Level: Master

Course title: Fundamental Interactions

Status: obligatory

ECTS: 8

Requirements: Particle Physics

Learning objectives

In this course students will gain additional knowledge to the basis of Particle Physics. Besides theoretical approach, this course includes also practical analysis of data from superior experiments devoted to the measurements of characteristics of fundamental interactions, experimental data from LHC experiments at CERN.

Learning outcomes

- General Skills:
  Students will have an insight into part of the analysis of huge amount of experimental results from superior particle physics experiments (LHC - CERN). From the other side, deeper understanding of the basic concepts of physics phenomena, theoretical calculations and comparison of theoretical predictions with experimental results.
- Specific Competencies:
  Obtaining theoretical and practical knowledge in the field of fundamental interactions. Through practical work, students will have an insight in parts of complicate analysis of experimental data from LHC experiments.

Syllabus

Theoretical instruction:

Elementary particles and basic interactions. Space-time physics (Lorentz transformations, relativistic kinematics, Faynmann's diagrams and calculations). Quark model. Calibration symmetries and interactions. Standard model and beyond standard model. Unification theories. Gravitation. Supersimetry. Strings. Experiments with fundamental interactions testing (CERN, LHC experiments).

Practical instruction:

Data analysis from complex experimental set-up (LHC experiments) and term papers.

Literature

1. Nuclear and Particle Physics, Niels Walet, UMIST, Manchester, U.K. (2003)
2. Dynamics of the Standard Model, J.F. Donogue, E. Golowich, B. L. Holstein.
3. LHC Physics, T. Binoth, C. Buttar, P. J. Clark, E.W.N. Glover, CRC Press (2012).

Weekly teaching load	**Lectures:** 3	**Exercises:** 3