

**Modules:**

physics700 **Elective Advanced Lectures**  
 physics730 **Theoretical Physics**

**Course:**

## 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:****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