

Condensed Matter Physics

Module No.: MN-P-SP-CondMat, MN-P-PN-CondMat, MN-P-WaMa

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Course: Superconductivity

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Category	Type	Language	Teaching Hours	CP	Semester
Specialized Course	Lecture	English	2	3	WiSe

Requirements for participation:

Basic knowledge of condensed matter physics

Type of module examinations:

One oral examination at the end of the module

Duration of the course:

1 semester

Aims of the course:

Understanding of the fundamental aspects of superconductivity.

Contents of the course:

The lecture provides an overview of the fundamental aspects of superconductivity. It discusses experimental results, the theoretical description, superconducting materials, technological applications, and recent developments. Topics covered are:

- Basic experimental properties (e.g. Meissner effect, thermodynamics, energy gap, type I and type II superconductors, fluxoid quantization, Josephson effects)
- Phenomenological description: London equations
- Microscopic description: Electron-phonon interaction, Cooper pairs, BCS theory
- Ginzburg-Landau theory
- Applications of superconductivity
- Brief introduction to unconventional superconductivity with recent examples

Recommended literature:

J. F. Annett: Superconductivity, Superfluids and Condensates (2005)

M. Tinkham: Introduction to Superconductivity (2004)

J. R. Waldram: Superconductivity of Metals and Cuprates (1996)

W. Buckel, R. Kleiner: Superconductivity: Fundamentals and Applications (2004)

D. R. Tilley and J. Tilley: Superfluidity and Superconductivity (1990)