GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Composites, PG_00055066		
Field of study	Management and Production Engineering		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
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	3	Language of instruction	Polish
Semester of study	5	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		

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	2.0	18.0	50

Subject objectives	The student obtains basic knowledge about the structure and techniques of forming composite materials.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W02] has knowledge of materials, their properties and research methods, including construction materials used in the machinery industry, has ordered, theoretically founded knowledge of mechanics including modeling of mechanical systems in the field of statics, kinematics and dynamics, and has an ordered, theoretically founded knowledge in the field of strength analysis materials and products	Student defines and classifies composite materials. The student indicates and describes the factors influencing the properties of composite materials and identifies the impact in detail geometric factors. Student uses the mixture rule for calculation modulus of elasticity of composites with a given volume fraction of fibers or grains. The student calculates the strength of a single layer of a polymer fiber composite. The student defines and explains the role of the boundary layer in composites with a polymer and metal matrix. The student describes the techniques of producing composites with a polymer matrix, as well as metal and ceramic. The student explains the mechanisms of the cracking resistance of composites with a ceramic matrix.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_K01] feels the need for self-realization by learning throughout life, is looking for modern and innovative solutions in their actions, is able to think creatively and act in an entrepreneurial way	The student actively participates in the classes. The student is able to interact in a group and make decisions using "brainstorming". The student is able to propose a composite material suitable for the requirements of a given application.	[SK1] Assessment of group work skills [SK5] Assessment of ability to solve problems that arise in practice [SK3] Assessment of ability to organize work
[K6_U01] can find the necessary information in professional literature, databases and other sources, knows basic scientific and technical journals in the field of production management, quality and operation management, can integrate the obtained information, formulate conclusions and justify opinions	Student is able to use the databases of articles in order to deepen the knowledge necessary to obtain the correct solution. On the basis of the standard, student is able to determine the correctness of material tests. Student is able to confirm or question the appropriateness of making composite materials with different technologies.	[SU5] Assessment of ability to present the results of task [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information

Subject contents

Lecture: Definition and division of composite materials.Factors influencing the properties of composite materials.The geometry of the reinforcement of composite materials.Characteristics (properties, manufacturing techniques) of glass, carbon, aramid, boron, silicon carbide and aluminum oxide fibers.Prediction of elastic properties and strength as a function of quantity and geometry of the reinforcement.Structure and importance of the boundary layer in polymer and metal matrix composites.Manufacturing techniques, typical properties and practical examples of applications of metal, ceramic and polymer composites.

Laboratory: designing the properties of metal matrix composite materials, designing the properties of polymer matrix composite materials, structural composites, producing materials using powder metallurgy, centrifugal casting - gradient materials, technological defects in composite materials, laminate manufacturing techniques.

Prerequisites and co-requisites

Basic knowledge of materials science and strength of materials.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
	50.0%	50.0%
	50.0%	50.0%

Recommended reading

Basic literature	• A.Boczkowska, J.Kapuścinski, Z.Linderman, D.Witemberg-Perzyk, S.Wojciechowski : Kompozyty. PW 2003. • W. Królikowski, Polimerowe kompozyty konstrukcyjne, PWN 2012 • J.Sobczak, Kompozyty metalowe, 2002 • Imielińska K., Papanicolaou G.C., Wprowadzenie do nauki o materiałach kompozytowych Kompozyty polimerowe, Wybrane zagadnienia, Skrypt PG, Gdańsk 1998. • F.L. Mattews, R.D.Rawlings, Composite Materials. 2008
Supplementary literature	• Dobrzański L.A.: Podstawy nauki o materiałach i metaloznawstwo. WNT, Warszawa, 2002. • M. Reyne, Composite solutions, JEC Group 2006
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	Choose a technology of making a carbon fiber rod.Give examples of applications of metal matrix composite materials in the automotive industry.Choose the material for the construction of the yacht's hull.
Work placement	Not applicable