Module: Elective Advanced Lectures: Theoretical Physics

Module No.: physics70c

Course: Lattice Field Theory - Hamiltonian and Lagrangian Methods (T)

Course No.: physics7520

Category	Type	Language	Teaching hours	CP	Semester
Elective	Mixed lecture and seminar	English	2+2	5	WT/ST

Requirements for Participation:

Preparation:
Theoretical courses at the Bachelor degree level

Form of Testing and Examination:
Written / oral examination

Length of Course:
1 semester

Aims of the Course:
To provide an introduction to the fundamentals of lattice field theory and to explore modern approaches for addressing the sign problem.

Contents of the Course:
- Fundamentals of lattice field theory
- The sign problem: chemical potentials, topological terms, and real-time evolution
- Lagrangian methods: Lefshetz thimbles and machine-learning-sampling for lattice field theory
- Hamiltonian methods: tensor networks and quantum algorithms for lattice field theory

Recommended Literature:
Gattringer, Lang, "Quantum chromodynamics on the lattice", Springer, Berlin (2010)
Aarts, "Introductory lectures on lattice QCD at nonzero baryon number", XIII International Workshop on Hadron Physics (2015), arXiv:1512.05145