

## Superconductivity and superconducting materials

2 units (selection)

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**Target** To understand basics and recent developments in superconductivity.

**Outline** This class reviews quantum mechanics and introduces superconductivity and recent superconducting materials.

**Style** Lecture

**Keyword** *superconductivity, Cooper pair, superconducting energy gap, density of states, anisotropic superconductivity*

**Goal** To understand the outline of superconductivity.

**Schedule**

1. Introduction to superconductivity
2. Review of quantum mechanics (1), Schrödinger equation and wave function
3. Review of quantum mechanics (2), operators and expected values
4. Review of quantum mechanics (3), perturbation theory
5. Free electron model of metals
6. Phenomenological theory of superconductivity
7. To understand Meissner effect on the basis of quantum mechanics
8. Formation of Cooper pair
9. Formation of superconducting energy gap
10. Density of states, and energy gap at finite temperatures
11. Introduction to Nuclear Magnetic Resonance method
12. Frontier of superconductivity (1), strong coupling superconductor
13. Frontier of superconductivity (2), heavy Fermion superconductor
14. Frontier of superconductivity (3), copper oxide high T<sub>c</sub> superconductor
15. Summary

**Evaluation Criteria** Reports on several subjects in the class.

**Textbook** To be introduced in the class.

**Reference** To be introduced in the class.

**Contents** <http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216768>

**Contact**

⇒ Yutaka Kishimoto (A202)