

Advanced Optoelectronic Devices

2 units (selection)

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Target) Understanding of opt-electronic devices

Outline) I lecture on an optical amplification and its effect on a semiconductor laser and optical properties of semiconductors. Carrier and light confinements, reflection and guided mode stripe lasers, and the quantum confinement hetero-structure lasers are explained. Reports are required in each of the step, and it is bases of final grade. Lecture schedule are follows. 1. Optical confinement and wave-guide. 2. v-b curves and effective index. 3. Einstein's relation in a semiconductor and black body radiation. 4. Semiconductor light absorption, spontaneous and stimulated emission. 5. Matrix element and density of state of a semiconductor. 6. Optical amplification and the various model calculation in a semiconductor. 7. Optical amplification and semiconductor lasers. 8. The design of a semiconductor laser. 9. The growth of a semiconductor laser. 10. Summary.

Keyword) *laser, semiconductor, light confinement*

Requirement) Students are required to have a good understand undergraduate level physics of semiconductor.

Goal) To understand of the opto-electronic semiconductors

Schedule)

1. Optical confinement and wave-guide.
2. v-b curves and effective index 1.
3. v-b curves and effective index 2.
4. Einstein's relation in a semiconductor and black body radiation.
5. Semiconductor light absorption, spontaneous and stimulated emission.
6. Matrix element and density of state of a semiconductor 1.
7. Matrix element and density of state of a semiconductor 2.
8. Optical amplification and the various model calculation in a semiconductor 1.
9. Optical amplification and the various model calculation in a semiconductor 2.
10. Optical amplification and semiconductor lasers 1.
11. Optical amplification and semiconductor lasers 2.
12. The design of a semiconductor laser 1.
13. The design of a semiconductor laser 2.
14. The growth of a semiconductor laser 1.
15. The growth of a semiconductor laser 2.
16. Summary.

Evaluation Criteria) 講義に対する理解力の評価は、講義への参加状況、レポートの提出状況と内容と、最終試験の成績を総合して行う。平常点と定期試験の比率は 40:60 とする。備考:1. 講義が終わるごとに演習問題やレポートを課す。これらにより、各授業項目の達成度を評価する。詳細は下記参照。2. 成績評価に対する平常点と試験の比率は 40:60 とする。平常点には講義への参加状況、レポートの提出状況と内容を含む。3. 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。4. 他の授業計画 (項目) を含めて授業目的の達成度は最終試験により評価する。

Textbook) Diode lasers and photonic integrated circuits, by L.A.Coldren, S.W. Corzine, John Wiley & sons, Inc., (1995) ISBN 0-471-11875-3

Reference) Hetero-structure lasers, by H.C.Casey, Jr, M.B.Panish, Academic Press, (1978), ISBN 0-12-163101

Contents) <http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216837>

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