



## Subject card

Subject name and code	Polymer Engineering I, PG_00059042						
Field of study	Materials Engineering, Materials Engineering, Materials Engineering						
Date of commencement of studies	October 2022		Academic year of realisation of subject			2024/2025	
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			4.0	
Learning profile	general academic profile		Assessment form			exam	
Conducting unit	Department of Polymers Technology -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Janusz Datta				
	Teachers						
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		35.0	100
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_K01		The student is able to determine what is the problem in the field of engineering of polymer materials related to the implementation of a specific task and whether he is competent to solve it. The student is aware of the rapid progress in knowledge in the field of plastics and the resulting need to constantly improve professional qualifications.			[SK5] Assessment of ability to solve problems that arise in practice	
	K6_U03		The student knows the basics of processes, apparatuses and devices for the production and processing of polymeric 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_W03		The student has a basic knowledge of 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, which may occur under their operating conditions.			[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge	
	K6_U01		The student knows the methods of studying the structure of polymers and of estimation of the basic physical and mechanical properties of plastics.			[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools	

Subject contents	Special properties of polymers with reference to other materials. Natural and synthetic polymers. Structure of polymer chains. Configuration and conformation of polymer chains. Topology of polymer chains. Tacticity and its influence on polymer properties. Average molecular weights and methods of their estimation. Polydispersity. Homopolymers and copolymers. Thermoplastics and crosslinked resins. Elastomers. Polymers and commercial plastics. Structure and physical states of amorphous polymers. Characteristics of glassy, viscoelastic, elastic, high elastic and plastic state. Relationship between amorphous polymer structure and the glass transition temperature and melting temperature. Stress relaxation in terms of chemical structure, time and temperature. Polymer crystallinity in reference to their structure and properties. Mechanisms of polymer crystallization. Types of polymer crystalline structures. Primary and secondary crystallization. Viscoelastic properties of polymers. Elastic, plastic and viscous deformations. Simple and complex mechanical models of viscoelastic materials. 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.		
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) <a href="https://ksiegarnia.pwn.pl/Wspolczesna-wiedza-o-polimerach.-Tom-1,708744500.p.html">https://ksiegarnia.pwn.pl/Wspolczesna-wiedza-o-polimerach.-Tom-1,708744500.p.html</a> 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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