

## Advanced Theory of Semiconductors

2 units (selection)

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**Target** To understand semiconductor physics and fundamental device operations for various semiconductor devices

**Outline** Semiconductor physics, especially behavior of carriers in semiconductor, is described. Properties of pn junction and Schottky barrier, including non-ideal case, are also lectured.

**Style** Lecture

**Keyword** *semiconductor, metal-semiconductor contact, pn junction diode*

**Relational Lecture** “Advanced Device Processing”(0.5), “Advanced Theory of Electron Devices”(0.5), “Advanced Optoelectronic Devices”(0.5)

**Goal**

1. To understand behavior of carries (such as scattering mechanisms) in semiconductor
2. To solve diffusion equations in simple conditions
3. To understand properties of pn junction and Schottky barrier

**Schedule**

1. Crystal Structure
2. Energy Bands
3. Carrier Concentration at Thermal Equilibrium
4. Carrier Transport
5. Phonon
6. High-Field Effect
7. Continuity Equations and Diffusion Equations of Carriers
8. Band Structure of Metal-Semiconductor Contact
9. Current Transport Processes of Schottky Barrier
10. Characterization of Schottky Barrier Height
11. Ohmic Contact
12. Band Structure of pn Junction Diode
13. Capacitance-Voltage Characteristics of pn Junction Diode
14. Current-Voltage Characteristics of pn Junction Diode
15. Heterojunction
16. Examination

**Evaluation Criteria** Report 50%, Examination 50%. More than 60% is required to pass this class.

**Textbook** Physics of Semiconductor Devices, by S.M.Sze

**Contents** <http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216816>

**Contact**

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