

。 GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Mechanics of materials and biomaterials, PG_00065006								
Field of study	Mechanical and Medical Engineering								
Date of commencement of studies	February 2025		Academic year of realisation of subject			2024/2025			
Education level	second-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			Polish			
Semester of study	1		ECTS credits			4.0			
Learning profile	general academic profile		Assessment form			exam			
Conducting unit	Zakład Mechaniki Stosowanej i Biomechaniki -> Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology								
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Wiktoria Wojnicz						
	Teachers		dr hab. inż. Wiktoria Wojnicz dr inż. Alicja Stanisławska						
Lesson types and methods			Tutorial	Itorial Laboratory Project		t	Seminar	SUM	
of instruction	Number of study hours	30.0	0.0	15.0	0.0		0.0	45	
	E-learning hours included: 0.0								
Learning activity and number of study hours	Learning activity	Participation in classes includ plan	I didactic Participation in consultation hours		Self-study		SUM		
	Number of study hours	45		11.0		44.0		100	
Subject objectives	Acquiring knowledge	and skills of so	lving advanced	problems of n	nechani	cs of m	aterials and bi	omaterials	
Learning outcomes	Course out	Subject outcome			Method of verification				
	[K7_W04] has structured and well- founded knowledge covering issues in the field of mechanical engineering allowing to design medical devices, rehabilitation systems and to formulate research procedures		To design a medical device a student formulates research procedure and stages of developing of medical device (or rehabilitation systems) on the base of knowledge related to mechanical-medical engineering			[SW2] Assessment of knowledge contained in presentation			
	[K7_K11] is aware of importance of professional acting, the need for critical verification of acquired knowledge and consulting experts opinion in case of facing difficulties with individual problem solving		To solve a given problem a student applies advanced knowledge related to the mechanical-medical engineering by considering the need to verify the current level of this knowledge on the base of teaching and scientific publications			[SK5] Assessment of ability to solve problems that arise in practice [SK2] Assessment of progress of work			
	[K7_K13] is ready for responsible performance of proffesional roles, considering ever-changing need of the society, including self developement and supporting and fullfiling work ethics		A student define a strategy that allows acquiring knowledge related to the mechanical-medical engineering to solve a problem by considering changing social needs			[SK5] Assessment of ability to solve problems that arise in practice [SK2] Assessment of progress of work			

Subject contents	Lectures (DSc PhD Wiktoria Wojnicz) (30h):					
	Tensor calculation fundamentals.					
	Fundamentals of elasticity theory: 3D stress state, Navier equation, boundary task in stress state and in the displacement state.					
	Fundamentals of elasticity theory; 3D strain state, constitutive relations.					
	Analysis of strain state by using strain gauge systems.					
	Deformable body mechanics: strain tensors.					
	Material models: orthotropic materials.					
	Modele materiałowe: modele stosowane do opisywania biomateriałów (w tym miękkich).					
	Fundamentals of composite materials modelling.					
	Finite Element Method (FEM) in engineering calculations: fundamental definitions. FEM: Truss element, Beam element, Membrane element.					
	Podstawy teorii plastyczności . Wytrzymałość prętów sprężysto-plastycznych.					
	Fatigue strength.					
	Fracture mechanics.					
	Contact stress.					
	Fundamentals of rheology.					
	Thin-walled structure in engineering calculations. Centre of shear estimation.					
	Lab (PhD Alicja Stanisławska) (15h):					
	Estimation of hardness, reduced Youngs modulus, yielding strength and elastic strength in nanoindentation test.					
	Estimation of type and value of internal stress in tested material.					
	Fracture mechanics. Assessment of stress intensity factor.					
	Testing of strain rate during the creep of material.					
	Testing of hardness by using Brinell, Rockwell and Vickers methods.					
	Testing of impact strength of metallic sample coved by the oxygen layer.					

Prerequisites and co-requisites	Skills on formulation of the static equilibrium conditions and dynamic equations. Skills on solution of ordinary and partial differential equations. Knowledge on Mathematics, Mechanics and Strength of Materials.						
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade				
	Written exam	50.0%	70.0%				
	Laboratory	50.0%	30.0%				
Recommended reading	Basic literature	Sawicki A.: Mechanika kontinuum. Wprowa Wornego PAN 1994. Wojnicz W., Wittbrodt E.: Mechaniczne Me	lość materiałów z elementami ujęcia komputerowego. Ibski M.: Zbiór zadań z wytrzymałości materiałów. PWN, alczyk-Gajewska K.: Rachunek tensorowy w mechanice awnictwo IPPT, 2013. n. Wprowadzenie. Gdańsk: Wydaw. Instytutu Budownictwa				
		Politechniki Gdańskiej, 2020, ISBN 978-83-7348-810-6					
	Supplementary literature	 Gawęcki A.: Mechanika materiałów i konstrukcji prętowych. Poznań: Wyd. Politechniki Poznańskiej 1998. Rymarz Cz.: Mechanika ośrodków ciągłych. Warszawa: Wydaw. Naukowe PWN 1993. Kaliński K. J.: Nadzorowanie procesów dynamicznych w układach mechanicznych. Gdańsk: Wydaw. Polit. Gdańskiej 2012. 					
	eResources addresses	Adresy na platformie eNauczanie:					
Example issues/ example questions/ tasks being completed	Describe parameters of stress state and stress state of isotropic materials and orthotropic materials						
Work placement	Not applicable						

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