



Subject card

Subject name and code	Biological Techniques in Biomaterial Research, PG_00065674						
Field of study	Mechanical and Medical Engineering						
Date of commencement of studies	February 2024	Academic year of realisation of subject			2024/2025		
Education level	second-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Zakład Technologii Biomateriałów -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Marcin Wekwejt				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	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	10.0		85.0	125	
Subject objectives	The objective of the course is to develop skills in applying advanced biological techniques in biomaterials research. Students will become familiar with selected methods for assessing biocompatibility and biological properties of materials, as well as standard diagnostic procedures used in mechanical-medical engineering. The main emphasis will be placed on laboratory techniques and their applications in biomedical research, enabling precise evaluation of materials in a medical context.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W04] He/she has in-depth knowledge related to the construction and utilization of machines used mechanical-medical engineering	The student is able to apply information and communication technologies to analyze the results of biomaterials research.			[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge		
	[K7_U13] He/she uses in-depth knowledge related to the diagnoses techniques and medical procedures in the scope of the field of study of mechanical-medical engineering	The student applies advanced diagnostic techniques and is able to interpret the biological research results of biomaterials.			[SU5] Assessment of ability to present the results of task [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		
	[K7_K82] is equipped to participate actively in lectures, seminars and laboratory classes conducted in foreign language	The student actively participates in class and is able to utilize materials in English.			[SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice [SK3] Assessment of ability to organize work [SK2] Assessment of progress of work		
[K7_U82] is able to proficiently obtain and process information related to field of study and academic environment in foreign language at B2+ level of the Common European Framework of Reference for Languages (CEFR)	The student is able to effectively utilize scientific literature and English-language resources in the context of biomaterials research.			[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information			

Subject contents	The course focuses on the practical understanding of advanced biological techniques and their applications in biomaterials research within the context of mechanical-medical engineering. Students will gain knowledge and practical skills in the following areas: (1) Introduction to advanced biological techniques in biomaterials research, (2) Assessment of biocompatibility and toxicity of materials, (3) Cell culture methods, (4) Analysis of biological properties in mechanical-medical engineering, (5) Optical and electron microscopy in biomaterials research, (6) Immunohistochemistry and cell staining techniques, (7) Methods for assessing biomechanical properties and biodegradation of biomaterials, (8) Diagnostic techniques and imaging in medical materials research.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Portfolio Containing Reports from Conducted Experiments	75.0%	100.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> 1. Murphy, W. L., Black, J., & Hastings, G. Handbook of Biomaterial Properties. Springer, 2016. 2. Freshney, R. I. Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications. Wiley, 2016. 3. Williams, D. F. Essential Biomaterials Science. Cambridge University Press, 2014. 4. Leng, Y. Materials Characterization: Introduction to Microscopic and Spectroscopic Methods. Wiley, 2008. 	
	Supplementary literature	<ol style="list-style-type: none"> 1. Ratner, B. D., Hoffman, A. S., Schoen, F. J., & Lemons, J. E. <i>Biomaterials Science: An Introduction to Materials in Medicine</i>. Academic Press, 2020. 2. Gibson, L. J. <i>Biomaterials: The Intersection of Biology and Materials Science</i>. Cambridge University Press, 2016. 3. Rieger, M. A., & Rieger, R. <i>Cell Culture Techniques: A Laboratory Handbook</i>. Springer, 2018. 	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none"> - What biological techniques are key in assessing the biocompatibility of biomaterials? - Conduct a project to evaluate the biological properties of a selected biomaterial. - What cell staining techniques are most commonly used in biomaterials research? - Perform an analysis of cell culture results and interpret the obtained data. - What are the applications of electron microscopy in studying the surface properties of biomaterials? - Prepare a presentation of the biological research results of biomaterials and discuss them. 		
Work placement	Not applicable		

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