



Subject card

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|---|---|--|--|-------------------------------------|--|------------|-----|
| Subject name and code | Materials science, PG_00055864 | | | | | | |
| Field of study | Power Engineering | | | | | | |
| Date of commencement of studies | October 2024 | | Academic year of realisation of subject | | 2024/2025 | | |
| Education level | first-cycle studies | | Subject group | | Obligatory subject group in the field of study Subject group related to scientific research in the field of study | | |
| Mode of study | Full-time studies | | Mode of delivery | | at the university | | |
| Year of study | 1 | | Language of instruction | | Polish | | |
| Semester of study | 1 | | ECTS credits | | 3.0 | | |
| Learning profile | general academic profile | | Assessment form | | assessment | | |
| Conducting unit | Department of Materials Engineering and Bonding -> Faculty of Mechanical Engineering and Ship Technology | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | prof. dr hab. inż. Jerzy Łabanowski | | | | |
| | Teachers | | prof. dr hab. inż. Jerzy Łabanowski | | | | |
| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 30.0 | 0.0 | 15.0 | 0.0 | 0.0 | 45 |
| | E-learning hours included: 0.0 | | | | | | |
| Learning activity and number of study hours | Learning activity | Participation in didactic classes included in study plan | | Participation in consultation hours | | Self-study | SUM |
| | Number of study hours | 45 | | 3.0 | | 27.0 | 75 |
| Subject objectives | The aim of this course is to provide students with the knowledge in the field of materials science and materials technologies necessary for an engineer with a specialization in Power Engineering | | | | | | |
| Learning outcomes | Course outcome | | Subject outcome | | Method of verification | | |
| | [K6_W04] has structured knowledge of mechanics, including the issues of material strength and general principles of shaping structures, necessary to conduct basic strength analyzes and design simple mechanical or construction systems for power industry or environmental engineering; knows the basics of machine construction and the most commonly used construction and operating materials | | The student has a knowledge of the materials science of iron and its alloys, non-ferrous metals, polymeric and ceramic materials necessary for an engineer with a specialization in Power Engineering. He knows the basic material technologies. | | [SW1] Assessment of factual knowledge | | |
| | [K6_U01] can obtain information from literature and other sources, organize, interpret it and draw and formulate conclusions; has the ability to self-educate, interprets the results of completed engineering tasks, is able to design simple energy systems and their systems | | Student can choose the right materials for applications in the power industry. He knows the differences in their properties and processing methods | | [SU3] Assessment of ability to use knowledge gained from the subject | | |

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| Subject contents | <p>COURSE CONTENT The structure of materials. Characteristics of the major groups of materials. Metals. Ceramic materials. Polymers. Composite materials. Rules for the selection of engineering materials. Crystalline structure of materials. Defects in the crystal structure. Polymorphism. Crystallization of metals and alloys. Mechanical properties of materials. Methods of testing materials. Working conditions and wear mechanisms of engineering materials. Alloys. Strengthening of metals and alloys, phase transformations. Phase equilibrium systems. Transformations in the solid state. System phase equilibrium iron-carbon. The division and classification of steel. Structural steels. Steels with special properties - corrosion resistant, heat resistant and creep resistant. Casting alloys. Cast steel and cast iron. Technological methods for structure and mechanical properties modeling. Plastic processing, thermal and thermo-chemical treatment. Annealing, hardening, carburizing, nitriding. Technical non-ferrous alloys. Copper and its alloys. Light metals and their alloys. Metallic materials for power plant industry. Ceramics and glass. Properties of ceramic materials. Methods of manufacture and shaping of ceramic materials. Polymeric materials. Structure of polymers. Thermoplastic polymers. Thermosetting polymers. Elastomers. Processing of polymers. Properties of polymers. Composite materials.</p> <p>LABORATORY PRACTICAL TRAINING Practical metallography. Cold plastic processing and recrystallization of metals. Phases and structural components of alloys of iron - coal system. Iron foundry alloys. Alloy and non-alloyed steels. Hardening and tempering heat treatment.</p> | | |
| Prerequisites and co-requisites | Not required | | |
| Assessment methods and criteria | Subject passing criteria | Passing threshold | Percentage of the final grade |
| | laboratory reports | 100.0% | 20.0% |
| | written exam | 50.0% | 60.0% |
| | pass tests in the laboratory | 100.0% | 20.0% |
| Recommended reading | Basic literature | <p>1. Podstawy Metaloznawstwa. Praca zbiorowa pod red M.Głowackiej. Politechnika Gdańska 2014.</p> <p>2. Metaloznawstwo. Praca zbiorowa pod red. M. Głowackiej. Skrypt Politechniki Gdańskiej. Wyd.3. Gdańsk 1996.</p> <p>3. Blicharski M. Wstęp do inżynierii materiałowej. Wyd. AGH, Kraków 2003.</p> <p>4. Materiały do ćwiczeń laboratoryjnych z metaloznawstwa. Skrypt Politechniki Gdańskiej Wyd.2. Gdańsk 1995.</p> | |
| | Supplementary literature | <p>1. Dobrzański L.: Podstawy nauki o materiałach i metaloznawstwo. WNT Warszawa 2002. 2. Przybyłowicz K.: Metaloznawstwo. WNT, Warszawa, 1992. 3. Dobrzański L.A.: Materiały inżynierskie i projektowanie materiałowe. WNT, Warszawa, 2005.</p> | |
| | eResources addresses | Adresy na platformie eNauczanie: | |

Example issues/
example questions/
tasks being completed

Give the characteristics of metals and metal alloys .

Give the characteristics of polymers.

What are composites ?

Explain the phenomenon of polymorphism .

What allotropic varieties have iron ?

What are defects in the crystal structure ?

The principle of measuring the hardness of the method : a - Vickers , b - Rockwell , c - Brinell

Explain the Charpy impact test method .

What is a hot forming of metals?

Draw the system Fe - Fe₃C with description

What are the advantages and disadvantages of gray cast iron ?

Give the definition of steel and cast steel.

How the carbon affects the mechanical properties of steels ?

What determines the corrosion resistance of steel ?

What is heat resistance and creep resistance of steel ?

Alloys designed to work at elevated temperatures -

Describe structural steels

Describe stainless steels

Explain annealing heat treatment.

What is the hardening of steel ?

Explain thermo-chemical heat treatment carburizing of steel

Explain thermo-chemical heat treatment nitriding of steel

Give the definitions of basic copper alloys.

Characteristics of aluminum wrought and cast alloys.

Characteristics of polymers

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| | <p>What are elastomers .</p> <p>What are plastomers .</p> <p>Enter the properties and methods of the processing of thermopl</p> |
| Work placement | Not applicable |