Module: Elective Advanced Lectures: Theoretical Physics

Module No.: physics70c

Course: Lattice QCD (T)

Course No.: physics769

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

Requirements for Participation:

Preparation:
Quantum Mechanics 1+2, Quantum Field Theory 1

Form of Testing and Examination:
Written / oral examination

Length of Course:
1 semester

Aims of the Course:
To give an introduction to the quantum field theory on the lattice

Contents of the Course:
- Introduction: Quantum mechanics on the lattice
- Numerical algorithms
- Spin systems on the lattice: The Ising model
- Scalar field theory on the lattice: Discretization; Perturbation theory; Continuum limit
- Gauge fields: Link variables; Plaquette action; Wilson loop and confinement
- Fermions on the lattice: Fermion doubling; Different formulations for lattice fermions; Axial anomaly; Chiral fermions
- Use of Effective Field Theory methods: Extrapolation in the quark masses; Resonances in a finite volume

Recommended Literature:
J. Smit, Introduction to quantum fields on a lattice: A robust mate, Cambridge Lect. Notes Phys. (2002)

I. Montvay and G. Münster, Quantum Fields on a Lattice, Cambridge Monographs on Mathematical Physics, Cambridge University Press 1994

C. Gattringer and Ch. Lang, Quantum Chromodynamics on the Lattice: An Introductory Presentation Series: Lecture Notes in Physics, Vol. 788

H.J. Rothe, Lattice Gauge Theories: An Introduction, World Scientific, (2005)