



## Subject card

Subject name and code	Materials Science I, PG_00040160						
Field of study	Mechanical Engineering, Mechanical Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2020/2021		
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			blended-learning		
Year of study	1	Language of instruction			English		
Semester of study	1	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			exam		
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					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	E-learning hours included: 24.0						
	Materials Science I - Moodle ID: 8025 <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=8025">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=8025</a>						
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	6.0		39.0	75	
Subject objectives	Introducing students to the fundamentals of contemporary materials science and materials engineering.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_W08	The student has a basic knowledge about selection of materials and processes			[SW1] Assessment of factual knowledge		
	K6_U10	The student knows the rules of selecting materials			[SU3] Assessment of ability to use knowledge gained from the subject		
	K6_W03	The student has knowledge about structure, fundamental properties of engineering materials as well as methods of their investigation.			[SW1] Assessment of factual knowledge		
Subject contents	Classification of materials, advanced materials. Atomic structure; The periodic table of elements; Atomic bonding in solids. Crystal structures - unit cells; crystal systems; close-packed crystal structures; defects and imperfections of crystal structure; Mechanical properties of metals, concepts of stress and strain; elastic deformation; plastic deformation, hardness; Dislocations; slip systems; deformation by twinning; Mechanisms of strengthening in metals; Recovery, recrystallization, and grain growth; Fracture; Fatigue; Creep behaviour; Phase diagrams; definitions and basic concepts; Binary phase diagrams, interpretation of phase diagrams, ceramic and ternary phase diagrams, the Gibbs phase rule; The iron-carbon system - the iron-iron carbide (Fe-Fe <sub>3</sub> C) phase diagram, development of microstructure in iron-carbon alloys,						
Prerequisites and co-requisites							
Assessment methods and criteria	Subject passing criteria	Passing threshold			Percentage of the final grade		
	Written examination	51.0%			100.0%		

Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. W. D. Callister, Jr., Materials science and engineering, an introduction, 7th ed., Wiley, 2007,</li> <li>2. M. Ashby, H. Shercliff and D. Cebon, Materials Engineering, Science, Processing and Design, Elsevier Ltd, 2007</li> <li>3. M. Ashby, D. Jones, Engineering Materials 1, An Introduction to Properties, Applications, and Design, Elsevier Ltd, 2012</li> <li>4. W. Bolton, <i>Materials for Engineering</i>, Routledge, Taylor &amp; Francis Group, NY, 2011</li> <li>5. A.J. Moulson, , J.M. Herbert, Electroceramics, Materials Properties and Applications, Chapman and Hall, 1990</li> <li>6. R. Pampuch, An Introduction to Ceramics, Springer International Publishing Switzerland, 2014</li> </ol>
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Blicharski M., <i>Wstęp do inżynierii materiałowej</i>, Wydawnictwo Naukowo Techniczne, Warszawa 2001</li> <li>2. M. Kaczorowski, A. Krzyńska, <i>Konstrukcyjne materiały metalowe, ceramiczne i kompozytowe</i>, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2017</li> <li>3. Dobrzański L. A., <i>Podstawy nauki o materiałach i metaloznawstwo. Materiały inżynierskie z podstawami projektowania materiałowego</i>, WNT Warszawa, 2002</li> <li>4. M.Ashby, H.Shercliff, D.Cebon, <i>Inżynieria materiałowa</i>, T1, T2, Wydawnictwo Galaktyka, Łódź, 2011</li> <li>5. M. Ashby, D. Jones, Engineering Materials 2, An Introduction to Microstructures and Processing, Elsevier Ltd, 2013</li> <li>6. M.Głowacka, A. Zieliński, (Red. ) <i>Podstawy metaloznawstwa</i>, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2011 (skrypt).</li> <li>7. M. Głowacka (Red), <i>Metaloznawstwo</i>, Wydawnictwo Politechniki Gdańskiej, Gdańsk 1996 (skrypt)</li> <li>8. J. Hucińska (Red), <i>Metaloznawstwo. Materiały do ćwiczeń laboratoryjnych</i>, Wydawnictwo Politechniki Gdańskiej, Gdańsk 1995(skrypt).</li> </ol>
	eResources addresses	
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Definitions of stress, strain and modulus of elasticity.</li> <li>2. Mechanical properties of materials.</li> <li>3. Crystal structure of advanced ceramics</li> <li>4. Phase diagrams</li> </ol>	
Work placement	Not applicable	