

CORSO di TEORIA DELLE INTERAZIONI FONDAMENTALI - F. FERUGLIO - TORASSA

This is an introductory course on electroweak interactions. A first part will be devoted to general properties of gauge theories and to the spontaneous breaking of a continuous symmetry. The course is addressed to all students (both theoreticians and experimentalists) aiming at

- understanding the present description of electroweak and strong interactions in terms of a consistent quantum field theory
- knowing the reasons of the great success of the so-called standard model, its theoretical foundations and the crucial experimental tests of its properties.
- knowing why, despite the overwhelming experimental confirmations, the standard model is considered unsatisfactory and why theorists are seriously considering alternatives.

The presentation will be kept at an introductory level, but I expect that the students are already familiar with: Dirac equation, second quantization, basics of Feynman diagrams.

The standard model of electroweak and strong interactions is a very successful theory, verified at a high degree of precision in almost all its different sectors by a large number of experimental data accumulated over the last thirty years. In this course, we review the construction of the theory and we point out its most significant properties:

- existence of massive gauge vector bosons
- breaking of flavour symmetries and origin of quark and lepton masses
- absence of flavour changing neutral currents
- CP violation

We will discuss the most relevant processes for a quantitative test of the model:

- Flavour changing and CP violating transitions
- precision tests at the Z peak and elsewhere
- Search for the Higgs boson