



UNIVERSITÀ DI PISA

QUANTUM FIELD THEORY / FISICA TEORICA 1

ENORE GUADAGNINI

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| Academic year | 2022/23 |
| Course | FISICA |
| Code | 213BB |
| Credits | 9 |

| Modules | Area | Type | Hours | Teacher(s) |
|------------------|--------|---------|-------|------------------|
| FISICA TEORICA 1 | FIS/02 | LEZIONI | 54 | ENORE GUADAGNINI |

Programma (contenuti dell'insegnamento)

Transition amplitude and cross section for elastic scattering in Quantum Mechanics. Use of the Green function method applied to the Helmholtz equation and choice of the boundary conditions for the wave function of the outgoing scattered particles. Born approximation.

Second quantization, identical particles, Fock space, field operators in the interaction picture, time ordering, relativistic covariance for the fields, free lagrangian and interaction lagrangian, Noether theorem, continuous symmetries, groups $U(1)$ and $SU(2)$ and their representations.

Field operators, wave functions, solutions of the Dirac equation, scalar fields, massless and massive vector fields, spinor fields, covariant bilinears, Weyl spinors, discrete symmetries.

Spinor electrodynamics, fields and lagrangian, gauge transformations and gauge invariance, minimal coupling, scalar electrodynamics.

S matrix, computation of the transition amplitudes in perturbation theory, derivation of the decay widths and of the cross sections in particles processes. Feynman propagator, Wick theorem, Feynman diagrams.

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