



Subject card

Subject name and code	Fundamentals of polymer engineering, PG_00061919						
Field of study	Materials Engineering, Materials Engineering						
Date of commencement of studies	October 2024	Academic year of realisation of subject				2026/2027	
Education level	first-cycle studies	Subject group				Obligatory subject group in the field of study 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	3	Language of instruction				Polish	
Semester of study	5	ECTS credits				5.0	
Learning profile	general academic profile	Assessment form				exam	
Conducting unit	Department of Polymer Technology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Janusz Datta				
	Teachers		prof. dr hab. inż. Janusz Datta				
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: 0.0						
eNauczanie source address: <a href="https://enauczanie.pg.edu.pl/2025/course/view.php?id=1599">https://enauczanie.pg.edu.pl/2025/course/view.php?id=1599</a>							
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		60.0		125
Subject objectives	To provide knowledge of the fundamental chemical and physical characteristics of polymers and the relationships between polymer structure and properties						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_U03] Can critically analyze and evaluate the functioning – particularly in the context of materials engineering –existing technical solutions, particularly equipment, objects, systems, processes.	The student analyzes and evaluates existing engineering solutions based on knowledge of materials engineering.			[SU2] Assessment of ability to analyse information		
	[K6_K01] Understands the need to improve professional and personal competencies; is conscious of own limitations and knows when to turn to experts, properly establishes priorities helping to accomplish tasks defined by oneself or others.	The student understands the need for continuous improvement of competencies and updating knowledge in the field of polymeric materials.			[SK2] Assessment of progress of work		
	[K6_U01] Can properly use selected analytical, simulation and experimental methods, as well as devices for measuring the fundamental properties of materials and technological processes.	The student selects and applies analytical, simulation, and experimental methods as well as measurement equipment to evaluate materials and technological processes			[SU4] Assessment of ability to use methods and tools		
[K6_W03] Has knowledge of materials science and can relate the properties of materials with their structure and composition, knows the theoretical description of phenomena occurring in materials subjected to external factors.	The student has knowledge of materials science enabling the relationship between the structure and composition of materials and their properties, as well as the description of phenomena occurring in materials under the influence of external factors			[SW1] Assessment of factual knowledge			

Subject contents	<p>Course content – lecture          Specific characteristics of polymers compared to other materials. Natural and synthetic polymers. Structure of polymer chains, configuration and conformation, topological structure, and tacticity and its influence on properties. Average molar masses, methods of their determination, and the significance of polydispersity. Homopolymers and copolymers. Classification of polymers into thermoplastics, thermosets, and elastomers. Polymers versus plastics. Structure and physical states of amorphous polymers, including glassy brittle, glassy forced-elastic, viscoelastic, highly elastic, and plastic states. Dependence of properties on glass transition and flow temperatures. Stress relaxation as a function of structure, time, and temperature. Polymer crystallization, its mechanisms, and the influence of structure on properties. Principle of time-temperature superposition. Mieszalność polimerów. Mieszaniny, stopy, kompozyty i nanokompozyty polimerowe. Static and dynamic mechanical properties of polymeric materials in relation to their chemical and physical structure. Micromechanical mechanisms of destruction.</p> <p>Course content – laboratory          Laboratory classes include the determination and analysis of basic physical and mechanical properties of polymers, examination of their structure, and investigation of their behavior under various temperature and loading conditions. Students become familiar with basic methods of polymer characterization, such as the analysis of thermal, mechanical, and physicochemical properties, as well as the interpretation of obtained results in relation to polymer structure.</p>											
Prerequisites and co-requisites												
Assessment methods and criteria	<table border="1" data-bbox="448 575 1487 680"> <thead> <tr> <th data-bbox="448 575 794 611">Subject passing criteria</th> <th data-bbox="794 575 1141 611">Passing threshold</th> <th data-bbox="1141 575 1487 611">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 611 794 647">Written exam</td> <td data-bbox="794 611 1141 647">50.0%</td> <td data-bbox="1141 611 1487 647">60.0%</td> </tr> <tr> <td data-bbox="448 647 794 680">Laboratory</td> <td data-bbox="794 647 1141 680">100.0%</td> <td data-bbox="1141 647 1487 680">40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Written exam	50.0%	60.0%	Laboratory	100.0%	40.0%
Subject passing criteria	Passing threshold	Percentage of the final grade										
Written exam	50.0%	60.0%										
Laboratory	100.0%	40.0%										
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. J. F. Rabek, <i>Współczesna wiedza o polimerach. Tom 1: Budowa strukturalna polimerów i metody badawcze</i>. Warszawa: Wydawnictwo Naukowe PWN, 2017.</li> <li>2. J. F. Rabek, <i>Współczesna wiedza o polimerach. Tom 2: Polimery naturalne i syntetyczne – otrzymywanie i zastosowania</i>. Warszawa: Wydawnictwo Naukowe PWN, 2017.</li> <li>3. M. Strankowski, J. Gołabek, K. Formela, J. Datta, <i>Podstawy technologii przetwórstwa materiałów polimerowych</i>. Gdańsk: Wydawnictwo Politechniki Gdańskiej, 2024.</li> <li>4. Ehrenstein G. W., <i>Materiały polimerowe. Struktura, właściwości, zastosowanie</i>, Wydawnictwo Naukowe PWN, Warszawa, 2020.</li> </ol>										
	Supplementary literature	<p>Nicholson J.W., <i>Chemia polimerów</i>, Wydawnictwa Naukowo-Techniczne, Warszawa, 1994.</p> <p>Floriańczyk Z., Penczek S., <i>Chemia polimerów. Tom I: Makrocząsteczki i metody ich otrzymywania</i>, Wydawnictwo PW, Warszawa, 2001</p>										
	eResources addresses											
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Discuss methods for determining the average molar mass of polymers.</li> <li>2. Describe how polymer properties are modified through the use of additives.</li> <li>3. Explain how the glass transition temperature of homopolymers, copolymers, and polymer blends is determined.</li> <li>4. Discuss, using any example, the dependence of the physical properties of polymers on temperature.</li> </ol>											
Practical activities within the subject	Not applicable											

Document generated electronically. Does not require a seal or signature.