COURSE DESCRIPTION CARD - SYLLABUS

Course name
Nanotechnology and Nanoengineering

Course

Field of study
Technical Physics

Year/Semester
1/2

Area of study (specialization)

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
45

Laboratory classes

Other (e.g. online)

Tutorials
30

Projects/seminars

Number of credit points

6

Lecturers

Responsible for the course/lecturer:
prof. dr hab. Ryszard Czajka

e-mail:ryszard.czajka@put.poznan.pl

tel. 61-665-3234

Faculty of Materials Engineering and Technical Physics

Piotrowo street 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge of experimental and theoretical physics in the field of the basics of nanotechnology, materials and quantum phenomena. Ability to describe physical and technical problems based on own knowledge, ability to obtain information from the indicated literature sources. Understanding the need to expand own knowledge and competences, willingness to cooperate within the team

Course objective

1. Providing students specialising in nanotechnology with the latest knowledge in these areas. Getting acquainted with the latest literature of the subject and trying to place their own research, thoughts and ideas in contemporary, discussed trends.

2. Developing students' critical analysis skills for their own ideas, research and ideas in the context of broadly understood nanotechnology and nanoengineering.

3. Developing students' teamwork skills in knowledge acquiring and dissemination.

Course-related learning outcomes

Knowledge

Student:

1. knows the achievements, challenges and limitations of selected advanced physics and physico-chemistry issues in modern technologies [K2_W02]

2. has extensive knowledge of the characterisation and manufacture of technological and structural materials and their potential applications in modern technology [K2_W04].

3. has well-established, detailed knowledge related to selected issues of analysis of the properties of functional materials on the nano, micro and macro scales [K2_W08]

4. is familiar with the current state of the art, research and development in nanotechnology, condensed phase physics, surface physics, electronics, quantum computing, bioelectronics, spintronics, non-linear and material optics, and optoelectronics; knowledge of technology transfer [K2_W10]

Skills

Student:

1. is able to obtain information on physical and technical issues from literature and databases, critically analyse them, integrate them and formulate opinions in physical, technical and economic aspects [K2_U02]

2. has the ability to self-educate and is able to define the directions of further self-learning [K2_U04]

3. can analyse the concepts of selected, intensively developed new areas of physics, assess their innovation and technical feasibility [K2-U07]

4. can see their social, economic and legal aspects when formulating and solving engineering tasks [K2_U22].

Social competences

Student:

1. can work responsibly on a multi-threaded task, alone and in a team [K2-K01]

2. understands the need and knows the possibilities for continuous updating and complementing knowledge and the need to improve professional and social competences [K2-K04]

3. is aware of the social role of the technical university graduate and understands in particular the need to formulate and provide the public with information and opinions on the achievements of technical physics and other aspects of engineering activities [K2-K08].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Effect	Form of assessment	Assessment criteria
W02, W04, W08, W10	Individual rating with presentation, discussion, final exam and exercises	50.1%-70.0% (3) 70.1%-90.0% (4) from 90.1% (5)
U02, U04, U07, U22	Assessment of material preparation for presentations and discussions	50.1%-70.0% (3) 70.1%-90.0% (4) from 90.1% (5)
K01, K04, K08	Individual presentation rating and assessment of answers to presentation questions	50.1%-70.0% (3) 70.1%-90.0% (4) from 90.1% (5)

Programme content

1. Understanding definitions and terms, and their limitations, concerning nanotechnology and nanoengineering.

2. Analysis of social, physical and interdisciplinary phenomena known to students in the context of nano.
3. Analysis of selected scientific papers in the context of trends in broad nanotechnology

4. Analysis of ideas, and scientific research relevant to the subject of ongoing M.Sci theses

Teaching methods

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

Exercises: solving tasks, practical exercises, discussion, teamwork

Bibliography

Basic

1. "Nanoscale Science and Technology, Editors: R.W. Kelsall, I.W. Hamley, M. Geoghegan, John Wiley & Sons Ltd. (Polish edition: Nanotechnologie, Wydawnictwo Naukowe PWN, Warszawa 2008)

2. Selected by the presenter, with the participation of students, on the basis of available new scientific publications

Additional

Selected by the presenter, with the participation of students, on the basis of available new scientific publications

Breakdown of average student's workload

	Hours	ECTS
Total workload	141	6,0
Classes requiring direct contact with the teacher	81	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate