Module: Elective Advanced Lectures: Theoretical Physics

Module No.: physics70c

Course: QCD at colliders (T)

Course No.: physics7510

Category	Type	Language	Teaching hours	CP	Semester
Elective	Lecture with exercises	English	3+2	7	WT

Requirements for Participation:

Preparation:
Quantum Field Theory (physics755)

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

Length of Course:
1 semester

Aims of the Course:
Understanding how to use perturbative quantum chromodynamics to perform calculations for collider experiments in modern high-energy physics.

Contents of the Course:
Quantum chromodynamics (QCD): quarks, gluons and the strong coupling constant
Tree-level scattering amplitudes: Feynman rules, modern methods for scattering amplitudes (BCFW recursion, scattering equations, ...)
Infrared divergences (collinear and soft singularities).
Loop corrections in QCD.
Cancellation of infrared divergences.
Parton model and parton distribution functions.
Modern methods for multi-loop computations.

Recommended Literature:
B. Webber, J. Stirling, R. K. Ellis; QCD and Collider Physics (Cambridge University Press 1996).
J. Campbell, J. Houston, F. Krauss; The Black Book of Quantum Chromodynamics: A Primer for the LHC Era (Oxford University Press 2017).
M. Peskin, D. V. Schroeder: An introduction to Quantum Field Theory (CRC Press 1995).
J. C. Plefka, J. M. Henn, Scattering Amplitudes in Gauge Theories (Springer 2014).
H. Elvang, Y.-T. Huang, Scattering Amplitudes in Gauge Theory and Gravity (Cambridge University Press 2015).