COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fundamentals of materials science [N1MiBM2>PNoM]

Course

Field of study
Mechanical Engineering

Year/Semester
1/1

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
24

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

Lecturers

Prerequisites

Knowledge: basics of chemistry, physics and mathematics. Skills: the ability to think logically, associating the picture with the description. Social competencies: understanding the need to learn and acquire new knowledge. Course objective

Course objective

Knowledge of the relationship between chemical composition, physical properties and structure of the material in conection with heat, thermochemical and plastic treatments.

Course-related learning outcomes

Knowledge
1. Student should know the basic groups of engineering materials.
2. Student should know the basic mechanical, physical and chemical properties of materials.
3. Student should know the methods of shaping the structure and properties of materials.
4. Student should know the basic methods of testing materials.
Skills
1. Student is able to obtain information from literature and also other sources.
2. Student is able to assess the structure and properties of materials based on phase equilibrium diagrams.

3. Student is able to identify the material and its previous processing.
4. Student is able to interpret results and draw conclusions.
5. Student is able to select engineering materials for applications in mechanics and machine construction.
Social competences
1. Student understands the need for lifelong learning.
2. Student is able to work in a group.
3. Student is aware of the importance of material properties in the economy

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Grade at the end of the semester (percentage range):
<90-100> - grade 5,0
<80-90) - grade 4,5
<70-80) - grade 4,0
<60-70) - grade 3,5
<50-60) - grade 3,0
<0-50 - grade 2,0
Assessment based on the final written pass of the course.

Programme content

Classification, types of materials and their purpose. Significant of materials properties. Factors determining the properties of materials. Methods and techniques for modifying the properties of materials. Classification of metals and metal alloys. Phase equilibrium systems of metal alloys. Kinds, microstructure and phase properties of metal alloys. Iron alloys - microstructure, properties and their modification, purpose. Copper alloys. Aluminum alloys. Titanium alloys. Heat and thermochemical treatment.

Course topics

1. Structure of materials in macro, micro and nano scale.
2. Observation of macrostructure and microstructure supported by examples.
3. Division of engineering materials (metals and its alloys, plastics, ceramics, composites).
4. Characteristics of individual groups of engineering materials.
5. Properties of engineering materials (physicochemical, mechanical, technological and operational).
6. Basic methods of testing material properties.
7. Bonds, crystal structure, crystal structure defects.
8. Diffusion mechanisms.
9. Mechanism of crystallization of metals.
10. Phase equilibrium systems, Fe-Fe3C system.
11. Transformations in the Fe – Fe3C system.
12. Methods of shaping material properties.

Teaching methods

multimedia presentation, examples of samples after various processes, discussion

Bibliography

Basic:
1. Dobrzański L. A.: Podstawy nauki o materiałach i metaloznawstwo, WNT, Warszawa, 2002
2. Przybyłowicz K.: Metaloznawstwo. WNT, Warszawa, 1999
3. Blicharski M.: Wstęp do inżynierii materiałowej. WNT, Warszawa, 1998
4. Głowacka M., Łabanowski J., Landowski M.: Współczesne materiały inżynierskie. Wybrane grupy materiałów. Wydawnictwo Poitechniki Gdańskiej, Gdańsk, 2021
5. Kaczorowski M., Krzyńska A.: Konstrukcyjne materiały metalowe, ceramiczne i kompozytowe. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2017
6. Barbacki A.: Materiały w budowie maszyn. Praca zbiorowa, Wydawnictwo Politechniki Poznańskiej,

Poznań, 2006
7. Ashby M.F., Jones D.R.H.: Materiały inżynierskie t. 1 i 2, WNT, Warszawa, 1995, 1996

Additional:
1. Burakowski T., Wierzchoń T.: Inżynieria powierzchni metali. WNT, Warszawa, 1995
2. Leda H.: Współczesne materiały konstrukcyjne i narzędziowe. Wydawnictwo Politechniki Poznańskiej, Poznań, 1998
3. Młynarczak A., Jakubowski J.: Obróbka powierzchniowa i powłoki ochronne. Wydawnictwo Politechniki Poznańskiej, Poznań, 1998

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	24	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	51	2,00