COURSE DESCRIPTION CARD - SYLLABUS

Course name

Course

Field of study
Materials Engineering

Year/Semester
2/3

Area of study (specialization)
Nanomaterials

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
15	15	
Tutorials	Projects/seminars	

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
prof. dr hab inż. Jarosław Jakubowicz

email: jaroslaw.jakubowicz@put.poznan.pl

tel. +48 61 665 3781

Wydział Inżynierii Materiałowej i Fizyki Technicznej

ul. Piotrowo 3 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge: basic knowledge of materials science, physics, electronics, nanomaterials

Skills: logical thinking, using information obtained from the library and the Internet

Social competences: understanding the need to learn and acquire new knowledge

Course objective

Understanding nanomaterials and their application in technology and the prospects for their development

Course-related learning outcomes

Knowledge

1. The student should characterize nanomaterials - [K_W10, K_W12, K_W14]

2. The student should characterize the risks resulting from the use of nanomaterials - [K_W16, K_W17]

3. The student should characterize the application of nanomaterials. - [K_W10, K_W12, K_W14]

Skills

1. The student is able to propose the use of nanomaterial in various branches of the economy - [K_U01, K_U03, K_U04, K_U05, K_U16, K_U21]

2. The student is able to describe medical, electronic and construction nanomaterials - [K_U01, K_U03, K_U04, K_U05, K_U16]

3. The student is able to propose and conduct research on nanomaterials and their properties - [K_U01, K_U03, K_U04, K_U05, K_U09]

Social competences

1. The student is able to work in a group - [K_K03]

2. The student is aware of the role of nanomaterials in the modern economy and for society as well as their safe use - [K_K02]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Pass on the basis of a test consisting of 5 general questions (pass if the correct answer to at least 3 questions: <3? Ndst, 3? Dst, 3.5? Dst +, 4? Db, 4.5? Db +, 5? ? bdb) carried out at the end of the semester.

Laboratory: Assessment based on an oral or written answer regarding the content of each performed laboratory exercise, a report on each laboratory exercise according to the instructions of the laboratory teacher. In order to pass the laboratories, all exercises must be passed (positive grade from the answers and the report).

Programme content

Lecture:

1. Characteristics of nanomaterials, the risks associated with their use, problems associated with the production and use of nanomaterials, the advantages of nanomaterials.

2. Biomedical applications? nanogold, nanosilver, nanoplatinum, cerium oxide, iron oxide, zinc oxide.

3.Applications in catalytic systems? nanoplatinum, titanium oxide, cerium oxide.

4.Nanoporous structures and nanotubes? titanium oxide, aluminum oxide.

5. Metal and ceramic nanocoatings.

6.Nanocomposites, nanoceramics, nanopolymers, nanostops Fe, Al, Ti.

7. Semiconductor, magnetic, piezoelectric and superconducting nanomaterials.

Lab:

1.Porous silicon technology part 1.

2. Technology of porous silicon part. 2.

3.Semiconductor materials? analysis of nanostructure images using AFM software, part 1.

4.Semiconductor materials? analysis of nanostructure images using AFM software, part 2.

5.Nan-sized multiferroiki.

6. Hard and soft magnetic nanomaterials.

Teaching methods

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

Laboratory exercises: practical exercises, performing experiments, discussion, team work, case studies.

Bibliography

Basic

1. A. Szaynok, S. Kuźmiński, Podstawy fizyki powierzchni półprzewodników, WNT, Warszawa 2000

2. W. Przygocki, A. Włochowicz, Fulereny i nanorurki, WNT, Warszawa 2001.

3. M. Jurczyk, Nanomateriały, wybrane zagadnienia, WPP 2001

4. K. Kurzydłowski, M. Lewandowska, Nanomateriały inżynierskie konstrukcyjne i funkcjonalne, PWN, Warszawa 2010

5. R.W. Kelsall, I.W. Hamley, M. Georghegan, Nanotechnologie, PWN, Warszawa 2008

Additional

1. C. Kittel, Wstęp do fizyki ciała stałego

2. M. Leonowicz, Nanokrystaliczne materiały magnetyczne, WNT 1998

3. M. Jurczyk, Nanomateriały, wybrane zagadnienia, WPP 2001

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,0
Classes requiring direct contact with the teacher	34	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	15	1,0

[1] delete or add other activities as appropriate