

## Optical properties of materials

2 units (selection)

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**Target** To understand the principle of optical response of atoms, molecules and crystals. To develop ability to apply such optical phenomena to applications.

**Outline** With quantum mechanics, we lecture optical process of materials. This course will cover the following topics: optical properties of materials for engineering, classical electromagnetic theory and optical property, optical transitions and optical process of atoms, molecules and semiconductors.

**Style** Lecture

**Keyword** *quantum mechanics, condensed matter, optical process, semiconductor*

**Relational Lecture** “**Photonic Device**”(0.5), “**Lecture in Optical Materials and Devices, Part 1**”(0.5)

**Requirement** Students should have fundamental knowledges of quantum mechanics.

**Notice** 授業を受ける際には、2時間の授業時間毎に2時間の予習と2時間の復習をしたうえで授業を受けることが、授業の理解と単位取得のために必要である。

**Goal**

1. Students can explain the optical processes of atoms and molecules.
2. Students can explain the optical processes in semiconductors.

**Schedule**

1. Introduction
2. Optical response described by classical electro-magnetic theory
3. Schroedinger equation and wave function
4. Hydrogen atom model
5. spin angular momentum
6. Quantum mechanics of light
7. Transition induced by interaction between electron state and light
8. Light absorption and emission
9. Electron transition in atoms and molecules
10. Optical spectra of atoms and molecules
11. Optical spectra of organic molecules
12. Energy bands in condensed matters
13. Optical processes in semiconductors
14. Optical spectra of impurity atoms in a crystal

15. Optical process of P-N junction

16. Final Examination

**Evaluation Criteria** Activity: 20%, Reports: 40% and Final Exam.:40%

**Textbook** 中澤, 鎌田著, 光物性・デバイス工学の基礎, 培風館 1999

**Contents** <http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216840>

**Contact**

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