

Photonic Semiconductor Device Physics

2 units (selection)

Shiro Sakai · PROFESSOR / MATERIAL AND DEVICE SCIENCE, ELECTRICAL AND ELECTRONIC ENGINEERING, SYSTEMS INNOVATION ENGINEERING, Yoshiki Naoi · ASSOCIATE PROFESSOR / MATERIAL AND DEVICE SCIENCE, ELECTRICAL AND ELECTRONIC ENGINEERING, SYSTEMS INNOVATION ENGINEERING

Katsushi Nishino · ASSOCIATE PROFESSOR / MATERIAL AND DEVICE SCIENCE, ELECTRICAL AND ELECTRONIC ENGINEERING, SYSTEMS INNOVATION ENGINEERING

Target To understand the device physics and fabrication technique of photonic semiconductor devices..

Outline Interaction of photons and electrons in semiconductors, physics of superlattice semiconductors and their applications as photonic devices. Crystal growth of semiconductors and heteroepitaxy.

Style Lecture

Keyword *semiconductor, photonic device*

Relational Lecture “**Optical and Functional Inorganic Materials**”(0.5)

Goal

1. To understand device physics of photonic devices in terms of interaction of photons and electrons
2. To understand device physics of quantum effect devices
3. To understand crystal growth and related technologies for fabrication of photonic devices

Schedule

1. Introduction
2. Energy band structure of semiconductors
3. Quantum statistics of electrons in semiconductors
4. Carrier transport in semiconductors
5. Quantum devices and superlattice
6. Light absorption in semiconductors (interaction of electrons and photons)
7. Photocinductivity, photovol and photodiode
8. Physics of light emission of semiconductors
9. Radiative recombination, non-radiative recombination, stimulated emission and spontaneous emission
10. Light emitting diodes and lasers
11. Devices for optical communication
12. Crystal growth of substrates for photonic semiconductor devices
13. MOCVD and MBE
14. Fabrication of Ohmic contact
15. Nano-photonic devices and fabrication technology
16. Examination

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

Textbook To be introduced in the class.

Contents <http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216839>

Contact

⇒ Sakai (E棟2階南 A-3, +81-88-656-7446, sakai@ee.tokushima-u.ac.jp)

MAIL

⇒ Naoi (E棟2階南 A-4, +81-88-656-7447, naoi@ee.tokushima-u.ac.jp) MAIL

(Office Hour: 年度ごとに学科の掲示を参照すること.)

⇒ Nishino (E棟2階南 A-5, +81-88-656-7464, nishino@ee.tokushima-u.ac.jp)

MAIL

Note 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。