Module: Specialization II

Module No.: physics630

Course: High Energy Collider Physics

Course No.: physics633

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

Requirements:

Preparation:
physics611 (Particle Physics)

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

Length of Course:
1 semester

Aims of the Course:
In depth treatment of particle physics at high energy colliders with emphasis on LHC

Contents of the Course:
Kinematics of electron-proton and proton-(anti)proton collisions,
Electron-positron, electron-hadron and hadron-hadron reactions, hard scattering processes,
Collider machines (LEP, Tevatron and LHC) and their detectors (calorimetry and tracking),
the Standard Model of particle physics in the nutshell, fundamental questions posed to the LHC,
spontaneous symmetry breaking and experiment,
QCD and electroweak physics with high-energy hadron colliders,
Physics of the top quark, top cross section and mass measurements,
Higgs Physics at the LHC (search strategies, mass measurement, couplings),
Supersymmetry and beyond the Standard Model physics at the LHC
Determination of CKM matrix elements, CP violation in K and B systems,
Neutrino oscillations

Recommended Literature:
V. D. Barger, R. Phillips; Collider Physics (Addison-Wesley 1996)
R. K. Ellis, W.J. Stirling, B.R. Webber; QCD and Collider Physics (Cambridge University Press 2003)
D. Green; High PT Physics at Hadron Colliders (Cambridge University Press 2004)
C. Berger; Elementarteilchenphysik (Springer, Heidelberg 2nd revised edition 2006)
A. Seiden; Particle Physics A Comprehensive Introduction (Benjamin Cummings 2004)
T. Morii, C.S. Lim; S.N. Mukherjee Physics of the Standard Model and Beyond (World Scientific 2004)