



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Materials Science – properties and applications of materials

### Course

Field of study

Engineering management

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)

Tutorials

Projects/seminars

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

prof. dr hab. inż. Jarosław Jakubowicz

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Responsible for the course/lecturer:

Wydział Inżynierii Materiałowej i Fizyki

Technicznej

ul. Piotrowo 3, 60-965 Poznań

### Prerequisites

Students should have a basic knowledge of physics and chemistry. They should also have the ability to think logically and to obtain information from various sources as well as be ready to cooperate within a team. In addition, they should understand the need to learn and acquire new knowledge

### Course objective

Providing to students information about basic groups of engineering materials, their properties, methods of properties design, materials application and the basics of materials management.

### Course-related learning outcomes

Knowledge

- 1) Students have knowledge of basic groups of engineering materials, their properties and applications.
- 2) Students have knowledge of the most important parameters used in the selection of materials.



- 3) Students have knowledge of methods for the materials properties design.
- 4) Students have knowledge of the costs affecting the price of materials.

#### Skills

- 1) Students are able to characterize the basic engineering materials.
- 2) Students are able to assess the economic aspect of the selection and use of various materials

#### Social competences

- 1) Students can work together in a team.
- 2) Students are aware of the role of materials in modern economy and for societies

#### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

- 1) Knowledge acquired during the lectures is verified at the final test lasting 45 minutes. There are two credit deadlines in the May / June of the summer semester to which every student is entitled. In addition, students can improve their grades in September. Final test consists of 5-10 questions. The pass threshold is 50% of the points.
- 2) Skills acquired as part of the laboratory classes are checked on an ongoing basis during each class in the form of an oral or written answer to the questions asked and assessed on the basis of reports from each laboratory exercise. Each laboratory exercise requires a positive evaluation. At the end of the semester, after completing 5 compulsory exercises, there is a possibility to pass a corrective exam of selected exercises

#### Programme content

Lecture:

- 1) Classification of engineering materials.
- 2) Physicochemical properties of materials.
- 3) Materials management, selection of materials.
- 4) Structure of materials, interatomic bonds, crystal structure, crystal structure defects and their influence on properties.
- 5) Equilibrium phase diagram of iron alloys.
- 6) Methods of the structure and properties of materials design.
- 7) Metals and metal alloys (cast iron alloys, steels, aluminum alloys, copper alloys, titanium alloys), their properties and applications.
- 8) Polymers; properties and application.
- 9) Ceramics; properties and application.
- 10) Composites; properties and application.

Laboratory classes (5 exercises chosen by the teacher):

- 1) Steels in delivery condition.
- 2) Heat treated steels.
- 3) Structure and properties of steel after thermo-chemical treatment.
- 4) Tool steels.



- 5) Cast iron alloys.
- 6) Copper and its alloys.
- 7) Light alloys.
- 8) Surface layers with special properties.
- 9) Composite materials.
- 10) Causes of premature wear of machine parts and tools.

### Teaching methods

- 1) Lecture: multimedia presentation, illustrated with examples on the board.
- 2) Laboratory exercises: microscopic observations; performance of tasks given by the teacher - practical exercises.

### Bibliography

#### Basic

- 1) WILLIAM D. CALLISTER, JR. FUNDAMENTALS OF MATERIALS SCIENCE AND ENGINEERING / AN INTERACTIVE; <http://www.wiley.com/college/callister>
- 2) L. Dobrzański, „Metaloznawstwo z podstawami nauki o materiałach”, WNT Warszawa.
- 2) K. Przybyłowicz, „Materiałoznawstwo”, WNT Warszawa.
- 3) red. A. Barbacki „Materiały w budowie maszyn”, wyd. PP.

#### Additional

- 1) red. A. Barbacki „Metaloznawstwo dla mechaników”, wyd. PP.
- 2) A. Ciszewski, T. Radomski „Materiały konstrukcyjne w budowie maszyn”, PWN Warszawa
- 3) M. Blicharski „Wstęp do inżynierii materiałowej”, WNT Warszawa

### Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests) <sup>1</sup>	45	2,0

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