POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Materials science and elements of chemistry basics

Course

Field of study	Year/Semester
Management and Production Engineering	1/2
Area of study (specialization)	Profile of study
-	general academic
Level of study	Course offered in
First-cycle studies	polish
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	30	
Tutorials	Projects/seminars	

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

PhD Marek Nowak

email: marek.nowak@put.poznan.pl

ph. +48 61 665 36 76

Faculty of materials engineering and technical physics

Jana Pawła II 24, 60-965 Poznań, room 327

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of physics and chemistry. Logical thinking, exploring of various sources of knowledge. Understanding of necessity of learning and acquisition of new knowledge.

Course objective

The aim of the course is to provide students with a general overview of the basic knowledge about the classification of materials, their structure, properties and applications.

Course-related learning outcomes

Knowledge

Has a basic knowledge of materials science covering types of materials used in engineering, principles

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for the selection of engineering materials in the construction of machines – comparison of their structure, properties and applications, fundamentals of materials design.

Has a general knowledge of manufacturing technologies used mainly in enterprises of the mechanical industry and which refers to metallurgy and casting, plastic forming, plastics processing, heat treatment, heat and chemical treatment.

Skills

Can assess the selection of properties of a construction material, mainly as regards its application. Understands the sense of heat treatment and chemical and heat treatment.

Can carry out principal tests of materials used in mechanical engineering (testing the properties of strength, hardness and resilience), can interpret test results and formulate conclusions concerning the use of specific construction materials

Social competences

He/ Can determine priorities connected with activities relating to the preparation of production. Understands technical and non-technical conditions of a technology used.

Understands technical and non-technical aspects connected with the development of a construction as regards the impact a given device has on society and the environment. Can recognize responsibility adopted for decisions made in the construction process

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:

Credit given in writing at the end of semester, covering five issues discussed in lectures (in order to receive a passing grade you must earn an minimum of half of a possible points).

Laboratory classes:

Credit given on the basis of oral or written tests in every individual laboratory class as well as on the basis of written reports of laboratory classes as required by the teacher. Final credit is given by summing all positive results of tests and reports.

Programme content

Lectures:

Introduction to Material Science: classification of engineering materials, engineering requirements of materials, criterion for selection of materials for engineering applications, structure-properties correlationship. Mechanical testing of materials: tensile test, hardness test, fatigue test, creep test, impact test. Strengthening mechanisms in metals. Materials structure: crystalline, polycrystalline and amorphous materials, crystal structure, unit Cell, crystal directions and planes, crystal structures of metallic, imperfections in crystals and their effect on properties. Phase diagrams: principles and types of phase diagrams, iron carbon equilibrium phase diagram. Solid solutions, intermetallic and interstitial

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phases. TTT and CCT diagrams - pearlitic, martensitic, and bainitic transformations. Heat treatment: annealing, volume hardening, surface hardening, tempering, steel hardenability and hardenability, precipitation hardening. Thermo-chemical treatment: carburizing, nitriding. Steels: classification of steels, properties and uses, effects of alloying metals. Non-ferrous metals and alloys: structure and properties of copper and its alloys, aluminum and its alloys, Al-Cu and Al-Si phase diagram. Ceramics, Polymers and Composites: crystalline ceramics, glasses -structure, properties and applications; classification, properties and applications of composites; classification, properties and applications of polymers.

Laboratory classes:

1. Structure and mechanical properties of steel in the delivery condition

2. Heat treated structural steels

3. Structure and properties of steel after thermo-chemical treatment

4. Tool steels

5. Cast iron and cast steel

6. Copper and its alloys

7. Light alloys

8. Surface layers with special properties

9. Composite materials

10. Causes of wear and failure of machine parts and tools

Teaching methods

Multimedia presentation illustrated with examples given on a blackboard

Bibliography

Basic

Dobrzański L., Materiały inżynierskie i projektowanie materiałowe. Podstawy nauki o materiałach i metaloznawstwo, WNT, Warszawa, 2006

Blicharski M.,Wstęp do inżynierii materiałowej, WNT, Warszawa, 2017

Additional

Ashby M.F., Jones D.R.H., Materiały inżynierskie tom. 1 i 2, WNT, 2004.

Leda H., Współczesne materiały konstrukcyjne i narzędziowe, Wydawnictwo Politechniki Poznańskiej, Poznań, 1996

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Leda H., Wybrane metalowe materiały konstrukcyjne ogólnego przeznaczenia, Wydawnictwo Politechniki Poznańskiej, Poznań, 1997

Leda H., Strukturalne aspekty własności mechanicznych wybranych materiałów, Wydawnictwo Politechniki Poznańskiej, Poznań, 1998

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	60	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	40	2

[1] delete or add other activities as appropriate