COURSE DESCRIPTION CARD - SYLLABUS

Course name
Materials of af special physical properties

Course

Field of study
Material Engineering

Year/Semester
3/5

Area of study (specialization)

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:
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Responsible for the course/lecturer:

Prerequisites

Basic knowledge of chemistry, physics and materials science. Logical thinking, use of the information obtained from library and Internet. Understanding the need for learning and acquiring new knowledge

Course objective

1. The basic knowledge of special properties of materials.

2. The selections of the materials for the specific applications.

Course-related learning outcomes

Knowledge

1. The student has knowledge about special properties of materials. K_W08 K_W11

2. The student has knowledge about applications of the special physical properties materials. K_W10, K_W14

3. The student has knowledge about technology related to the special properties materials. K_W12, K_W14.

Skills

1. The student can select the proper materials for specific applications. K_U01, K_U02, K_U12

2. The student can propose applications of specific materials in modern industry. K_U01, K_U02, K_U12

3. The student can perform the basic investigation of the materials with specific properties. K_U02, K_U08, K_U10

Social competences

1. The student can collaborate in order to obtain and implement the new knowledge. K_K03

2. The student is aware of importance of materials with specific properties in modern industry and society. K_K02

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Written test at the end of the semester

Tutorias: Written or oral tests during each classes, reports, activity and written test at the end of the semester.

Programme content

Lectures:

1. Metals, semiconductors and isolators

2. High-k materials

3. Dielectrics and dielectric relaxations

4. Piezoelectric and pyroelectric materials

5. Ferroelectric materials

6. Diamagnetic, paramagnetic, ferromagnetic, antiferromagnetic and ferrimagnetic materials

7. Hard and soft magnets

8. Multiferroic materials

9. Specific properties at nanoscale

Laboratory:

1. Technology of special materials

2. Mechanochemical synthesis

3. Structural investigations of special materials

4. Magnetic properties of materials

Teaching methods

Lecture: multimedia presentation

Tutorials: scientifiv papers, usage of high energy ball mills, X-ray diffractometry, problem solving, discussion

Bibliography

Basic

1. „Nanoelectronics and Information Technology", R. Waser (red.), Wiley, Weinheim 2003

2. E. Nogas-Ćwikiel „Otrzymywanie proszków ceramicznych do kompozytów ceramiczno-polimerowych dla detektorów piroelektrycznych", Katowice 2012

3. „Elektroceramika ferroelektryczna", Z. Surowiak (red.) Wydawnictwo UŚ, Katowice 2004

4 „Przemiany fazowe" A. Graja, A.R. Ferchmin (red.), Małe Monografie IFM, Tom II (Poznań 2003)

5. Encyklopedia Fizyki Współczesnej, PWN, Warszawa 1983

6. „Zagadnienia fizyki dielektryków" T. Krajewski (red.), Wydawnictwa Komunikacji i Łączności (Warszawa 1970)

7. M. Blicharski, „Wstęp do inżynierii materiałowej"

8. J. Przesławski „Multiferroiki i nanoferroelektryki" http://www.wfa.uni.wroc.pl/pub/content/2280/files/Multiferroiki%20i%20ultraferroiki%20-%20Przes%C5%82awski.pdf

9. M. Pikul, „Fizyka Magnetyków" http://www.wfa.uni.wroc.pl/pub/content/2280/files/Fizyka%20magnetyk%C3%B3w%20-%20Pikul.pdf

10. M. Jurczyk, Nanomateriały. „Wybrane zagadnienia", Wydawnictwo Politechniki Poznańskiej, 2001

11. M. Jurczyk, J. Jakubowicz, „Nanomateriały ceramiczne”, Wydawnictwo Politechniki Poznańskiej, 2004

12. M. Jurczyk „Mechaniczna synteza”, Wydawnictwo Politechniki Poznańskiej, 2003

Additional

1. Scientific papers

Breakdown of average student's workload

	Hours	ECTS
Total workload	70	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]	35	1,0

[1] delete or add other activities as appropriate