



Subject card

Subject name and code	Methods of testing materials and tissues, PG_00053363						
Field of study	Biomedical Engineering, Biomedical Engineering, Biomedical Engineering						
Date of commencement of studies	February 2023		Academic year of realisation of subject		2023/2024		
Education level	second-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	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Biomedical Engineering -> Faculty of Electronics, Telecommunications and Informatics						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Piotr Jasiński				
	Teachers		dr inż. Iga Szpunar prof. dr hab. inż. Piotr Jasiński				
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		3.0		17.0	50
Subject objectives	The aim of the course is to familiarize students with the test materials, biomaterials and tissue for the purpose of biomedical engineering.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U02] can perform tasks related to the field of study as well as formulate and solve problems applying recent knowledge of physics and other areas of science		Knowledge of materials and tissue testing methods		[SU2] Assessment of ability to analyse information		
	[K7_U52] can examine tissues, materials and biomaterials used in biomedical engineering		Knowledge of materials and tissue properties		[SU3] Assessment of ability to use knowledge gained from the subject		
	[K7_U06] can analyse the operation of components, circuits and systems related to the field of study; measure their parameters; examine technical specifications; interpret obtained results and draw conclusions		Knowledge of materials and tissue investigation		[SU3] Assessment of ability to use knowledge gained from the subject		
	[K7_W52] Knows and understands, to an increased extent, selected aspects of materials science and biomaterials, constituting general knowledge in the field of biomedical engineering		Knowledge of materials and tissue testing methods in materials engineering and biomaterials		[SW1] Assessment of factual knowledge		
	[K7_W51] Knows and understands, to an increased extent, selected aspects of chemistry and biochemistry constituting general knowledge in the field of biomedical engineering.		Knowledge of materials and tissue testing methods in chemistry and biochemistry		[SW1] Assessment of factual knowledge		

Subject contents	Spectroscopic methods of materials testing - comparison of UV-VIS and IR spectroscopy. Spectroscopic methods of materials testing - comparison of methods: classical IR spectroscopy, FTIR spectroscopy and Raman spectroscopy. Optical microscopy and electron microscopy. EDX spectroscopy. Impedance spectroscopy - what can be measured, 2, 3 and 4 electrode measurements. Impedance spectroscopy - equivalent schemes (Randles and Brick Layer Model), fitting results to equivalent schemes, spectrum analysis methods (DRT). Application of impedance spectroscopy to the analysis of two-phase systems. Gas chromatography - measurement system and detectors used, measurement of two-phase systems. X-ray diffraction. Measurements of single phase systems, two phase systems and thin films. Atomic force microscopy.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lab	50.0%	30.0%
	Lecture	50.0%	70.0%
Recommended reading	Basic literature	Szczepaniak, Metody instrumentalne w analizie chemicznej, PWN 2007 Robert M. Silverstein, Francis X. Webster, David J. Kiemle, Spektroskopowe metody identyfikacji związków organicznych, Wydawnictwo Naukowe PWN 2007 A. Cygański, Metody Spektroskopowe w Chemii Analitycznej, WNT 2002	
	Supplementary literature	Bogusz W., Krok F., Elektrolity stałe, WNT 1995	
	eResources addresses	Adresy na platformie eNauczanie: Metody badania materiałów i tkanek lato 2024 - Moodle ID: 36801 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=36801	
Example issues/ example questions/ tasks being completed	What is the difference between FTIR and Raman spectroscopy?		
Work placement	Not applicable		