GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	CHEMISTRY AND TECHNOLOGY OF POLYMERS, PG_00064408						
Field of study	Chemistry						
Date of commencement of studies	October 2026		Academic year of realisation of subject	2028/2029			
Education level	first-cycle studies		Subject group	Optional subject group 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 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	15.0	0.0	0.0	45
	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	45		5.0		50.0	100
Subject objectives	The aim of this course is to familiarize students with issues related to polymers and biopolymers chemistry and technology. The chemical section will discuss types of polymers, such as thermoplastics, thermosets, and elastomers, as well as addition and condensation polymerization methods. The technological section will cover the processing of these types of polymers and biopolymers.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K02] is aware of the importance of non-technical aspects and consequences of engineering activities, including their impact on the environment, and of the related responsibility for the decisions to be taken	is aware of and can explain the importance of plastics recycling, as well as the development of plastics from natural raw materials and biodegradable plastics, within a sustainable economy.	[SK5] Assessment of ability to solve problems that arise in practice [SK4] Assessment of communication skills, including language correctness
[K6_U07] is able to undertake accurate and precise analytical measurements, to synthesise simple and large-molecular chemical compounds, to purify and analyse their composition and to determine their structure using classical and instrumental methods	is able to synthesize polymers using selected methods, including free-radical polymerization, addition polymerization, polycondensation, and chemical modification. The student is able to employ appropriate analytical methods and techniques to characterize the obtained materials.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K6_W04] identifies the conditions of chemical processes occurring in the analysed systems through the appropriate selection of methods to solve them, by taking into account the interdependence of the structure and properties of key materials in sustainable development technologies	is familiar with polymer synthesis methods and can discuss specific types of polymerization, including addition (free-radical and ionic) and condensation processes. The student is able to classify polymers into thermoplastics, thermosets, and elastomers, and to characterize each group while providing examples of polymers for various applications. Students are familiar with polymer production methods - such as injection molding and extrusion - and can identify the industrial equipment used to manufacture thermoplastics, thermosets, and elastomers.	[SW1] Assessment of factual knowledge
[K6_U09] is able to recognise hazards, counteract them and work with chemical reagents and basic technical apparatus in accordance with health and safety principles and the concept of sustainability	is able to safe work with chemical reagents, machinery, and equipment, and is able to identify hazards and appropriate personal protective equipment. The student adheres to these principles while working in the laboratory and the technological hall.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject

Subject contents

Course content – lecture

- Introduction to polymer chemistry and technology
- Polymers and plastics. Functional additives to polymers
- Free-radical polymerization. Radical polymerization methods
- Ionic polymerizations: anionic and cationic polymerization
- Condensation polymerization
- Chemistry and technology of rubber
- Chemistry and technology of polyurethanes
- Chemistry and technology of chemo- and thermosetting resins
- Polymer processing by injection molding
- Polymer processing by extrusion
- Functional polymers
- Engineering and special purpose polymers

Course content – laboratory

- Radical Polymerization of Methyl Methacrylate: Bulk and Suspension Polymerization
- Polycondensation: Synthesis of polyamides in bulk and at the interface
- Polyaddition: Synthesis of cast and porous polyurethanes
- Chemical modification of polymers: Synthesis of poly(vinyl alcohol) from poly(vinyl acetate)
- Thermoplastic processing: injection molding and extrusion

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
lecture: written exam	60.0%	60.0%
laboratory: work in classes, reports, tests	60.0%	40.0%

Recommended reading

Basic literature

- J. Pielichowski, A. Puszyński: *Chemia Polimerów*, Wydawnictwo FOSZE, Rzeszów 2012
- Z. Floriańczyk, S. Penczek: *Chemia Polimerów. Tom I: Makrocząsteczki i metody ich otrzymywania*, Wydawnictwo PW, Warszawa 2001
- Z. Floriańczyk, S. Penczek: *Chemia Polimerów. Tom II: Podstawowe polimery syntetyczne*, Wydawnictwo PW, Warszawa 2002

	Supplementary literature	• J. Rabek: *Współczesna wiedza o polimerach. Tom I: Budowa strukturalna polimerów i metody badawcze*, PWN, Warszawa 2017 • J. Rabek: *Współczesna wiedza o polimerach. Tom II: Polimery naturalne i syntetyczne, otrzymywanie i zastosowania*, PWN, Warszawa 2017
	eResources addresses	
Example issues/ example questions/ tasks being completed	• List the polymers obtained by free-radical polymerization. • Describe the mechanism of free-radical polymerization of a selected unsaturated monomer. • List the industrial methods for free-radical polymerization. • List the polymers obtained by hetero- and homopolycondensation. • List the basic raw materials necessary for the synthesis of polyurethanes. • List the methods for processing thermoplastics. • Give examples of synthetic rubbers. • List the components of rubber mixtures	
Practical activites within the subject	Not applicable	

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