

Course syllabus

binding for the doctoral students of the CUT Doctoral School commencing their studies
in the academic year 2022/2023

Information on the course

Name of the course in Polish	Nowoczesne materiały do zastosowań w optoelektronice
Name of the course in English	Modern materials for optoelectronics applications
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Choosable
Field of education	Engineering and technology
Discipline of education	Materials engineering
Person responsible for the course Contact	Ewa Gondek, <i>doctor habilitatus</i> , prof. of. CUT egondek@pk.edu.pl

Type of course, number of hours in the study programme curriculum

Semester	Credit type (G / NG)*	Lecture	Practical classes	Laboratory	Computer Lab	Project Class	Seminar
1	G	15	0	0	0	0	0

*G – graded credit, NG – non-graded credit

Course objectives

Code	Objective description
Objective 1	Introduction to the types of organic semiconductors for applications in organic electronics and their properties.
Objective 2	Introduction to the methods of producing layers of organic semiconductors and methods of their characterization.
Objective 3	Introduction to the areas of application of organic semiconductors.

Learning outcomes

Code	Description of the learning outcome adjusted to the specific characteristics of the discipline	Learning outcome symbol in the CUD DS	Methods of verification
OUTCOMES RELATED TO KNOWLEDGE			
EUW1	The doctoral student knows the basic mechanisms of optoelectronic devices, including OLEDs based on fluorescent and phosphorescent compounds, an organic photovoltaic cell, and a transistor.	E_W01 E_W02	Attendance and involvement in class activities.

EUW2	The doctoral student knows the basic methods used to produce organic electronic components.	E_W01 E_W02	Attendance and involvement in class activities.
OUTCOMES RELATED TO SKILLS			
EUU1	The doctoral student is able to discuss the advantages and disadvantages of organic compounds used in modern electronics	E_U01	Attendance and involvement in class activities.
EUU2	The doctoral student can discuss the basic types of optoelectronic devices and they can discuss the development perspectives of organic electronics.	E_U01	Attendance and involvement in class activities.
OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	The doctoral student is ready to critically assess and select appropriate materials for use in optoelectronic devices.	E_K01 E_K03	Discussion

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	Development trends in optoelectronics: light sources and detectors, photovoltaic cells, optical fibres for telecommunications and sensor applications. Inorganic materials: narrow-gap semiconductors (Si, InP, multi-component semiconductors, e.g. AlGaIn) and wide-gap semiconductors (SiOxNy, transition metal oxides TiO2; ZnO), organic semiconductors. Layers as basic components of modern optoelectronic structures. Layer fabrication techniques (PVD, CVD, spin-coating, dip-coating...). Methods for the characterization of thin films (ellipsometry, spectrophotometry, atomic force microscopy).	EUW2, EUU1, EUU2, E_K01, E_K03	6

W2	<p>Organic optoelectronics; organic OLEDs, photovoltaic cells and OFET field effect transistors. Diodes based on simple molecules - OLED fluorescence phenomenon - PhOLED phosphorescence phenomenon. Techniques for producing layers in OLED structures of photovoltaic cells (sublimation, spin-coating, roll-to roll, doctor blade). Basic parameters of OLEDs (internal and external quantum efficiency, ignition voltage, luminance, luminous efficiency, CIE, lifetime). Advantages and disadvantages of OLED technology. The most important manufacturers of OLED displays. Fundamentals of operation of OFET organic field effect transistors and the materials used. Organic photovoltaic cells, generations of photovoltaic cells and their basic functional parameters. The current state and prospects for the development of organic photovoltaics. Optoelectronic sensors, examples of constructions and applications.</p>	<p>EUW1, EUW2, EUU1, EUU2, E_K01, E_K03</p>	9
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The ECTS points statement

WORKING HOURS SETTLEMENT	
Type of activity	Average number of hours (45 min.) dedicated to the completion of an activity type
SCHEDULED CONTACT HOURS WITH AN ACADEMIC TEACHER	
Hours allotted in the syllabus	15
Consultations	1
Examination / course credit assignment	2
HOURS WITHOUT THE PARTICIPATION OF AN ACADEMIC TEACHER	
Independent study of the course contents	12
Preparation of a paper, a report, a project, a presentation, a discussion	0
ECTS POINTS STATEMENT	
Total number of hours	30
The ECTS points number	1

Preliminary requirements

No.	Requirements
1	Not specified

Course credit assignment conditions / method of the final grade calculation

No.	Description
COURSE CREDIT ASSIGNMENT CONDITIONS	
1	75% attendance in class.
METHOD OF THE FINAL GRADE CALCULATION	

Course credit assigned on the grounds of attendance and involvement in class.

Additional information

Not specified

The course reading list

1	Selected academic publications.
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