COURSE DESCRIPTION CARD - SYLLABUS

Course name
Metals and their alloys [S1IMat1>MiS]

Course

Field of study
Materials Engineering

Year/Semester
2/4

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
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of materials science. Logical thinking ability to associate an image with a description. Understanding the need to learn and acquiring knowledge, systematic learning

Course objective

Understanding the properties of metals. Understanding the relationship between the chemical composition, physical properties and structure of the alloy in connection with heat, thermo-chemical and plastic treatment.

Course-related learning outcomes

Knowledge:
1. the student should learn the characteristics of individual alloys and metals. - [k_w10]
2. the student should know the properties of materials. - [k_w10]
3. the student should know the influence of heat treatment of various alloys on their properties. - [k_w12]

Skills:

1. the student is able to determine the structure and properties of alloys on the basis of microscopic observations. - [k_u16, k_u21]
2. the student is able to identify the alloy and its previous heat treatment based on the observation of the structure. - [k_u16, k_u21]

Social competences:
1. the student is able to work in a group. - [k_k03]
2. the student is aware of the role of materials in the economy. - [k_k07]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lectures: written exam / oral exam
Laboratory: Assessment based on oral responses in the content of each laboratory exercise according to the instructions of the laboratory teacher. In order to pass the laboratories, all exercises must be passed (positive grade from the answers and the report).

Programme content

Lecture:
Solid solutions. Strengthening mechanisms occurring in solutions. Steel classification. The influence of alloying elements on the properties of steel. Heat treatment of steel. Carbon structural steels. Structural alloy steels for carburizing and thermal improvement. Weldable steels with increased strength. Spring and bearing steels and their heat treatment. Special steels: maraging, Hadfielda. Rules for the selection of steel. Carbon tool steels. Alloy tool steels for cold, hot and high-speed work. Metal corrosion. Structure influence on corrosion resistance. Stainless steels. Heat resistance and creep resistance. Heat-resistant steels and alloys. Incandescent and valve. Aluminum and its alloys. Foundry and forming alloys. Copper and its alloys. Brass. Bronze: tin, aluminum, silicon, beryllium. Heat treatment of copper alloys. Magnesium and its alloys. Beryl and his feet. Zinc and its alloys. Tin, lead and their alloys. Bearing alloys. Titanium and its alloys. Properties and heat treatment of titanium alloys. Steels and tungsten carbide. Principles of powder metallurgy. Properties of sintered carbides and their application.
Lab:
1. Properties and structure of pure metals. 2. Foundry iron alloys. 3. Unalloyed and low-alloy structural steels. 4. Computer support in determining the properties of steel. 5. Steels for rolling bearings, 6. Tool steels for forging dies and high-speed steels. 7. Examples of special steels. 8. Copper alloys - bronze and brass. 9. Light metals - aluminum alloys and titanium alloys. 10. Bearing alloys and bushings

Course topics

Lecture:
Solid solutions. Mechanisms of strengthening occurring in solutions. Classification of steels. Effect of alloying elements on steel properties. Heat treatment of steels. Carbon structural steels. Steels
Structural alloyed steels for carburizing and tempering. Weldable steels for higher strength. Spring, bearing steels and their heat treatment. Special steels: maraging. Principles of steel selection. Carbon tool steels. Alloy tool steels for cold working, hot working
hot and high-speed. Corrosion of metals. Effect of structure on corrosion resistance. Stainless steels. Heat resistance and heat resistance. Heat-resistant steels and alloys. Heat resistant and valve steels and alloys. Aluminum and its alloys. Casting and forming alloys. Copper and its alloys. Brasses. Bronzes: tin, aluminum, silicon, beryllium. Heat treatment of copper alloys. Magnesium and its alloys. Beryllium and its alloys. Zinc and its alloys. Tin, lead and their alloys. Bearing alloys. Titanium and its alloys. Properties and heat treatment
Heat treatment of titanium alloys. Carbide steels and carbides.
Laboratory:
Properties and structure of pure metals. Cast iron alloys. Structural steels unalloyed and low alloyed. Steels for rolling bearings,
Tool steels for forging dies and high-speed steels. Examples of special steels. Copper alloys - bronzes and brasses. Light metals - aluminum alloys and titanium alloys. Bearing alloys and shells.

Teaching methods

1. Lecture: multimedia presentation.
2. Laboratory exercises: the use of selected microscopic research techniques, discussion and preparation of the results in the form of a report, formulation of conclusions regarding the issues discussed during classes.

Bibliography

Basic
1. LA. Dobrzański, Podstawy nauki o materiałach i metaloznawstwo, WNT, Warszawa 2002.
2. K. Przybyłowicz, Metaloznawstwo, WNT, 1999
Additional
1. S. Rudnik, Metaloznawstwo, WNT, 1998

Breakdown of average student's workload

	Hours	ECTS
Total workload	80	3,00
Classes requiring direct contact with the teacher	50	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00