GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Polymeric biomaterials, PG_00060805		
Field of study	Chemical Technology		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2029/2030
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_W07] Has knowledge of raw materials and technologies in the chemicaland polymer industries, also covering issues of corrosion and material protection.	has knowledge of the technological and functional properties of polymers used as biomaterials and knows selected methods of their 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
[K6_U02] Performs design calculations of technological processes, selects industrial equipment, operates laboratory equipment and conducts material analyses	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 [SU2] Assessment of ability to analyse information
[K6_K02] is aware of the responsibility for his/her work and is ready to work in a team and share responsibility for common tasks.	is able to work collaboratively in a team during laboratory tasks. The student performs assigned tasks in a professional and responsible manner.	[SK1] Assessment of group work skills [SK2] Assessment of progress of work

Subject contents

Course content – lecture
- 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
- 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

Presentations and discussions on student-selected topics in polymer biomaterials, for example:

- 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
laboratory (entry tests, reports, activity)	60.0%	35.0%
seminar (presentation, activity)	60.0%	25.0%
lecture (written test)	60.0%	40.0%

Recommended reading

Basic literature	• 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	• 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
- 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 activites within the subject

Not applicable

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