



Subject card

Subject name and code	BIOMATERIALS AND GREEN POLYMERS IN A SUSTAINABLE ECONOMY, PG_00064311						
Field of study	Chemical Technology						
Date of commencement of studies	February 2027		Academic year of realisation of subject		2026/2027		
Education level	second-cycle studies		Subject group		Optional subject group Specialty subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies		Mode of delivery		blended-learning		
Year of study	1		Language of instruction		Polish		
Semester of study	1		ECTS credits		4.0		
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	30.0	0.0	30.0	0.0	0.0	60
	E-learning hours included: 30.0						
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	60		5.0		35.0	100
Subject objectives	The aim of the course is to familiarize students with biomaterials (dedicated to medical applications) and green polymer materials (obtained from natural raw materials and recycled materials).						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_K03] can interact and work in a group, taking on a variety of roles		is prepared to work effectively in a team, including taking on various roles within the group and collaborating with other team members during the planning and execution of laboratory research projects.		[SK1] Assessment of group work skills [SK3] Assessment of ability to organize work		
	[K7_K01] critically evaluates the content of cognitive and practical problems		is able to critically analyze and evaluate various solutions and approaches used in the fields of medical materials, natural materials, and recycled materials. The student is able to formulate and propose solutions to problems in these areas, taking into account their social, environmental, and ethical implications.		[SK2] Assessment of progress of work [SK5] Assessment of ability to solve problems that arise in practice		
	[K7_U02] carries out experiments using properly selected techniques and apparatus, taking advantage of new developments in technology and related fields		is prepared to responsibly plan and carry out processes for the production of materials intended for medical applications, the mechanical and chemical recycling of polymeric materials, and the manufacture of materials using natural raw materials. The student is prepared to critically evaluate and interpret the results of characterizing substrates and products in the processes carried out, taking into account safety, ethical, and environmental protection principles.		[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools		

Subject contents	Course content – lecture		
	<ul style="list-style-type: none">• Nomenclature and definitions related to polymeric biomaterials.• Medical devices, classification, and conformity assessment.• Requirements for polymeric materials used in medical applications.• Properties of polymeric biomaterials in relation to specific applications.• Biopolymers in a sustainable economy: definition, application, and legal acts regulating their classification.• Biomonomers for organic synthesis (bioglycols, biocarboxylic acids, bioalcohols, biopolyols, polyols from biomass and lignin, etc.).• Polymers obtained from biomonomers: polyurethanes, polyester and epoxy resins, and others.• Polymers derived from renewable sources, including starch, cellulose, and chitosan.• Recent trends in the use of biopolymers in various industries.• Mechanical recycling of plastics and the use of products in industrial practice.• Chemical recycling of plastics and the use of products in industrial practice.• Circular plastics in a sustainable economy. National and European legislation		
	Course content – laboratory		
	<ul style="list-style-type: none">• Preparation and Characterization of Materials for Selected Medical Applications• Preparation, Processing, and Properties of Thermoplastic Starch• Thermal Depolymerization of Poly(methyl Methacrylate) and Rectification of the Obtained Pyrolysate• Chemical Depolymerization of Poly(ethylene Terephthalate) and Polyurethanes• Preparation of Polyurethanes Using Natural and Recycled Raw Materials		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	laboratory (entry tests, reports, attendance, activity)	60.0%	40.0%
	lecture (written exam)	60.0%	60.0%
Recommended reading	Basic literature	<ul style="list-style-type: none">• A. Laska, Biomateriały stosowane w inżynierii tkankowej do regeneracji tkanek, Zeszyty naukowe Towarzystwa Doktorantów UJ, Nauki ścisłe nr 14 (1/2017)• M. Dalton, M. J. Forde, I. Major, Bioresorbable Polymers and their Biomedical Applications, Polymeric Biomaterials, 2017• Andrzejewska A., Topoliński T., Polimery biodegradowalne do zastosowań biomedycznych, Postępy w Inżynierii Mechanicznej, Czasopismo naukowo-techniczne, 6(3)/2015, 5-12• J. F. Rabek, Współczesna wiedza o polimerach tom 2, Polimery naturalne i syntetyczne, otrzymywanie i zastosowania, Wydawnictwo Naukowe PWN, Warszawa 2017	
	Supplementary literature	<ul style="list-style-type: none">• M. Bassas-Galia, M. Zinn, Bioresorbable Polymers for Biomedical Applications , 2017• A. Aravamudhan, D.M Ramos, A.A Nada., S.G Kumbar, Natural Polymers, Polysaccharides and Their Derivatives for Biomedical Applications, Natural and Synthetic Biomedical Polymers, Elsevier, 2014• F. Martello, I. Gerges, A. Tocchio, Bringing bioresorbable polymers to market, Bioresorbable Polymers for Biomedical Applications, Woodhead Publishing Editors: Perale& Hilborn, 2016	
	eResources addresses		
	Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none">• Requirements for Polymeric Biomaterials• Production and Applications of Thermoplastic Starch• Plastics Recycling	
Practical activities within the subject	Not applicable		

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