



Subject card

Subject name and code	, PG_00072906						
Field of study	Recycling and Energy Recovery						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2026/2027		
Education level	first-cycle studies		Subject group				
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		dr hab. inż. Justyna Kucińska-Lipka dr inż. Krzysztof Formela dr hab. inż. Michał Strankowski dr inż. Marcin Włoch dr inż. Paulina Kosmela dr inż. Paulina Parcheta-Szwindowska				
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	0.0	20.0	0.0	0.0	40
	E-learning hours included: 0.0						
	eNauczanie source addresses: Moodle ID: 7966 2026/2027 Polimery - Aspekty Gospodarki Obiegu Zamkniętego - WYKŁAD / LABORATORIUM https://enauczanie.pg.edu.pl/2025/course/view.php?id=7966						
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	40		0.0		0.0	40
Subject objectives	The aim of the course is to familiarize students with selected aspects of plastics within the circular economy, including the acquisition of knowledge and skills regarding plastic recycling methods, techniques for characterizing products made using recycled materials, and the principles of conducting life cycle assessments for plastic products.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W06] integrates and extracts data from multiple sources to analyze complex engineering and technology problems.	The student is able to integrate knowledge from various fields (chemistry, technology, law, economics) and gather information from diverse sources to analyze complex engineering and technological problems related to plastics processing and recycling.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
	[K6_K03] is committed to independent lifelong learning and independently follows the development of science and technology, especially in the area of recycling raw materials and energy.	The student understands the need for lifelong learning, including expanding their knowledge of plastics (such as new materials and waste recycling) in light of the rapidly developing industry.	[SK4] Assessment of communication skills, including language correctness
	[K6_W02] analyzes engineering and technological issues and problems in the area of raw materials and energy recovery using appropriate and appropriate analytical, numerical and experimental tools and methods	The student is familiar with methods for preparing waste for recycling, plastic recycling methods, principles of life-cycle analysis for plastic products, and methods and techniques for testing plastic products made using recycled materials. The student is able to apply this knowledge to analyze engineering and technological issues and problems related to the recovery of raw materials and energy.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
	[K6_U02] solves engineering issues and problems in the area of raw materials and energy recovery through the use of appropriate analytical, numerical and experimental tools and methods.	The student is able to recycle plastics using selected methods, plan a recycling line for specific types of products, and characterize the raw materials obtained through recycling as well as the materials produced using them.	[SU1] Assessment of task fulfilment [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 - Plastics in the circular economy – key aspects: processing, collection, purification, and reintroduction into the loop – possibilities and limitations - Plastics in the circular economy – examples of circular plastics and products made from circular plastics - Thermoplastics in the circular economy – production, purification, and recycling - Chemical recycling of plastics and the use of recovered raw materials in the synthesis of new materials - Rubber products in the circular economy: manufacturing and recycling methods - Plastics from renewable feedstocks, biodegradable and compostable plastics – current developments and future prospects - Life cycle analysis of selected plastic products Course content – laboratory - Health and Safety Regulations. Laboratory Course Completion Requirements - Recycling of rubber products: Preparation of vulcanizates containing rubber crumb - Recycling of rubber products: Mechanical characterization of the obtained vulcanizates - Effect of thermoplastics reprocessing on their mechanical and rheological properties - Effect of thermoplastics reprocessing on their thermal properties - Chemical recycling of polyurethane foams and poly(ethylene terephthalate) - LCA analysis of selected plastic products		
Prerequisites and co-requisites	Basic knowledge of polymers chemistry and technology and the circular economy.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	laboratory: activity on the classes, entry tests, reports	60.0%	40.0%
	lecture: activity on the classes, written test	60.0%	60.0%
Recommended reading	Basic literature	- TWORZYWA SZTUCZNE W OBIEGU ZAMKNIĘTYM. Analiza sytuacji w Europie, PlasticsEurope [na:] https://plasticseurope.org/pl/ - TWORZYWA – FAKTY. Analiza produkcji, zapotrzebowania oraz odzysku tworzyw sztucznych w Europie, PlasticsEurope [na:] https://plasticseurope.org/pl/ - K.A.Błędzki, R. Jeziórska, J. Kijeński (Red.):Odzysk i recykling materiałów polimerowych, PWN, Warszawa 2017	

	Supplementary literature	- G.W. Ehrenstein, Ż. Brocka-Krzemińska: Materiały polimerowe: Struktura, właściwości, zastosowanie, PWN, Warszawa 2016 - J.F. Rabek: Współczesna wiedza o polimerach. Tom 1: Budowa strukturalna polimerów i materiały badawcze, PWN, Warszawa 2017 - J.F. Rabek: Współczesna wiedza o polimerach. Tom 2: Polimery naturalne i syntetyczne, otrzymywanie i zastosowania, PWN, Warszawa 2017
	eResources addresses	
Example issues/ example questions/ tasks being completed	- List and characterize methods for the mechanical recycling of plastics - List and characterize methods for the chemical recycling of plastics - Discuss methods for recycling rubber products - Discuss the principles of conducting a life cycle analysis for plastic products	
Practical activities within the subject	Not applicable	

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