

Cracow University of Technology

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	Podstawy Nanotechnologii
Name of the course in English	Fundamentals of Nanotechnology
Number of the ECTS points	1
Language of instruction	Polish
Category of the course	Elective
Field of education	Engineering and Technology
Discipline of education	Chemical Engineering
Person responsible for the course Contact	Katarzyna Matras-Postolek, <i>doctus habilitatus</i> , DSc, prof.of CUT k.matras@pk.edu.pl

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

Semester	Credit type (G / NG)*	Lecture	Practical class	Laboratory	Computer laboratory	Project class	Seminar
5	NG	15	0	0	0	0	0

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

Course objectives

Code	Objective description
Objective 1	To expand students' knowledge of obtaining and characterising broadly understood nanomaterials used in optoelectronics; the course will contain elements concerning the latest techniques and methods of obtaining nanomaterials, their classification, basic research techniques used for their characterization and possible applications.
Objective 2	To expand students' knowledge of the operation and construction of optoelectronic devices based on nanomaterials, including LEDs, photovoltaic cells, transistors and sensors.

Learning outcomes

Code	Description of the learning outcome adjusted to the specific characteristics of the discipline	Learning outcome symbol in the CUT SD	Methods of verification
OUTCOMES RELATED TO KNOWLEDGE			
EUW1	The doctoral student knows and understands the most important issues related to nanomaterials, their classification, major methods for their preparation and characterization.	E_W01, E_W02, E_W03	Involvement in class activities; a test

EUW2	The doctoral student knows and understands the most important issues concerning the application of nanomaterials in optoelectronics.	E_W01, E_W02, E_W03	Involvement in class activities; a test
OUTCOMES RELATED TO SKILLS			
EUU1	The doctoral student is able to choose the appropriate methods for synthesis and characterization of selected nanomaterials.	E_U01, E_U02	Involvement in class activities; a test; giving a paper
EUU2	The doctoral student is able to select appropriate nanomaterials in order to develop prototypes of optoelectronic devices.	E_U01, E_U02	Involvement in class activities; a test; giving a paper
OUTCOMES RELATED TO SOCIAL COMPETENCES			
EUK1	The doctoral student is prepared to critically evaluate the methodology of the applied research in order to obtain and characterise nanomaterials.	E_K01, E_K03, E_K04	Discussion; giving a paper
EUK2	The doctoral student is prepared to recognise the importance of knowledge on conducting research into the possibility of using nanomaterials to develop optoelectronic devices.	E_K01, E_K03, E_K04	Discussion; giving, a paper

Course outline

No.	Contents	Learning outcomes for the course	No. of hours
LECTURE			
W1	History of the development of nanotechnology, basic definitions related to nanotechnology and nanomaterials, classification of nanomaterials, including quantum dots and hybrid organic-inorganic nanocomposites.	EUW1, EUW2, EUU1, EUK1	2
W2	Types of nanoparticles, size, dimensions, surface modification, methods of nanomaterial stabilisation, self-organisation process.	EUW1, EUW2, EUU1, EUK1	2
W3	Principal methods of nanomaterial synthesis: bottom-up and top-down approaches, including sol-gel methods, colloidal methods, solvothermal syntheses.	EUW1, EUW2, EUU1, EUK1	3
W4	Principal analytical methods used to characterise nanomaterials, including microscopic techniques, diffraction techniques, spectroscopic techniques.	EUW1, EUW2, EUU1, EUK1	3
W5	Application of nanomaterials in optoelectronics to obtain light-emitting diodes, photovoltaic cells and sensors.	EUW1, EUW2, EUU2, EUK2	5

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 THE ACADEMIC TEACHER	
Hours allotted in the syllabus	15
Consultations	1

Examination / course credit assignment	2
HOURS WITHOUT THE PARTICIPATION OF THE ACADEMIC TEACHER	
Independent study of the course contents	8
Preparation of a paper, report, project, presentation, discussion	4
ECTS POINTS STATEMENT	
Total number of hours	30
The ECTS points number	1

Preliminary requirements

No.	Requirements
1	Basic knowledge of the main chemical and physical processes.
2	English language skills.

Course credit assignment conditions / method of the final grade calculation

No.	Description
COURSE CREDIT ASSIGNMENT CONDITIONS	
1	80% attendance in class. Giving a paper and passing the test.
METHOD OF THE FINAL GRADE CALCULATION	
Weighted average of the test and presentation grades.	

Additional information

None

The course reading list

1	Ludovico Cademartiri, <i>Nanochemia podstawowe koncepcje ...</i>
2	...

Z komentarzem [M1]: Lista niekompletna