



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Photonic materials [S2FT2>MatFoto]

Course

Field of study

Technical Physics

Year/Semester

2/3

Area of study (specialization)

–

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

30

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Knowledge in the field of experimental physics, optics, optoelectronics, laser optics and materials engineering - implemented as part of the study program at the first and second degree of education in the field of Technical Physics. Ability to obtain information from indicated sources and their assimilation. Understanding the necessity of expanding one's competences, understanding the necessity of education in order to obtain qualifications appropriate for the future profession and performing social functions.

Course objective

1. Provide students with knowledge about the properties of the latest photonic materials and related issues.
2. Developing the ability of students to obtain information with the use of specialized scientific literature.

Course-related learning outcomes

Knowledge:

1. has knowledge of selected issues carried out during the lecture
2. knows the application of laws and phenomena in the scope of selected issues carried out during the lecture to describe phenomena in the surrounding world

Skills:

1. is able to see and explain physical phenomena in the surrounding world on the basis of theoretical knowledge concerning selected issues of physics
2. is able to use the indicated sources of knowledge (list of basic literature) with understanding and is active in acquiring knowledge from other sources

Social competences:

1. understands the need to expand knowledge in the field of selected problems in physics in order to apply them in innovative solutions to technological, technical and engineering problems

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The following assessment thresholds apply to the methods used to verify the learning outcomes achieved:

- 50.1-60% dst;
- 60.1-70% dst+;
- 70.1-80% db;
- 80.1-90% db+;
- 90.1% bdb and above.

Assessment is based on individual written work and/or oral response.

Programme content

Issues related to the properties of the selected photonic materials (laser crystals, crystalline luminescent materials, nonlinear optical crystals, photonic crystals, optical fiber structures, plasmonic materials).

Course topics

1. Introduction to the issues.
2. The spectrum of electromagnetic waves. Wave properties of light (the law of light reflection, the law of light refraction, polarization, interference, diffraction, the phenomenon of total internal reflection of light, Brewster's angle).
3. Natural and artificial light sources.
4. Absorption and emission of light.
5. Luminescence of light.
6. Spectroscopic properties of rare earth ions.
7. Luminescence materials.
8. Optical properties of crystals.
9. Nonlinear optical properties of crystals.
10. Laser crystals.
11. Crystalline luminescent materials.
12. Photonic crystals.
13. Fiber optic structures.
14. Semiconductor quantum dots.
15. Plasmonic materials.

Teaching methods

Lecture: multimedia presentation.

Bibliography

Basic:

1. Podstawy Fizyki, D. Halliday, R. Resnick, J. Walker, t. 1 - 5, PWN 2004.
2. Spektroskopia ciała stałego, skrypt pod red. M. Drozdowskiego, WPP 2001.
3. Własności fizyczne kryształów, J.F. Nye, PWN 1962.
3. Handbook of Nonlinear Optics, R. L. Surtherland, 1996 New York.

Additional:

1. Selected articles from the scientific journals: Optics Express, Nature Photonics, Scientific American.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00