



Subject card

Subject name and code	Materials Science II, PG_00040168						
Field of study	Mechanical 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			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	prof. dr hab. inż. Dionizy Czekaj dr inż. Krzysztof Krzysztofowicz dr inż. Artur Sitko					
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						
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	<p>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 iron-carbon system, the iron-iron carbide (Fe-Fe₃C) phase diagram, development of microstructure in iron-carbon 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 iron-carbon 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.</p> <p>Nonmetallic materials: plastics, elastomers, ceramics, and composites introduction; plastics, elastomers, ceramics, composite materials.</p>						

Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Colloquium (written paper)	51.0%	60.0%
	Laboratory	100.0%	40.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Michael Ashby, Hugh Shercliff and David Cebon, <i>Materials Engineering, Science, Processing and Design</i>, Elsevier Ltd, 2007 2. Kelsall R.W., Haley J.W., Geghegan M (Eds.), <i>Nanoscale Science and Technology</i>, John Wiley & Sons Ltd, 3. Moulson, A.J. and Herbert, J.M. <i>Electroceramics, Materials Properties and Applications</i>, Chapman and Hall, 1990 4. Roman Pampuch, <i>An Introduction to Ceramics</i>, Springer International Publishing Switzerland 2014 	
	Supplementary literature	<ol style="list-style-type: none"> 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. 	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> 1. Fundamentals of fracture 2. Phase diagrams. 3. Nonferrous metals and alloys 		
Work placement	Not applicable		

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