Cologne Courses in Theoretical Solid State Physics -

Module No.
Category
Credit Points (CP)
Semester

Module: Cologne Courses in Theoretical Solid State Physics

Module Elements:

Nr	Course	Course No.	CP	Type	Teaching hours	Semester
1	Solid State Theory I	TheoSolidSt	6	Lect. + ex.	3+1	WT
2	Quantum Field Theory I (T)	QFT I	8	Lect. + ex.	4+2	ST
3	Quantum Field Theory II (T)	QFT II	8	Lect. + ex.	4+2	ST

Requirements:

Preparation:

Content:

Aims/Skills:

Form of Testing and Examination:

Length of Module:

Maximum Number of Participants:

Registration Procedure:

Note:

PDF version of this page.

Solid State Theory I - TheoSolidSt

Course	**Solid State Theory I**
Course No.	TheoSolidSt

Category	**Type**	**Language**	**Teaching hours**	**CP**	**Semester**
Elective	Lecture with exercises	English	3+1	6	WT

Requirements:

Preparation: training in theoretical physics at the B.Sc. level, experimental solid state physics

Form of Testing and Examination: written or oral examination

Length of Course: 1 semester

Aims of the Course: this course gives an introduction to the physics of electrons and phonons in solids together with theoretical concepts and techniques as applied to these systems.

Contents of the Course: The lecture investigates basic concepts to describe solids and their excitations. Various applications are discussed with emphasis on experimental and theoretical research directions of the physics department in Cologne.

Recommended Literature: Ashcroft/ Mermin: “Solid State Physics”

PDF version of this page.

Quantum Field Theory I (T) - QFT I

Course	**Quantum Field Theory I (T)**
Course No.	QFT I

Category	Type	Language	Teaching hours	CP	Semester
Elective	Lecture with exercises	English	4+2	8	ST

Requirements:

Preparation: Training in theoretical physics at the B.Sc. level

Form of Testing and Examination: Written or oral examination

Length of Course: 1 semester

Aims of the Course: Methods of quantum field theory are in use in almost all areas of modern physics. Strongly oriented towards applications, this course offers an introduction based on examples and phenomena taken from the area of solid state physics.

Contents of the Course:

Second quantization and applications

Functional integrals

Perturbation theory

Mean-field methods

Recommended Literature: A. Altland and B.D. Simons, Condensed Matter Field Theory (Cambridge University Press, Cambridge, second edition: 2010)

PDF version of this page.

Quantum Field Theory II (T) - QFT II

Course	**Quantum Field Theory II (T)**
Course No.	QFT II

Category	**Type**	**Language**	**Teaching hours**	**CP**	**Semester**
Elective	Lecture with exercises	English	4+2	8	ST

Requirements:

Preparation: Quantum Field Theory I

Form of Testing and Examination: Written or oral examination

Length of Course: 1 semester

Aims of the Course: Quantum field theory is one of the main tools of modern physics with many applications ranging from high-energy physics to solid state physics. A central topic of this course is the concept of spontaneous symmetry breaking and its relevance for phenomena like superconductivity, magnetism or mass generation in particle physics.

Contents of the Course:

Correlation functions: formalism, and their role as a bridge between theory and experiment

Renormalization

Topological concepts

Recommended Literature: A. Altland and B.D. Simons, Condensed Matter Field Theory (Cambridge University Press, Cambridge, second edition: 2010)

PDF version of this page.