Renormalization Group Methods in Field Theory

Managing Director of the Institute of Theoretical Physics and Astrophysics

Managing Director of the Institute of Theoretical Physics and Astrophysics

Faculty of Physics and Astronomy

ECTS Method of grading Only after succ. compl. of module(s)

8 numerical grade --

Duration Module level Other prerequisites

1 semester graduate --

Contents

This course is complementary to the discussion of Wilson’s renormalisation group (RG) as covered in the course "Renormalisation Group and Critical Phenomena" (11-CRP). It focuses on the diagrammatic formulation of RG flow equations and its relation to diagrammatic perturbation expansions. This is of particular relevance for interacting fermion systems in the context of functional renormalisation groups. An outline of the course might be:

1. Wilson’s RG
2. Path integrals of interacting fermions
3. Bethe-Salpeter equation
4. RG flow equations for the one-particle and two-particle vertex
5. Comparison of flow equations with diagrammatic resummation schemes (such as the random phase approximation)
6. RG flow equations for spin systems.

Intended learning outcomes

The students become familiar with the modern diagram-based description of many-particle systems. This knowledge serves as a theoretical basis for the examination of phenomena such as superconductivity, charge and spin density waves, and nematic instabilities.

Allocations

Master’s degree (1 major) Physics (2016)
Master’s degree (1 major) Mathematical Physics (2016)
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<tr>
<th>Module description</th>
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<tr>
<td>Master's teaching degree Gymnasium MINT Teacher Education PLUS, Elite Network Bavaria (ENB) (2016)</td>
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