



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Materials Science with elements of chemistry

### Course

Field of study

Mechanical engineering

Area of study (specialization)

-

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

1 / 1

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

34

Laboratory classes

8

Other (e.g. online)

-

Tutorials

-

Projects/seminars

-

### Number of credit points

5

### Lecturers

Responsible for the course/lecturer:

PhD Eng. Aneta Bartkowska

Responsible for the course/lecturer:

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Faculty of Materials Science and Technical

Physics

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### Prerequisites

Knowledge: basics of chemistry, physics and mathematics;

Skills: the ability to think logically, associating the picture with the description;

Social competencies: understanding the need to learn and acquire new knowledge, regularity in science

### Course objective

Knowledge of the relationship between chemical composition, physical properties and structure of the material in connection with heat, thermochemical and plastic treatments.



### Course-related learning outcomes

#### Knowledge

1. Student should know a basic groups of engineering materials
2. Student should know a basic mechanical, physical and chemical properties of materials
3. Student should know a basic of the heat treatment and thermochemical treatment

#### Skills

1. Student is able to assess the microstructure and properties of materials on the basis of phase equilibrium diagrams
2. Student can suggest a proper heat treatment for the iron alloys

#### Social competences

1. Student is able to work in a group
2. Student is aware of the importance of material properties in the economy

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

#### Forming rating:

- a) in the field of laboratory classes based on oral 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:

Classification, types of materials and their purpose. Significant of materials properties. 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. Kinds, microstructure and phase properties of metal alloys. Iron alloys - microstructure, properties and their modification, purpose. Copper alloys. Aluminum alloys. Titanium alloys. Heat and thermochemical treatment.

#### Laboratory classes:

1. Steels in able of delivery



2. Heat-treated constructional steels
3. Structure and properties of steel after thermochemical treatment
4. Tool steels
5. Cast iron and cast steel
6. Copper and copper alloys
7. Light alloys
8. Surface layers
9. Processes of wear materials
10. Composites

### Teaching methods

Lecture: multimedia presentation, examples of samples after various processes, discussion

Laboratory: practical exercises, discussion

### Bibliography

#### Basic

1. Dobrzański L. A.: Podstawy nauki o materiałach i metaloznawstwo, WNT, Warszawa, 2002
2. Przybyłowicz K.: Metaloznawstwo. WNT, Warszawa, 1999
3. Blicharski M.: Wstęp do inżynierii materiałowej. WNT, Warszawa, 1998
4. Barbacki A.: Materiały w budowie maszyn. Praca zbiorowa, Wydawnictwo Politechniki Poznańskiej, Poznań, 2006
5. Ashby M.F., Jones D.R.H.: Materiały inżynierskie t. 1 i 2, WNT, Warszawa, 1995, 1996

#### Additional

1. Burakowski T., Wierzchoń T.: Inżynieria powierzchni metali. WNT, Warszawa, 1995
2. Leda H.: Współczesne materiały konstrukcyjne i narzędziowe. Wydawnictwo Politechniki Poznańskiej, Poznań, 1998.
3. Młynarczak A., Jakubowski J.: Obróbka powierzchniowa i powłoki ochronne. Wydawnictwo Politechniki Poznańskiej, Poznań, 1998.



### Breakdown of average student's workload

	Hours	ECTS
Total workload	84	5,0
Classes requiring direct contact with the teacher	42	2,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	42	2,5

<sup>1</sup> delete or add other activities as appropriate