COURSE DESCRIPTION CARD - SYLLABUS

Course name
Materials with special physical properties

Course

Field of study
Materials science

Year/Semester
1/2

Area of study (specialization)
Nanomaterials

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
15

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars
15

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
prof. dr hab. Mieczysław Jurczyk

email: mieczyslaw.jurczyk@put.poznan.pl

tel. 61 665 35 08

Materials Science and Technical Physics Faculty

Piotrowo 3 Str., 60-965 Poznań

Responsible for the course/lecturer:
dr hab. inż. Andrzej Miklaszewski

email: andrzej,miklaszewski@put.poznan.pl

Prerequisites

Basic knowledge of physics, chemistry, materials technology. Skills: logical thinking, using information from the library and the Internet. Understanding the need to learn and acquire new knowledge.

Course objective

1.Provide students with basic knowledge of materials/nanomaterials with physical characteristics, to the extent specified by the curriculum content specific to the field of study.

2.Develop students' ability to solve simple problems related to the selection of materials/nanomaterials with physical characteristics, distinguish materials and analyse the results of microscopic observations based on the acquired knowledge.

3.Shaping teamwork skills in students.

Course-related learning outcomes

Knowledge

1. The student shall characterise materials/nanomaterials with special physical characteristics. - [K_W04.K_W10]

2. The student should characterize the basic processes of obtaining materials/nanomaterials with special physical properties - [K_W08,K_W12,K_W14,K_W15]

Skills

1. The student can select materials/nanomaterials with physical properties depending on the applications - [K_U01,K_U03,K_U5,K_U13,K_U14]

2. The student can propose the use of materials/nanomaterials with physical properties - [K_U01,K_U05]

3. The student is able to carry out research of materials/nanomaterials with physical properties - [K_U04,K_U05,K_U08,K_U09]

Social competences

1. Student can collaborate in a group - [K_K03]

2. The student is aware of the role of materials/nanomaterials with special physical properties in the modern economy and for society - [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 colloquium consisting of 5 general questions (pass in case of correct answer to min. 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: Based on an oral or written response to the content of each laboratory exercise performed, a report of each laboratory exercise according to the indications of the laboratory exercise operator. In order to be counted in laboratories, all exercises must be completed (positive assessment from the response and report).

Programme content

Lecture:

1.Nanoscience/nanotechnology and solid physics

2.Multiferroiki with nanostructure

3.Hard magnets with nanostructure and interchangeable interactions

4.Soft magnets with nanostructure and solid metallic glass

5.Thin layers

6.Modern optoelectronics

7.High temperature superconductive

Laboratory:

1.Introduction to the laboratory ? test methods for analysis and observation

2.Nanotubes and Nanocurrents

3.Nanocrystalline magnetically soft and hard materials

4.Metallic glasses

5.Thin layers for electronics and cutting tools

6.Photonic crystals using silicon structures

Teaching methods

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

2. Laboratory exercises: practical exercises, discussion, teamwork, case study.

Bibliography

Basic

1. C. Kittel, Wstęp do fizyki ciała stałego, Państwowe Wyd. Naukowe Warszawa

2. M. Jurczyk, Nanomateriały. Wybrane zagadnienia, Wyd. Pol. Pozn.

3. R. Pampuch, Współczesne materiały ceramiczne, Uczelniane Wyd. Naukowo-Dydaktyczne AGH, Kraków 2005

4. M. Jurczyk, J. Jakubowicz, Nanomateriały ceramiczne. Wyd. Pol. Pozn. 2004

5. M. Jurczyk, Mechaniczna synteza, Wyd. Pol. Pozn. 2003

6. D. Senczyk, Rentgenografia strukturalna, WPP, Poznań 1988

7. M. Cytro, D. Pavuna, Wstęp do nadprzewodnictwa, Państwowe Wyd. Naukowe Warszawa 1996

8. J. Stankowski, B. Czyżak, Nadprzewodnictwo, WNT, Warszawa 1999

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

Additional

1. Krajowe I zagraniczne czasopisma naukowe - J. Alloys Compounds, Mater. Sc.Eng

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	35	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