



Subject card

Subject name and code	Polymeric biomaterials, PG_00060805						
Field of study	Chemical Technology						
Date of commencement of studies	October 2023	Academic year of realisation of subject				2026/2027	
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	4	Language of instruction				Polish	
Semester of study	7	ECTS credits				3.0	
Learning profile	general academic profile	Assessment form				assessment	
Conducting unit	Department of Polymer Technology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Justyna Kucińska-Lipka				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	15.0	0.0	15.0	45
	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	45		5.0		25.0	75
Subject objectives	The aim of the course is to provide students with fundamental knowledge and practical skills in the design, synthesis, modification, and characterization of polymer biomaterials. Students will be introduced to the definition of a biomaterial and to a comparison of the properties of polymeric, metallic, and ceramic biomaterials. Examples of polymers intended for applications in medicine and tissue engineering will be presented, along with the relationships between their chemical structure and their physicochemical, mechanical, and biological properties.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K6_U02] is able to operate typical laboratory apparatus and conduct analyses related to materials testing		The student is able to operate laboratory equipment used in the study of polymeric biomaterials and perform basic analyses of their physicochemical and mechanical properties.		[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		
	[K6_K02] understands the non-technical aspects and implications of the activities of a chemical engineer, including the impact on the environment, is aware of professional behaviour, observance of professional ethics and respect for diversity of views and cultures		The student understands the non-technical aspects of an engineer's activity in the field of polymeric biomaterials, including the impact of the materials and technologies used on the environment and human health, and acts in accordance with the principles of professional ethics.		[SK2] Assessment of progress of work [SK4] Assessment of communication skills, including language correctness		
	[K6_W09] has knowledge of the technological and functional properties of polymers, the physical basis and processing methods of polymers and rubber		The student has knowledge of the technological and functional properties of polymers used as biomaterials and knows selected methods of their production and processing, understanding the impact of the manufacturing process on the final properties of the material.		[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects		

Subject contents	Course content – lecture <ul style="list-style-type: none"> • Introduction to polymer biomaterials • Applications of biomaterials • Implants materials and characterization • Tissue engineering and tissue scaffolds • Polymer hydrogels characterization and properties • Methods for biomaterials testing 			
	Course content – laboratory <ul style="list-style-type: none"> • Health and safety regulations and laboratory organization • Polymer hydrogels synthesis and characterization • Tissue scaffolds synthesis and characterization • Polymeric protective coatings synthesis and characterization • 3D printing of polymers for medical applications 			
	Course content – seminar <p>Presentations and discussions on student-selected topics in polymer biomaterials, for example:</p> <ul style="list-style-type: none"> • 3D bioprinting of hydrogel materials and bioink preparation • Polymers in tissue engineering • Methods for producing tissue scaffolds review and comparison • Polymer modifications to improve mechanical properties • Polymer modifications to improve biological properties 			
Prerequisites and co-requisites				
Assessment methods and criteria	Subject passing criteria		Passing threshold	Percentage of the final grade
	lecture (written test)		60.0%	40.0%
	laboratory (entry tests, reports, attendance and activity)		60.0%	35.0%
	seminar (presentation, activity and attendance)		60.0%	25.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"> • M. Błażewicz, W. Stoch, Biomateriały, Akademicka Oficyna Wydawnicza EXIT, Warszawa, 2019 • B. Świeczko-Żurek, Biomateriały, Wydawnictwo Politechniki Gdańskiej, 2009 • J. Marciniak, Biomateriały, Wydawnictwo Politechniki Śląskiej, 2002 		
	Supplementary literature	<ul style="list-style-type: none"> • Y. Liu, K. Hwa Chan, Advances in Hydrogels, Mdpi AG, 2022 • B. D. Ratner, A. S. Hoffman, F. J. Schoen, J. E. Lemons, Biomaterials Science: An Introduction to Materials in Medicine, Elsevier Science Publishing Co Inc, 2020 • P. Ma, Biomaterials and Regenerative Medicine, Cambridge University Press, 2014 		
	eResources addresses			
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none"> • Provide a definition of biomaterial. • Classify polymeric biomaterials based on their origin. • Compare the properties of polymeric biomaterials with metallic and ceramic biomaterials. • List and characterize three key applications of polymeric biomaterials in medicine. • Propose and characterize a method for obtaining a tissue scaffold for a given application. • Propose a research methodology to characterize a biomaterial for implant applications. 			
Practical activities within the subject	Not applicable			

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