

Nonlinear Optical Devices

2 units (selection)

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Target) To understand the principle, typical structure, advantages and disadvantages of current nonlinear optical devices. To develop ability to design new devices and solve various problems for applications.

Outline) Physics of second-order and third-order nonlinear optical phenomena. Principles of electro-optics. Optical nonlinearities in fibers. Photorefractive materials. Nonlinear optical media. Anisotropic nonlinear optical media. Dispersive nonlinear optical media. Coupled-wave theory. Electro-optic and acousto-optic devices. Second-order and third-order nonlinear optical devices. Photonic switches. All-optical switches. Bistable optical devices. Optical connections.

Style) Portfolio

Keyword) *nonlinear optics, harmonic generation, nonlinear optical device, optical switch*

Relational Lecture) “[Optical and Functional Inorganic Materials](#)”(0.5)

Requirement) Student should have fundamental knowledge of electromagnetic theory, waveoptics, optical properties of materials and lasers.

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. Possible to explain principles, structure and characteristics of optoelectric devices.
2. Possible to explain principles, structure and characteristics of the second-order nonlinear optical devices.
3. Possible to explain principles, structure and characteristics of the third-order nonlinear optical devices.

Schedule)

1. Introduction & interview
2. nonlinear optical phenomena
3. Electrooptic effect and its applications
4. Magneto-optic effect and its applications
5. Acousto-optic effect and its applications
6. principle of second-order nonlinear effects

7. Second-order nonlinear optical materials

8. Second-order nonlinear optical devices

9. principle of third-order nonlinear effects

10. third-order nonlinear optical materials

11. Third-order nonlinear devices

12. Experiment for nonlinear optical phenomena

13. Current application of nonlinear devices

14. Photonic crystal

15. Integrated optical devices

Evaluation Criteria) Activity:20%, reports:40% and oral examinations:40%

Textbook) After interview, we will decide suitable text books.

Contents) <http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216849>

Contact)

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MAIL (Office Hour: 16:05-18:00)