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 (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

dr hab. inż. Aneta Bartkowska prof. PP
aneta.bartkowska@put.poznan.pl

Lecturers

dr hab. inż. Aneta Bartkowska prof. PP
aneta.bartkowska@put.poznan.pl

Prerequisites

Knowledge: basics of chemistry, physics and and mathematics. Skills: the ability to think logically, use of information obtained from libraries and the Internet. Social competencies: understanding the need to learn and acquire new knowledge.

Course objective

Understanding the relationship between chemical composition, physical properties and material structure. Understanding the influence of material shaping methods on the properties of engineering materials.

Course-related learning outcomes

Knowledge:
Has knowledge of materials science with elements of chemistry, including natural and engineering technical materials (comparison of their structure, properties and applications), principles of selecting engineering materials in machine construction, shaping the structure and properties of engineering materials using technological methods, materials testing methods, elements computer-aided material design (CAMD - Computer Aided Materials Design) and material selection (CAMS - Computer Aided Materials Selection), the importance of engineering materials in the construction and operation of

machines, obtaining metals and their alloys in metallurgical processes.

Skills:
1. Is able to obtain information from literature, databases and other appropriately selected sources (also in English or another foreign language recognized as the language of international communication) in the field of mechanics and machine construction and other engineering and technical issues consistent with the field of study; is able to integrate the information obtained, interpret it, draw conclusions and formulate and justify opinions.
2. Is able to select engineering materials for applications in mechanics and machine construction.

Social competences:
1. Understands the need for lifelong learning; can inspire and organize the learning process of other people.
2. Is aware of the importance and understanding of non-technical aspects and effects of engineering activities, including its impact on the environment and the related responsibility for decisions made.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Assessment based on verification of knowledge in written form.
Final grade criteria:
over 94% - 5.0
from 84% to 94% - 4.5
from 73% to 83% - 4.0
from 63% to 72% - 3.5
from 51% to 62% - 3.0
below 51% - 2.0

Programme content

Classification, properties, types of materials and their applications (metals, plastics, ceramics, composites).
Factors determining the properties of materials.
Methods and techniques for modifying material properties.
Phase equilibrium systems of metal alloys.

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, 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