COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basis of heat treatment working [S1IBio1>POC]

Course

Field of study
Biomedical 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
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Knowledge: basics of chemistry, physics and science of materials; 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

Getting to know the principles and types of heat treatment, understanding changes taking place during heat treatment and their effects on the structure and properties of metals and their alloys.

Course-related learning outcomes

Knowledge:
1. student should know how to name and describe basic methods of heat treatment and mechanisms of transformations which occur during heat treatment.
2. student should characterize properties of materials related to heat treatment method applied.

Skills:
1. student know how to select appropriate heat treatment technology to material properties required.

2. student know how to interpret the structure and properties of metal alloys after heat treatment, based on their knowledge of phase and structure transformations.

Social competences:
1. student are willing to work in teams in order to solve problems.
2. student are well aware of the significance of different types of heat treatment methods that determine properties of materials and products.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented are verified as follows:
Assessment at the end of the semester: <90–100> 5.0 (A); <80–90) 4.5 (B); <70–80) 4.0 (C); <60–70) 3.5 (D); <50–60) 3.0 (E); <0–50) 2.0 (F)

Forming rating:
a) in the field of laboratory classes based on oral or writing responses from each exercise,
b) in the field of lectures based on pass conducted during the last lecture classes.
Summary rating:
a) in the laboratory classes, the average of grades obtained from the exercises,
b) in the field of lectures - pass in a written form.

Programme content

• Devices used in heat treatment.
• Definition and classification of heat treatment.
• Characterization and analysis of changes in iron alloys during heating and cooling.
• Hardenability and hardenability test methods.
• Heat treatment of ferrous alloys and selected non-ferrous alloys.
• The influence of heat treatment processes on the structure and properties of metal alloys.

Course topics

1. Classification and characteristics of devices used in heat treatment.
2. Definition and classification of heat treatment: annealing, quenching, tempering, supersaturation, aging.
3. Characteristics and analysis of transformations in iron alloys during heating and cooling: pearlitic transformation, bainitic transformation, martensitic transformation and transformations during tempering.
5. Hardenability and its importance for the selection of construction materials. Hardenability testing methods.
6. Heat treatment of selected metal alloys: iron, aluminum, titanium, copper.
7. The influence of heat treatment processes on the structure and properties of metal alloys.

Laboratory:
1. Introduction to basic issues in heat treatment.
2. Heat treatment of iron alloys – theory and practice.
3. Hardenability as a criterion for steel selection.
4. Supersaturating and ageing of non-ferrous alloys.
5. Thermochemical treatment: nitriding, carburizing and boriding.

Teaching methods

Lecture: multimedia presentation, examples of samples after various processes, discussion
Laboratory: practical exercises, solving tasks, discussion

Bibliography

Basic
1. Dobrzański L. Metalowe materiały inżynierskie. WTN, Warszawa, 2004
2. Przybyłowicz K. Inżynieria stopów żelaza. Wyd. Politechniki Świętokrzyskiej, Kielce, 2008
3. Ciszewski A.: Materiałoznawstwo. Oficyna Wyd. Politechniki Warszawskiej, Warszawa, 2009

Additional
1. Burakowski T., Wierzchoń T.: Inżynieria powierzchni metali. WNT, Warszawa, 1995
2. Szewieczek D. i in. Wprowadzenie do projektowania procesów obróbki cieplnej metali i stopów. Wyd. Politechniki Śląskiej, Gliwice, 2009

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