COURSE DESCRIPTION CARD - SYLLABUS

Course name
Application of materials in technology [N1IBiJ1>ZMwT]

Course

Field of study
Safety and Quality 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
part-time

Requirements
compulsory

Number of hours

Lecture
9

Laboratory classes
9

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

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. Characterizes the classification, types of materials, and their intended use, demonstrating advanced knowledge about the life cycle of products and technical devices [K1_W01, K1_W06].
2. Explains the essential properties of materials, including their impact on user safety and the factors determining these properties, considering quality engineering issues [K1_W07].
3. Describes methods and techniques for modifying material properties, including heat treatment and thermochemical processing, and understands the significance and application of materials in technology

[K1_W01].

Skills:
1. Analyzes and evaluates the properties and structure of materials used in technical devices, making the appropriate selection of information sources and applying critical analysis [K1_U01].
2. Uses analytical, simulation, and experimental methods to formulate and solve engineering tasks, including optimizing production processes and material applications [K1_U04].
3. Conducts a critical analysis and optimization of existing technical solutions to increase the quality and safety of machines, devices, and processes using various materials [K1_U06].

Social competences:
1. Demonstrates awareness of the non-technical aspects and consequences of engineering activity, including the impact of materials on the environment and the associated responsibility for decisions made [K1_K03].
2. Develops teamwork skills, showing responsibility for tasks undertaken together and readiness to adhere to team working principles, especially in the context of selecting and applying materials in technical projects [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

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

Course topics

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	50	2,00
Classes requiring direct contact with the teacher	18	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	32	1,50