COURSE DESCRIPTION CARD - SYLLABUS

Course name
Optoelectronic

Course

Field of study
Electrical Engineering

Year/Semester
3 / 5

Area of study (specialization)
-

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

1

Lecturers

Responsible for the course/lecturer:
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Faculty of Control, Robotics and Electrical Engineering

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Responsible for the course/lecturer:

Prerequisites

Student starting this item should have basic knowledge of semiconductors, optics, electrotechnics, electronics and metrology. Also should have ability to realize the efficient self-education in the area related to the chosen field of study and have awareness of the necessity of broadening of the competence in the field of electrical engineering and willingness to cooperate in a team

Course objective

Providing students with basic knowledge in the field of optoelectronics and photonics useful in the

design and application process min. in control and measurement, telecommunications, industrial and sensory systems.

Course-related learning outcomes

Knowledge

- has knowledge about the properties of optical radiation

- has knowledge about generation, transmission and detection of optical signals

- has knowledge of basic optoelectronic elements, their properties, parameters and applications

- has knowledge about construction and operation of optoelectronic devicesStudent:

Skills

Student:

- is ability to characterize the importance and scope of the optoelectronics

- is ability to plan and accomplish a simple engineering task by the use of the selected basic optoelectronic elements

Social competences

Student appreciates the possibilities of using optical radiation to solve technical problems. Student is especially understanding the need of formulating and information of the relating achievements of optoelectronics and photonic engineering and bringing it clearly into general use. Is aware of the safe handling of strong sources of optical radiation and the risks it may cause to the environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture content is verified during the last class in the form of a 45-minute final test on the presented content. The test consists of approximately 25-30 questions (test, calculation and problem questions) with varying scores, with a pass mark of 60%. Additionally, individual activity during classes is assessed and outside the classroom by assessing homework solutions.

Programme content

Lectures:

The topics of the lecture include a number of issues such as:

- Optical radiation: properties, parameters, description, wave-particle duality, wave phenomena

- Geometric optics - phenomena, properties, applications

- Methods for generating optical radiation

- LED diodes, superelectroluminescent, laser,

- LASER: operating principle, parameters, properties, electronic power systems, application, security

Optical radiation detectors methods

- Photoconductive photodetectors: photoresistors, photodiodes, phototransistors, principle of operation, parameters, properties, electronic signal conditioning systems, application

- Thermal photodetectors: thermocouples, bolometers, pyroelectric

- Photoemission photodetectors: photomultiplier

- Radiation photodetectors matrices: CCD, CMOS

- Fiber optics: working principle, types, types, properties, application

- Optoelectronic systems: optocouplers, optical amplifiers, rotational speed sensors, optical encoders, distance sensors, communication interfaces (irDA, LiFi), LiDAR

Teaching methods

Lecture: multimedia presentation (including drawings, photos). Selected examples of diagrams and parameters calculation of optoelectronic circuits, physical phenomena, presented on the board

Bibliography

Basic

1. K. Booth, S. Hill, Optoelektronika WKŁ, Warszawa 2001

2. Z. Bielecki, A. Rogalski - Detekcja sygnałów optycznych, WNT, Warszawa 2001

3. B. Ziętek, Optoelektronika, Wydawnictwo Uniwersytetu Mikołaja Kopernika, 2011

4. R. Jóźwicki, Podstawy inżynierii fotonicznej, Oficyna Wyd. Politechniki Warszawskiej, Warszawa 2006

5. Z. Kaczmarek - Światłowodowe czujniki i przetworniki pomiarowe, Agenda Wydawnicza PAK, Warszawa 2006

6. R. Jóźwicki - Technika laserowa i jej zastosowania, Oficyna Wyd. Politechniki Warszawskiej, Warszawa 2009

7. M. Miłek, Metrologia elektryczna wielkości nieelektrycznych, Oficyna Wydawnicza Uniwersytetu Zielonogórskiego, 2006

Additional

1. A. Cysewska-Sobusiak - Podstawy metrologii i inżynierii pomiarowej, Wyd. Politechniki Poznańskiej, Poznań 2010

2. A. Cysewska-Sobusiak - Modelowanie i pomiary sygnałów biooptycznych, Wyd. Politechniki Poznańskiej, Poznań 2001

3. Szlaferek M., Parzych J., Układy chłodzenia diod i matryc LED, Poznan University of Technology Academic Journals,Electrical Engineering No 88, Computer Applications in Electrical Engineering 2016, Poznan 2016, s. 273-287

4. Parzych J., Hulewicz A., Krawiecki Z., Matryce światłoczułe - właściwości, parametry, zastosowania, Poznan University of Technology Academic Journals, Electrical Engineering, No 92, Poznań 2017, s. 189-204

5. J. Siudak - Wstęp do współczesnej telekomunikacji światłowodowej, WKŁ, Warszawa 1999

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1
Classes requiring direct contact with the teacher	15	0,5
Student's own work (literature studies, ~~preparation for laboratory classes~~/~~tutorials~~, preparation for tests/~~exam~~, ~~project preparation~~) [1]	10	0,5

[1] delete or add other activities as appropriate