# Module: Elective Advanced Lectures: Theoretical Physics

**Module No.:** physics70c

# 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 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 3He, superconductivity in heavy fermion compounds, high temperature superconductivity and open questions.

**Recommended Literature:**
Will be announced in the first lecture