

## Quantum Field Theory for Condensed Matter Physics (T) - physics759

<i>Course</i>	<b>Quantum Field Theory for Condensed Matter Physics (T)</b>
<i>Course No.</i>	physics759

Category	Type	Teaching			Semester
		Language	hours	CP	
Elective	Lecture with exercises	English	2+1	5	WT/ST

**Requirements for Participation:** Quantum mechanics I (physik421)

### Preparation:

Quantum mechanics II (physics606), Thermodynamics and statistical physics (physik521)

Can be heard in parallel to physics617: "Theoretical Condensed Matter Physics"

**Form of Testing and Examination:** Requirements for the examination (written or oral): attendance of and successful work with the exercises

**Length of Course:** 1 semester

### Aims of the Course:

Knowledge of quantum field theory of interacting many-body systems at finite temperature

Knowledge of quantum field theory for non-equilibrium systems

Ability to construct and evaluate perturbation theory using Feynman diagram

### Contents of the Course:

Fock space and occupation number representation for bosons and fermions

Green's functions: analytical properties and their relation to observable quantities

Elementary linear response theory

Equations of motion

Perturbation theory in thermodynamic equilibrium: Feynman diagrams, Matsubara technique

Perturbation theory away from equilibrium: Keldysh technique

Infinite resummations of perturbation expansions

Exemplary application to model system

### Recommended Literature:

W. Nolting, Grundkurs Theoretische Physik 7: Vielteilchen-Theorie (Springer, Heidelberg 2009)

A. A. Abrikosov, L. P. Gorkov, I. E. Dzyaloshinskii, Methods of Quantum Field Theory in Statistical Physics (Dover, New York 1975 and later editions)

Xiao-Gang Wen, Quantum Field Theory of Many-Body Systems, Oxford Graduate Texts (Oxford University Press, Oxford 2004)

A. Altland and B. Simons, Condensed Matter Field Theory (Cambridge University Press, Cambridge 2006)

PDF version of this page.