Module: Specialization: Experimental Physics

Module No.: physics61a

Course: Particle Physics

Course No.: physics611

Category	Type	Language	Teaching hours	CP	Semester
Elective	Lecture with exercises	English	3+1	6	WT

Requirements for Participation:

Preparation:
Introductory particle physics and quantum mechanics courses

Form of Testing and Examination:
Requirements for the examination (written or oral): successful work with the exercises

Length of Course:
1 semester

Aims of the Course:
Understanding of the fundamentals of particle physics: properties of quarks and leptons and their interactions (electromagnetic, weak, strong), experiments that have led to this understanding, the Standard Model of particle physics and measurements that test this model, the structure of hadrons

Contents of the Course:
Basics: leptons and quarks, antiparticles, hadrons, forces / interactions, Feynman graphs, relativistic kinematics, two-body decay, Mandelstam variables, cross-section, lifetime
Symmetries and Conservation Laws. Positronium, Quarkonium. Accelerators and Detectors
Electromagnetic interactions: (g-2) experiments, lepton-nucleon scattering
Strong interactions: colour, gauge principle, experimental tests of QCD. Electroweak interactions and the Standard Model of particle physics: spontaneous symmetry breaking, Higgs mechanism, experimental tests of the Standard Model. Neutrino physics, neutrino oscillations; CP violation

Recommended Literature:
F Halzen, A. Martin; Quarks and Leptons (J. Wiley, Weinheim 1. Aufl. 1984)
C. Berger; Elementarteilchenphysik (Springer, Heidelberg 2. überarb. Aufl. 2006)
Perkins; Introduction to High Energy Physics (Cambridge University Press 4. Aufl. 2000)
D. Griffith; Introduction to Elementary Particle Physics (J. Wiley, Weinheim 1. Aufl. 1987)
A. Seiden; Particle Physics : A Comprehensive Introduction (2005)
Martin & Shaw; Particle Physics, Wiley (2nd edition, 1997)