COURSE DESCRIPTION CARD - SYLLABUS

Course name
Application of materials in technology [S1IBez2>ZMwT]

Course

Field of study
Safety Engineering

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

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Prerequisites

Student has a basic knowledge of chemistry, physics and mathematics. Student can think logically, associates the image with the description. Student understands the need to learn and acquisition knowledge, systematic learning.

Course objective

Understanding the relationship between chemical composition, physical properties and material microstructure in combination with heat treatment, thermo-chemical treatment and plastic forming.

Course-related learning outcomes

Knowledge:
1. The student knows an engineering issues in advanced degree (physics, chemistry, materials science,

manufacturing technologies, strength of materials, mechanics)[K1_W01]
2. The student knows the issues of technical safety, safety systems, occupational health and safety as well as threats and their effects in depth. [K1_W02]
3. The student has advenced knowledge of the life cycle of products, devices, facilities, systems and technical systems. [K1_W06]

Skills:
1. The student is able to properly select the sources and information derived from them, making the assessment, critical analysis and synthesis of this information. [K1_U01]
2. The student is able to use analytical, simulation and experimental methods to formulate and solve engineering tasks, also with the use of information and communication methods and tools. [K1_U04]
3. The student is able to make a critical analysis of the functioning method and evaluate, in connection with the Safety Engineering, the existing technical solutions, in particular machines, devices, objects, systems, processes and services. [K1_U06]

Social competences:
1. The student is aware of the understanding of non-technical aspects and effects of engineering activities, including its impact on the environment and the related responsibility for decisions made. [K1_K03]
2. The student is aware of the responsibility for their own work and readiness to submit to the rules of teamwork and responsibility for jointly performed tasks. [K1_K07]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Formative assessment:
a. In the scope of laboratory activities based on oral answers from each exercise. Passing threshold: 51% of knowledge from a given laboratory exercise.
b. In terms of lectures based on a test during the semester. Passing threshold: 51% of knowledge in the discussed subject
Summative assessment:
a. In terms of laboratory classes, the average of the grades obtained from the exercises.
b. In the field of lectures - final test. Form: written / oral. Type: test / open-ended questions. Passing threshold: 51% of knowledge in the discussed subject

Programme content

Lecture: Classification, types of materials and their application. The scope of the "life" cycle of products, technical devices. Important properties of materials and their influence on the safety of use. 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. Iron alloys, microstructure, properties and their modification, application. Copper alloys. Aluminum alloys. Ceramics, types, microstructure, properties, purpose. Plastics, types, properties, application. Composites, types, structure and properties. Heat and thermo-chemical treatment. The importance and application of materials in technology.
Laboratory: Application, properties and structure of materials used in technical devices: Steels as delivered; Structural steels after heat treatment; Structure and properties of steel after thermo-chemical treatment; Tool steels; Cast iron and cast steel; Copper and alloys, light alloys; Surface layers; Composite materials; Reasons for premature wear of machine parts and tools

Teaching methods

Lecture: multimedial presentation ilustrated by the examples presented on the board
Laboratory: practical laboratory

Bibliography

Basic:
W. D. Callister Jr., D. G. Rethwisch "Materials Science and Engineering: An Introduction"2021
J. Shackelford "Introduction to Materials Science for Engineers"2021

Additional:
P.Dziarski, N. Makuch "Effect of Indentation Load on Nanomechanical Properties Measured in a Multiphase Boride Layer" , Materials - 2021, vol. 14, no. 21, s. 6727-1-6727-16

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00