COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basics of heat treatment

Course

Field of study

Biomedical engineering

Area of study (specialization)

-

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

Polish

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

Lecturers

Responsible for the course/lecturer:

PhD Eng. Aneta Bartkowska

email: aneta.bartkowska@put.poznan.pl

tel. 61 665 3572

Faculty of Materials Science and Technical Physics

Jana Pawla II 24, 61-138 Poznan

Responsible for the course/lecturer:

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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:

Assessment at the end of the semester (assessment at least 51% correct answers). Below 51% - 2.0; from 51% to 62%? - 3.0; from 63% to 72% - 3.5; from 73 to 83 - 4.0; from 84% to 94% - 4.5; above 94% - 5.0.

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

Lectures:

1. Classification and characterizations of heat treatment furnaces.

2. Principles and classification of basic types of metal and alloys heat treatment: annealing, hardening, tempering, supersaturating and ageing.

3. Transformation analysis in iron alloys during heating and cooling.

4. Transformation characteristics for phenomena interpretation during heat treatment i.e. pearlite, martensite and bainite heat treatment and transformations during tempering.

5. Hardenability and its significance for selection of construction materials. Methods of studying hardening.

6. Heat treatment of selected metals and their alloys: iron, aluminium, titanium and copper.

7. Influence of heat treatment processes on properties of materials.

8. Introduction to heat exchange in heat treatment furnaces.

Laboratory classes:

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	50	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	20	1,0

[1] delete or add other activities as appropriate