



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Optoelectronic

### Course

Field of study

Electrical Engineering

Area of study (specialization)

-

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3 / 5

Profile of study

general academic

Course offered in

polish

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:

Dariusz Prokop

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tel. 61 665 2614

Faculty of Control, Robotics and Electrical Engineering

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Responsible for the course/lecturer:

Joanna Parzych

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### 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 devices

#### 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 final test on the content presented (test, calculation and problem questions). In addition, individual activity in each class is assessed.

Getting additional points for the activity during classes, in particular:

- the efficiency of the use of acquired knowledge to solve a given problem;
- remarks connected with the improvement of didactic materials;

### 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

1. 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. Józwicki, Podstawy inżynierii fotonicznej, Oficyna Wyd. Politechniki Warszawskiej, Warszawa 2006
5. Z. Kaczmarek - Światłowodowe czujniki i przetworniki pomiarowe, Agenda Wydawnicza PAK, Warszawa 2006
6. R. Józwicki - 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	1,0
Classes requiring direct contact with the teacher	20	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	5	0

<sup>1</sup> delete or add other activities as appropriate