GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fundamentals of polymer engineering, PG_00061919		
Field of study	Materials Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2025/2026
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 Language - possible English.
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 -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Janusz Datta	
	Teachers	prof. dr hab. inż. Janusz Datta	

Lesson types and methods of instruction	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						

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 on the specific characteristics of chemical and physical of polymers and relationships between structure and properties of plastics

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 knows the basics of processes, apparatus and devices for the production and processing of polymer materials and is able to assign them to specific groups of materials	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[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 is able to determine what is the problem in the engineering of polymeric materials, related to implementation of a specific task, and whether he is competent to solve it. The student is aware of the rapid progress of knowledge in the field of plastics and of the resulting need for continuous improvement of professional skills	[SK5] Assessment of ability to solve problems that arise in practice
[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 basic knowledge regarding the relationship between the structure of plastics and their properties and is able to determine the influence of external factors on changes in the physical and chemical structure of plastics that may occur under the conditions of their use	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
[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 knows the methods of polymer structure and basic properties physical and mechanical of plastics	[SU4] Assessment of ability to use methods and tools

Subject contents

Special properies of polymers in relation to other materials. Natural and synthetic polymers. Structure of polymer chains. Concepts of configuration and conformation. Influence of tacticity on polymer properties. Average molar masses of polymers and methods of their determination. Polydispersity and importance of the degree of polydispersity of polymers. Homopolymers and copolymers. Thermoplastics, thermosets and cross-linked elastomers. Polymers and plastics. Structure and physical states of amorphous polymers. Relationships between the structure of amorphous polymers and the range of glass transition temperature and pour point. Stress relaxation depending on chemical structure, time and temperature. Crystallization possibilities of polymers in relation to their structure and properties. Mechanisms of polymer crystallization. Types of polymer crystal structures. Primary and secondary crystallization. Miscibility of polymers. Mixtures, alloys, polymer composites and nanocomposites. Viscoelastic properties of polymers. Elastic, plastic and viscous deformations. Simple and complex mechanical models of viscoelastic materials. The principle of time-temperature equivalence. Static and dynamic mechanical properties of polymeric materials in relation to their chemical and physical structure. Micromechanical mechanisms of destruction processes.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam	60.0%	60.0%
Laboratory	100.0%	40.0%

Recommended reading

Basic literature	1. Współczesna wiedza o polimerach. Tom 1 (paer back or eBook) Budowa strukturalna polimerów i metody badawcze Autor: Jan F. RabekWydawca: Wydawnictwo Naukowe PWN Formaty: mobi, ePub (Watermark) https://ksiegarnia.pwn.pl/Wspolczesna-wiedza-o-polimerach.-Tom-1,708744500,p.html 2. Leszek A. Dobrzański, Podstawy nauki o materiałach i metaloznawstwo, Wydawnictwa Naukowo-Techniczne 20023. John W. Nicholson Chemia polimerów Wydawnictwa Naukowo Techniczne 19914.. Praca zbiorowa, Tworzywa sztuczne w praktyce, red. J.T, Haponiuk, Verlag Dashöfer, Warszawa 2007.
Supplementary literature	Magazines located in the Department of Polymer Technology and literature databases from the main library
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	1. Methods of determination of molecular weight of polymers. 2. Modification of the properties of plastics through the use of additives. 3. Glass transition temperature of homopolymers, copolymers and polymer blends. 4. The dependence of the physical properties of polymers on temperature. 5. 5. How are the viscoelastic properties of polymers characterized?
Work placement	Not applicable

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