



## Subject card

Subject name and code	Material Science I, PG_00033402						
Field of study	Mechatronics, Mechatronics						
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			Polish		
Semester of study	1	ECTS credits			4.0		
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		dr hab. Agata Lisińska-Czekaj				
	Teachers		dr hab. Agata Lisińska-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						
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		65.0	100
Subject objectives	The aim of the course is to familiarize students with the basic properties of metal materials, alloys, ceramics, polymer and composite materials both bulk and thin films exhibiting special electrical, mechanical and optical properties.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U01				[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		
	K6_U03				[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		
	K6_W05				[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
Subject contents	Fundamentals of material science. Solid structure, atomic structure, defects of the crystal structure. Studies of the structure and microstructure of materials. A general overview of the main groups of engineering materials. Metals and their alloys, polymers, ceramic materials, composite materials. Classification of materials due to their electrical conductivity, mechanisms of current conduction in various materials. Metals - general characteristics, metallic bonds; metal structure. Intrinsic semiconductors. Doped semiconductors. Dielectrics, polarization, dielectric permittivity and susceptibility. Piezoelectric effect, electrical polarization, polarization mechanisms, spontaneous polarization. Classification of dielectrics, piezo-, pyro- and ferroelectrics, ferroics and multiferroics. Optical properties of dielectrics, Phase transitions: classifications, anomalies of physical properties in the vicinity of the phase transformations. Biomimetic, intelligent and functional materials.						
Prerequisites and co-requisites							
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
			50.0%		100.0%		

Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Dobrzański L. A., Podstawy nauki o materiałach i metaloznawstwo. Materiały inżynierskie z podstawami projektowania materiałowego., WNT Warszawa, 2002</li> <li>2. Ashby M., Shercliff H., Cebon D., Inżynieria materiałowa, T1, T2, Wydawnictwo Galaktyka, Łódź, 2011</li> <li>3. Blicharski M. Wstęp do inżynierii materiałowej, Wydawnictwo Naukowo Techniczne, Warszawa 2001</li> <li>4. Pampuch R., Współczesne materiały ceramiczne, Wydawnictwo AGH, Kraków 2005</li> <li>5. L. Stobierski, Ceramika węglkowa, Wydawnictwo AGH, Kraków 2005</li> <li>6. Głowacka M., Zieliński A. (Red). Podstawy materiałoznawstwa, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2014</li> <li>7. Surowiak Z. (Red), Elektroceramika ferroelektryczna, UŚ, Katowice, 2004.</li> <li>8. Boczkowska A., Krzesiński G., Kompozyty i techniki ich wytwarzania, Oficyna Wydawnicza Politechniki Warszawskiej, 2016</li> <li>9. Królikowski W., Polimerowe kompozyty konstrukcyjne, PWN, Warszawa, 2012</li> </ol>
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Hofmann K.H: Smart Materials, 2003</li> <li>2. Schwartz M. Encyclopedia of Smart Materials t.1 i 2 , 2003</li>   <li>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.</li>   <li>4. Ferroelectric thin films: synthesis and basic properties, Paz de Araujo C.,Scott J.F., Taylor G.W. (Eds.), Gordon and Beach Publishers, United Kingdom, 1996</li>   <li>5. D. Czekaj, Fabrication and study of BST – based functional materials, University of Silesia, Gnome Publishing House, Katowice 2010,</li> </ol>
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	