# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Optoelectronic Materials

## Course

Field of study
Technical Physics

Year/Semester
4/7

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
elective

## Number of hours

Lecture
20

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

## Number of credit points

5

## Lecturers

Responsible for the course/lecturer:
dr hab. Eryk Wolarz, prof. PP

e-mail: eryk.wolarz@put.poznan.pl

tel. 61 665 3167

Wydział Inżynierii Materiałowej i Fizyki Technicznej

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

## Prerequisites

Basic knowledge of electronics, condensed phase physics and molecular physics from courses in technical physics. The ability to combine the knowledge gained during previous courses in order to understand the issues related to optoelectronic materials, the ability to obtain information from the indicated sources.

## Course objective

1. Providing students with detailed knowledge about the materials used in optoelectronics.

2. Developing students' ability to solve problems in optoelectronics based on the acquired knowledge.

## Course-related learning outcomes

Knowledge

1. knowledge of the physical properties of materials used in optoelectronics [K1_W13]

2. knowledge of the current state of advancement and the latest development trends in optoelectronics [K1_W13]

3. knowledge and understanding of the process of designing and manufacturing simple electronic and optical devices [K1_W10]

Skills

1. ability to select optoelectronic materials for laboratory and engineering applications [K_U18]

2. ability to use the indicated sources of knowledge (list of basic literature) with understanding and acquiring knowledge from other sources [K1_U02]

Social competences

1. understanding the need to provide the society with information on achievements in the field of optoelectronics [K1_K09]

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

| Learning effect | Form of evaluation | Evaluation criteria |
|---|---|---|
| W01, W02, W03 | written/oral exam | 3 - 51%-70.0% |
| | | 4 - 70.1%-90.0% |
| | | 5 - od 90.1% |
| U01, U02 | written/oral exam | 3 - 51%-70.0% |
| | | 4 - 70.1%-90.0% |
| | | 5 - od 90.1% |
| K01 | written/oral exam | 3 - 51%-70.0% |
| | | 4 - 70.1%-90.0% |
| | | 5 - od 90.1% |

## Programme content

1. Materials for organic electronics

a) classification of materials for applications in organic electronics,

b) model of diffusive movement of electric charges,

c) models of injection of electric charge carriers,

d) electric current in organic materials,

e) organic light-emitting diodes, organic photovoltaic cells.

2. Liquid crystals

a) chemical structure and basic physical properties of liquid crystals,

b) thermotropic liquid crystal phases,

c) long range ordering in uniaxial liquid crystal phases,

d) selected electro-optical effects occurring in layers of liquid crystals,

e) liquid crystal displays - structure and principle of operation, applications.

## Teaching methods

Lecture: multimedia presentation, presentation illustrated with examples given on the board

## Bibliography

Basic

1. H. Klauk (ed.), Organic Electronics: Materials, Manufacturing, and Applications, Wiley-VCH, Weinheim 2006.

2. H. Klauk (ed.), Organic Electronics II: More Materials and Applications,Wiley-VCH, Weinheim 2012.

3. J. Godlewski, Wstęp do elektroniki molekularnej, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2008.

4. A. Ulman, An Introduction to Ultrathin Organic Films: From Langmuir Blodgett to Self Assembly, Academic Press, Boston 1997.

5. W. Cai, V. Shalaev, Optical Metamaterials. Fundamentals and Applications, Springer, New York Dordrecht Heidelberg London 2010.

6. P.J. Collings , M. Hird, Introduction to Liquid Crystals, Taylor and Francis, 1997.

7. S. Kumar, Liquid Crystals: Experimental Study of Physical Properties and Phase Transitions,Cambridge University Press, 2001.

Additional

1. P. G. de Gennes, The Physics of Liquid Crystals, Clarendon Press, Oxford 1974.

2. H. Stegemeyer (ed.), Liquid Crystals, Springer, Steinkopff New York1994.

## Breakdown of average student's workload

| | Hours | ECTS |
|---|---|---|
| Total workload | 134 | 5,0 |
| Classes requiring direct contact with the teacher | 44 | 2,0 |
| Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1] | 0 | 0,0 |

[1] delete or add other activities as appropriate