

# Module: Elective Advanced Lectures: Theoretical Physics

Module No.: physics70c

Course:  universität**bonn**

## Theory of Superconductivity and Superfluidity (T)

Course No.: physics7504

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

### Requirements for Participation:

#### Preparation:

Quantum Mechanics, Thermodynamics and Statistics, Quantum Field Theory

#### Form of Testing and Examination:

Requirements for the (written or oral) examination: Successful participation in the exercises

#### Length of Course:

1 semester

### Aims of the Course:

The goal of the course is to introduce students to the theory of superconductivity and superfluidity.

### Contents of the Course:

Phenomenological theory of basic superconductivity, type I and type II superconductivity, vortices and their dynamics, Meissner-Ochsenfeld Effekt, microscopic theory of superconductivity: Gor'kov equation, BCS theory, Migdal theorem, strong coupling theory of superconductivity: Eliashberg equation, Andreev scattering, Josephson effect, Anderson theorem: impurity scattering, Collective excitations in superconductors and superfluids, Anderson (Higgs) mechanism for the mass generation. Superfluidity in  $^3\text{He}$ , superconductivity in heavy fermion compounds, high temperature superconductivity and open questions.

### Recommended Literature:

Will be announced in the first lecture