GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Materials Science II, PG_00040168		
Field of study	Mechanical Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023
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	English
Semester of study	2	ECTS credits	2.0
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. Dionizy Czekaj	
	Teachers	dr inż. Gabriel Strugała prof. dr hab. inż. Dionizy Czekaj	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	0.0	0.0	30

E-learning hours included: 0.0

Materials Science II, W, DaPE, sem.02, letni 22/23 - Moodle ID: 27191
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=27191

Materials Science II, L, DaPE, sem.02, letni 22/23 - Moodle ID: 29714
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29714

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	30	5.0	15.0	50

Subject objectives

Some issues of modern materials engineering are presented.

Learning outcomes

Course outcome	Subject outcome	Method of verification
K6_U10	The student can present the principles of both material selection and selection of the appropriate technology	[SU2] Assessment of ability to analyse information
K6_W03	The student has knowledge about the structure and basic properties of materials.	[SW1] Assessment of factual knowledge
K6_W08	The student has knowledge including the strategic thinking: matching material to design and process selection	[SW1] Assessment of factual knowledge

Subject contents

Failure; fracture, fundamentals of fracture, ductile fracture, brittle fracture; fatigue, cyclic stresses, the SN curve, crack initiation and propagation, creep, generalized creep behaviour, stress and temperature effects. Phase diagrams, solubility limit, phases, microstructure, phase equilibria, one-component (or unary) phase diagrams, binary phase diagrams, binary isomorphous systems, binary eutectic systems, equilibrium diagrams having intermediate phases or compounds, eutectic and peritectic reactions, congruent phase transformations, ceramic and ternary phase diagrams , the Gibbs phase rule; the ironcarbon system, the ironiron carbide (FeFe3C) phase diagram, development of microstructure in ironcarbon alloys, the influence of other alloying elements. Phase transformations in metals: development of microstructure and alteration of mechanical properties, phase transformations, basic concepts, the kinetics of phase transformations, microstructural and property changes in ironcarbon alloys. Applications and processing of metal alloys, types of metal alloys, ferrous metals, iron steel, stainless steels, tool steels, cast irons, cast steels, nonferrous metals and alloys, copper and copper alloys , aluminum and aluminum alloys , magnesium and magnesium alloys, zinc and zinc alloys, titanium and titanium alloys, nickel-based alloys, superalloys, refractory metals, and other materials designed for high-temperature service.

Nonmetallic materials: plastics, elastomers, ceramics, and composites introduction; plastics, elastomers, ceramics, composite materials.

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3"></td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Colloquium (written paper)</td><td>51.0%</td><td>60.0%</td></tr>
<tr><td>Laboratory</td><td>100.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. Michael Ashby, Hugh Shercliff and David Cebon, Materials Engineering, Science, Processing and Design, Elsevier Ltd, 2007
2. Kelsall R.W., Haley J.W., Geghegan M (Eds.), Nanoscale Science and Technology, John Wiley & Sons Ltd,
3. Moulson, A.J. and Herbert, J.M. Electroceramics, Materials Properties and Applications, Chapman and Hall, 1990
4. Roman Pampuch, An Introduction to Ceramics, Springer International Publishing Switzerland 2014</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. Hofmann K.H: Smart Materials, 2003
2. Schwartz M. Encyclopedia of Smart Materials t.1 i 2 , 2003
3. Scanning Probe Microscopy: Characterization, Nanofabrication and Device Application of Functional Materials, P.M.Vilarinho, Y.Rosenwaks, A.Kingon (Eds.), NATO Science Series, II. Mathematics, Physics and Chemistry, vol.186, Kluwer Academic Publishers, Dordrecht, Boston, London 2002.</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3">1. Fundamentals of fracture
2. Phase diagrams.
3. Nonferrous metals and alloys</td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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