



Universität Hamburg

DER FORSCHUNG | DER LEHRE | DER BILDUNG

CHAMPP

CENTER IN HAMBURG FOR  
ASTRO-, MATHEMATICAL AND  
PARTICLE PHYSICS

LECTURE COURSE IN THE QUANTUM UNIVERSE RESEARCH SCHOOL

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Winter Term 2021/2022

# Conformal Field Theory

Volker Schomerus

## Course Description:

Scale invariant quantum systems play an important role in many different areas of science. In particular, they describe the low-energy physics of many quantum field theories as well as the critical behavior of second order phase transitions. After discussing a few important examples from quantum field theory and statistical physics, the basic notions of conformal symmetry and operator product expansions are introduced. The second part then focuses on conformal field theories in  $d = 2$  dimensions, where the conformal group gets enhanced to a Virasoro symmetry. With some background from mathematics, which will be developed in detail, many such theories can be solved exactly. In the third part, the course proceeds to conformal field theories in dimension  $d > 2$  and the so-called conformal bootstrap programme. After a detailed introduction to conformal blocks and the crossing symmetry constraint, the course concludes with recent results, e.g. on calculation of critical exponents in the 3-dimensional Ising model.

## Prerequisites:

Undergraduate courses in theoretical physics. Some background from quantum field theory and group theory are helpful but not mandatory.

**Date and Place:** Thu, 11:15–12:45, SR 2, Building 2a, Bahrenfeld

**Starting on:** 14 October 2021

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