

Experimental Subnuclear Physics

- Prof. **Riccardo Brugnera**
Dipartimento di Fisica e Astronomia, via Marzolo 8
room n. 164
tel. 049-8277321
e-mail: brugnera@pd.infn.it
- **office hours:** Monday from 14:00 to 16:00

Program:

1) Quantum Chromodynamics: QCD lagrangian, renormalization group equations, α_s as running coupling constant. Dokhshitzer-Gribov-Altarelli-Parisi evolution equations. Structure functions. Hadronization processes. Jets

2) Electroweak Theory: $SU(2) \times U(1)$ model, radiative corrections, physics at the Z^0 , interference and asymmetries at LEP, LEP II. Higgs phenomenology, search for the Higgs boson. Physics at the hadronic colliders: search and properties of the top quark and of the intermediate vector bosons.

3) CKM matrix and CP violation: Hierarchy of the parameters, different parametrization. Unitarity triangle. Example of measurement of some elements of the CKM matrix. Oscillation and CP violation in the neutral B system. CP violation in the mesons decays

4) Neutrinos oscillations: two flavours oscillations, three flavours oscillations, matter effect. Solar neutrino oscillations and related experiments. Atmospheric neutrinos oscillations and related experiments. Long-baseline experiments. Neutrinoless double beta decay.

Target skills and knowledge:

The course gives fundamental information about some important aspects of the Standard Model (Chromodynamics, Electroweak theory, Flavour Physics and oscillations) using an **experimental approach**. At the end of the course the student will have an up-to-date knowledge of the subnuclear physics. The student should be able to judge in a critical manner the results obtained by various experiments.

Readings:

- A book containing all the arguments treated in the course at a correct level doesn't exist. The materials can be found on various sources.
- The student will have all the slides (<https://elearning.unipd.it/dfa/>), if necessary other bibliographic information will be given.

Calendar:

The official calendar is fine. But for sure there will be some changes of lessons. These changes will be planned together.

For such reason it will be important for me to have your e-mail addresses.

Examination method:

Oral. The student will present, with the help of slides, a scientific argument.

Exams when?:

The timetable of the official exams are already defined and made public. But, of course, we can choose the best date between us.