COURSE DESCRIPTION CARD - SYLLABUS

Course name
Heat treatment of automotive parts [S1MiTPM1>OCCM]

Course

Field of study
Materials and technologies for automotive industry

Year/Semester
2/3

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
15

Number of credit points

3,00

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. Getting to know heat treatment technologies used in the automotive industry.

Course-related learning outcomes

Knowledge:
1. Student should know how to name and describe basic methods of heat treatment and mechanisms of transformations which occurring during heat treatment.
2. Student should characterize the properties of materials depending on the heat treatment method used.

Skills:
1. Student is able to select the appropriate heat treatment technology for the required material properties.
2. Student is able to interpret the structure and properties of metal alloys after heat treatment based on knowledge of phase and structural transformations.

Social competences:
1. Student is willing to work in a group to solve problems.
2. Student is aware of the role of types of heat treatment that shape the properties of materials and products.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

End-of-semester grade:
a) in the scope of laboratory classes, based on oral or written answers to each exercise, and a report on its progress according to the instructor's instructions. The final grade is obtained based on the average of all positive grades from the answers and reports.
b) in the field of project classes based on prepared projects and discussions on their content.
c) in terms of lectures based on a written assessment conducted during the last classes.

Final grade criteria: <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)

Programme content

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

Course topics

Lecture:
1. Classification and characteristics of devices used in heat treatment of automotive parts.
2. Definition and classification of heat treatment: annealing, hardening, tempering, supersaturating, ageing.
3. Characteristics and analysis of transformations in iron alloys during heating and cooling: pearlitic transformation, bainitic transformation, martensitic transformation and transformations during tempering.
4. Hardenability and its importance for the selection of materials intended for automotive parts. Hardenability testing methods.
5. Heat treatment of selected metals and alloys used in the automotive industry: iron, aluminum, titanium, copper.
6. The influence of heat treatment on the structure and properties of metal alloys intended for the automotive industry.
7. The impact of thermo-chemical treatment on the structure and properties of metal alloys intended for the automotive industry.
Laboratory:
1. Introduction to the basic terms used in heat treatment of automotive parts.
2. Hardenability as the main criterion for selecting steel.
3. Heat treatment of automotive parts made of iron alloys.
4. Heat treatment of automotive parts made of non-ferrous alloys.
5. Thermo-chemical treatment used in the automotive industry.
6. Control during and after heat treatment of automotive parts.
Project:
1. Introduction to the design of the heat treatment process of automotive system parts.
2. Problems related to the heat treatment process and their solutions.
3. Designing the heat treatment of a car part of the braking system.

4. Designing the heat treatment of the automotive steering system part.
5. Designing the heat treatment of the car part of the drive system.
6. Designing the heat treatment of a car suspension system part.

Teaching methods

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

Bibliography

Basic:
1. Barbacki A. i in.: Metaloznawstwo dla mechaników. Wydawnictwo Politechniki Poznańskiej. Poznań 1995
2. Barbacki A. i in.: Materiały w budowie maszyn. Wydawnictwo Politechniki Poznańskiej. Poznań 2006
3. Ciszewski A.: Materiałoznawstwo. Oficyna Wydawnicza Politechniki Warszawskiej. Warszawa, 2009
4. Dobrzański L.: Metalowe materiały inżynierskie. WTN. Warszawa, 2004
5. Głowacka M. i in.: Metaloznawstwo. Materiały do ćwiczeń laboratoryjnych. Wydawnictwo Politechniki, Gdańskiej. Gdańsk 1996
6. Hucińska J. i in.: Metaloznawstwo. Materiały do ćwiczeń laboratoryjnych. Wydawnictwo Politechniki Gdańskiej. Gdańsk 1995
7. Przybyłowicz K.: Inżynieria stopów żelaza. Wydawnictwo Politechniki Świętokrzyskiej. Kielce, 2008

Additional:
1. Blicharski M.: Inżynieria powierzchni. Wydawnictwa Naukowo-Techniczne. Warszawa 2009
2. Burakowski T., Wierzchoń T.: Inżynieria powierzchni metali. WNT. Warszawa, 1995
3. Przybyłowicz K.: Metody badania tworzyw metalicznych. Wydawnictwo Politechniki Świętokrzyskiej. Kielce 2011
4. Szewieczek D. i in. Wprowadzenie do projektowania procesów obróbki cieplnej metali i stopów. Wydawnictwo Politechniki Śląskiej. Gliwice, 2009

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00