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| <b>Module:</b> | <b>Elective Advanced Lectures:<br/>Theoretical Physics</b> |
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| <b>Module No.:</b> physics70c |
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| <b>Course:</b> | <br>universität <b>bonn</b> | <b>Theory of Superconductivity and<br/>Superfluidity (T)</b> |
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| <b>Course No.:</b> physics7504 |
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| Category | Type                   | Language | Teaching hours | CP | Semester |
|----------|------------------------|----------|----------------|----|----------|
| Elective | Lecture with exercises | English  | 2+1            | 5  | WT/ST    |

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| <b>Requirements for Participation:</b> |
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| <b>Preparation:</b> |
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| Quantum Mechanics, Thermodynamics and Statistics, Quantum Field Theory |
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| <b>Form of Testing and Examination:</b> |
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| Requirements for the (written or oral) examination: Successful participation in the exercises |
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| <b>Length of Course:</b> |
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| 1 semester |
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**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