GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	MODERN TECHNOLOGIES IN PLASTICS PROCESSING, PG_00064310						
Field of study	NOWOCZESNE TECHNOLOGIE PRZETWÓRSTWA TWORZYW SZTUCZNYCH						
Date of commencement of studies	February 2026		Academic year of realisation of subject	2025/2026			
Education level	second-cycle studies		Subject group	Optional subject group Specialty 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	1		Language of instruction	Polish			
Semester of study	1		ECTS credits	4.0			
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 inż. Maciej Sienkiewicz				
	Teachers						
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						
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	The aim of the course is to familiarize students with modern methods of plastics processing, including injection, extrusion, thermoforming, rotational and expansion molding, and reactive molding technologies, etc. The course focuses on discussing the properties of various groups of polymers (thermoplastics, duroplastics, elastomers and composite materials) in the context of their processing and the selection of optimal process parameters. Students gain knowledge about innovative technologies that increase production efficiency and improve the functional properties of polymer products, as well as learn about issues related to recycling and sustainable development in plastics processing.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_K04] is aware of his/her responsibility for making decisions, respecting and developing principles of professional ethics and taking action to uphold these principles	The student knows and understands the fundamental ethical principles that apply in the area of plastics processing technology. Is able to analyze the effects of professional decisions made, taking into account their impact on the environment, health and safety. Demonstrates knowledge of applicable legal norms and standards regarding polymer processing, ensuring their compliance. Is aware of the impact of engineering activities on the environment and is able to make decisions that minimize negative technological and ecological effects.	[SK1] Ocena umiejętności pracy w grupie [SK5] Ocena umiejętności rozwiązywania problemów występujących w praktyce
[K7_U02] carries out experiments using properly selected techniques and apparatus, taking advantage of new developments in technology and related fields	The student is able to select appropriate experimental methods adapted to the nature of the tested material or technological process. Knows modern devices used in material technology and plastics processing.	[SU3] Ocena umiejętności wykorzystania wiedzy uzyskanej w ramach przedmiotu [SU4] Ocena umiejętności korzystania z metod i narzędzi
[K7_W02] selects appropriate apparatus and materials for the manufacture and processing of consumer goods	The student understands basic and advanced methods of manufacturing and processing polymer, composite and other materials used in the production of consumer goods. He is able to analyze the physicochemical and mechanical properties of materials and then select the appropriate processing method for them in accordance with the functional and operational requirements of the product.	[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym

Subject contents

Course content – lecture

- Introduction to modern technologies of polymer processing.
- Classification of polymer materials and their properties in the context of processing.
- Trends and innovations in polymer processing.
- Sustainable development and circular economy.
- Characteristics of polymer processing technologies with elements of modern techniques and development trends in relation to: injection, extrusion, thermoforming, expansion molding, bonding, spinning, rotational molding, laminating, polymerization molding, gluing, pressing, pultrusion, pressure molding, vulcanization, calendering and others.
- Modification and reinforcement of polymer materials.
- Surface modifications and the impact on functional properties.
- Automation and digitalization of processing processes.
- Quality and process control in polymer processing.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lecture	60.0%	60.0%
Laboratory	60.0%	40.0%

Recommended reading

Basic literature	1. Catoen B., Rees H., Injection Mold Design Handbook, Hanser Publications, 2021 2. Myer Kutz, Applied Plastics Engineering Handbook Processing, Materials, and Applications, Elsevier Inc. 2017 3. Harper Ch.A., Handbook of Plastics Technologies: The Complete Guide to Properties and Performance, The McGraw-Hill Companies, Inc. 2006
Supplementary literature	1. Kamal Musa R., Injection Molding: Fundamentals and Applications, Hanser Pubn, 2009 2. Reyne M., Plastic Forming Processes, Wiley, 2008
eResources addresses	

Example issues/ example questions/ tasks being completed	• What are the basic groups of polymer materials and their properties? • What are the main innovations in polymer processing in recent years? • What is the circular economy and how does it affect the polymer industry? • Describe the operating principle of an injection molding machine and an extruder and their construction. • What are the parameters of the injection and extrusion process that affect the quality of the final product? • What is the difference between single- and multi-component injection molding? What is gas injection? What is injection into a hot and cold channel mold? • What are the innovations in injection molding technology for extruding plastic products? • What are the differences between single- and multi-screw extrusion? • How are the parameters of the extrusion process of films, pipes, profiles and plates shaped? • What are the differences between thermoforming and rotational molding and polymerization molding? • What materials are most often used in thermoforming and other processing techniques discussed? • What are the methods of mechanical reinforcement of polymer materials? • What surface modification techniques of polymer materials are used to improve their functional properties? • What are the quality standards in the polymer materials industry? • What defects can occur in the processing of polymer materials and how to eliminate them? • What factors should be taken into account when assessing the profitability of a new technology in the plastics industry? • What are the market opportunities for modern technologies in plastics processing?
Practical activites within the subject	Not applicable

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