI PAVIA

Anno Accademico 2020/2021

QUANTUM FIELD THEORY

Enrollment year	2020/2021
Academic year	2020/2021
Regulations	DM270
Academic discipline	FIS/02 (THEORETICAL PHYSICS, MATHEMATICAL MODELS AND METHODS)
Department	DEPARTMENT OF PHYSICS
Course	
Curriculum	Fisica nucleare e subnucleare
Year of study	1°
Period	2nd semester (01/03/2021 - 11/06/2021)
ECTS	6
Lesson hours	48 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	PICCININI FULVIO (titolare) - 6 ECTS
Prerequisites	Basic knowledge of non-relativistic quantum mechanics and special relativity. Attendance of the course Quantum Electrodymanics is suggested.
Learning outcomes	Learning of basic concepts and functional methods in quantum field theory, with particular reference to QED as a prototype of gauge theories. One of the aims of the course is also to provide the necessary theoretical tools for the understanding of the subjects treated in the course Theory of Fundamental Interactions.
Course contents	- Path-integral quantization in non-relativistic quantum mechanics. - Functional approach in quantum field theory: quantization of scalar fields, vectorial fields (with reference to gauge fields) and of fermionic fields, for non interacting fields. - General relation between Green functions and S-matrix elements: LSZ

	reduction formualae. - Renormalization (general concepts, dimensional regularization and calculation of Green function at one loop in perturbation theory) for a self-interacting scalar field and for Quantum Electrodynamics. - Infrared divergencies in Quantum Electrodynamics - Renormalization group: general concepts developed for a self-interacting scalar field and for Quantum Electrodymanics.
Teaching methods	Lectures at the blacboard.
Reccomended or required readings	-Lecture notes provided by the teacher. Within the reference material given in the lecture notes, the following textbooks are suggested: - L.H. Ryder, Quantum Field Theory, Cambridge, 1996 - A. Zee, Quantum Field Theory in a Nutshell, Princeton University Press, 2010 - M. Bohm, A. Denner, H. Joos, Gauge Theories of the Strong and Electroweak Interaction, Springer, 2001
Assessment methods	Oral examination, aimed at testing the level of knowledge of the fundamental concepts. Some technical details, necessary for a (as far as possible) self-contained development of the lectures, are not strictly required.
Further information	Attendance of the lectures is not compulsory but, nevertheless, suggested. Indeed, due to the complexity of the treated subjects, the direct interaction with the teacher can considerably simplify the learning process.
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile