COURSE DESCRIPTION CARD - SYLLABUS

Course name
Optoelectronics

Course

Field of study
Technical Physics

Year/Semester
1/1

Area of study (specialization)

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	15	
Tutorials	Projects/seminars	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
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Faculty of Materials Engineering and Technical Physics

Piotrowo street 3, 60-965 Poznan, Poland

Responsible for the course/lecturer:
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Prerequisites

Knowledge of experimental physics and mathematical analysis, specialist knowledge of functional materials and semiconductors. The ability to solve simple physical problems based on the possessed knowledge, the ability to obtain information from the indicated sources. Understanding the need to expand your competences, readiness to cooperate as part of the team.

Course objective

1. The aim of the course is to familiarize students with the issues of electromagnetic wave propagation on the dielectric / dielectric and dielectric / metal boundaries. Getting to know the physical basics of light detectors, LCD, OLED, PLED indicators and modern light sources.

2. Developing students' ability to analyze the results, prepare research reports and present the results publicly and discuss them in a forum.

3. Shaping students' teamwork skills

Course-related learning outcomes

Knowledge

1. Has extensive knowledge of selected optoelectronics departments, principles of operation and basic construction of detectors for the UV-vis and IR range. [K2_W04]

2. Has detailed knowledge of the principles of operation and selected structures of LCD, LED, OLED displays [K2_W05]

Skills

1. can, on the basis of literature, independently analyze the properties of detectors and displays, the scope of their applicability and the optimal selection for the indicated application purposes. [K2_U02]3. Can select standard measuring devices for a specific task - [K1_U14].

Social competences

As a result of the course, the student will acquire the competences listed below. Completing the course means that:

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

final written examination/oral examination at the end of the semester

Programme content

The wave nature of light:

Electromagnetic waves in material centers. Light propagation at the dielectric / dielectric and dielectric / metal interface. Basic photometric units.

Light detectors for the UV-vis and IR range:

Physical basis and principle of operation of thermal and photon detectors. Characteristics of photosensitive materials (photoresists). Thermal infrared detectors (Pt100 resistor, itermistors, bolometer and pyrometer). The principle of operation and construction of a vacuum photocell and photomultiplier tube. Photon detectors on p-n junctions (construction of a photodiode and examples of constructions)

Principles of operation of p-n, pin, Schottky, avalanche photodiode, phototransistor and phototriac, MIS structures, CCD matrices.

Displays:

LCD displays, electroluminescent LCD, LED, OLED, PLED, CRT, plasma, e-paper.

Modern sources of light:

Gallium nitride (GaN - gan) - a future light source ("killer of light bulbs")

The principle of operation and examples of LED and OLED structures

Teaching methods

lecture supported by audiovisual means and demonstrations

Bibliography

Basic

1. D.J. Griffiths, Intorduction to Electrodynamics, Cambridge University Press, 2017,

2. K. Booth, S. Hill, The Essence of Optoelectronics, Prentice Hall , 1998,

Additional

A. Billings, Optics. Optoelectronics an photonics, Prentice Hall, 1990

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3
Classes requiring direct contact with the teacher	45	2
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	30	1

[1] delete or add other activities as appropriate