



## Subject card

Subject name and code	Composite Materials, PG_00049094						
Field of study	Materials Engineering, Materials Engineering, Materials Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-cycle studies	Subject group			Optional subject group 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	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Michał Landowski					
	Teachers	dr inż. Michał Landowski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	15.0	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	Gaining basic knowledge about structure and processing of composite materials						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_U06	Student compares fabrication methods and properties of fibres: glass, carbon, aramid, boron, SiC, Al <sub>2</sub> O <sub>3</sub> . Student compares properties of matrix materials and their modification after incorporation of the filler. Student identifies adhesion mechanisms of the composite constituents.			[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject		
	K6_K01	student is active and participates in the lectures			[SK2] Assessment of progress of work		
	K6_W07	Student defines and classifies composite materials. Student indicates and describes factors affecting properties of composite materials and identifies in detail the effect of geometrical factors. Student applies rule of mixtures to calculate elastic modulus of a composite material at a given fibre/filler volume fraction V <sub>f</sub> . Student calculates strength of a single ply of polymer fibrous composite. Student defines and explains the role of the interphase in polymer and metal matrix composites. Student describes techniques for manufacturing polymer, metal an ceramic matrix composites. Student explains fracture toughness mechanisms of ceramic matrix composites.			[SW1] Assessment of factual knowledge		

Subject contents	<p>Definition and classification of composite materials. Factors affecting properties of composite materials and the role of geometrical factors. Fabrication methods and properties of fibres: glass, carbon, aramid, boron, SiC, Al<sub>2</sub>O<sub>3</sub>. Student compares properties of matrix materials and their modification after incorporation of the filler. Prediction of elastic properties and strength as a function of fibre/filler volume fraction <math>V_f</math>. Strength of a single ply of polymer fibrous composite. The role of interphase in polymer and metal matrix composites. Adhesion mechanisms of the composite constituents. Techniques for manufacturing polymer, metal and ceramic matrix composites. Fracture toughness mechanisms of ceramic matrix composites.</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Test	50.0%	100.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"> <li>• A. Boczkowska, J. Kapuściński, Z. Linderman, D. Witemberg-Perzyk, S. Wojciechowski : Kompozyty. PW 2003.</li> <li>• W. Królikowski, Polimerowe kompozyty konstrukcyjne, PWN 2012</li> <li>• J. Sobczak, Kompozyty metalowe, 2002</li> <li>• Imielińska K., Papanicolaou G.C., Wprowadzenie do nauki o materiałach kompozytowych Kompozyty polimerowe, Wybrane zagadnienia, Skrypt PG, Gdańsk 1998.</li> <li>• F.L. Matthews, R.D. Rawlings, Composite Materials. 2008</li> </ul>	
	Supplementary literature	<ul style="list-style-type: none"> <li>• Dobrzański L.A.: Podstawy nauki o materiałach i metaloznawstwo. WNT, Warszawa, 2002.</li> <li>• M. Reyne, Composite solutions, JEC Group 2006</li> </ul>	
	eResources addresses	<p>Adresy na platformie eNauczanie:  Materiały kompozytowe, W/S, IM, sem. 06, lato 23/24 (PG_00049094)  - Moodle ID: 38720  <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38720">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=38720</a></p>	
Example issues/ example questions/ tasks being completed	<p>Describe how to form carbon fibre tennis racket .</p> <p>List types of carbon fibres and their properties</p>		
Work placement	Not applicable		