

Winter Semester 2008/09

Condensed Matter Field Theory, with Exercises (TMP-TA4, T6-ASC)

Lecturer: Prof. Jan von Delft

Tutor: Dr. Jerome Rech

Lectures (4 hours per week): Tuesday, 8:15-10:00, Room 449, Theresienstr. 37
Friday, 8:15-10:00, Room 449, Theresienstr. 37

Exercises: To be announced

This course will emphasize the development of modern methods of quantum field theory with applications of current interest in theoretical condensed matter physics. Conceptual and formal methodology will be emphasized and developed, but the discussion and examples will be rooted firmly in practical experimental applications. Considerable attention will be devoted to working out exercises in joint tutorial sessions.

Outline:

1. Bosonization and Re-fermionization
2. Functional Integrals
(many-body path integral, field integral for quantum partition function)
3. Functional Bosonization
4. Renormalization Group
(general concepts & selected examples: Ising model, dissipative quantum tunnelling, ferromagnetic transition, non-linear sigma model, Kosterlitz-Thouless transition)
5. Functional Renormalization Group
6. Topological Field Theories

Textbook: *Condensed Matter Field Theory*, by Alexander Altland and Ben Simons
+ Selected review papers

Prerequisites: T3: Quantum Mechanics I
T4: Statistical Physics
T6: Many-Body-Theory