GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	RUBBER CHEMISTRY AND TECHNOLOGY, PG_00064345		
Field of study	Chemical Technology		
Date of commencement of studies	February 2025	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	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Polymer Technology -> Faculty of Chemistry -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Justyna Kucińska-Lipka	
	Teachers	dr inż. Marcin Włoch dr inż. Krzysztof Formela dr inż. Paulina Parcheta-Szwindowska prof. dr hab. inż. Janusz Datta	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	0.0	0.0	45

E-learning hours included: 0.0

eNauczanie source addresses:

Moodle ID: 1605 2025/2026 - CHEMIA I TECHNOLOGIA GUMY - WYKŁAD / LABORATORIUM
https://enauczanie.pg.edu.pl/2025/course/view.php?id=1605

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	25.0	75

Subject objectives

The aim of the course is to familiarize students with issues related to rubber chemistry and technology, including the raw materials used, methods of obtaining rubber mixtures and their vulcanization, research techniques used to characterize rubber mixtures and vulcanizates, and machines and devices used in the rubber industry.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U04] predicts the properties of the materials obtained and the course of processes involving them, based on knowledge of technology and related fields and computer methods of data analysis, modelling and simulation	The student is able to predict and shape the properties of rubber materials based on natural rubber and/or synthetic rubbers based on the selection of appropriate raw materials and process parameters used in the production of rubber mixtures.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
[K7_W04] recognises scientific, technological, organisational and economic opportunities and constraints in technology and related fields	Students will gain knowledge of the raw materials and processing technologies used in the rubber industry. Students will recognize the scientific, technological, organizational, and economic opportunities and limitations in rubber chemistry and technology.	[SW1] Assessment of factual knowledge
[K7_U02] carries out experiments using properly selected techniques and apparatus, taking advantage of new developments in technology and related fields	Students understand the principles of use and are able to operate selected equipment, devices, and machines used to prepare rubber mixtures, their vulcanization, and characterize the resulting rubber materials. Students are able to analyze and interpret the results obtained from research related to rubber chemistry and technology.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[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 is aware of responsibility for their decisions and adheres to the principles of professional ethics. The student is able to identify hazards occurring in the workplace and caused by the materials used and produced in the rubber industry.	[SK2] Assessment of progress of work [SK5] Assessment of ability to solve problems that arise in practice

Subject contents

LECTURE:

- Introduction to rubber chemistry and technology: basic concepts
- Rubbers in rubber technology: types, preparation/synthesis, properties, and applications
- Auxiliary raw materials used in rubber technology: activators, accelerators, vulcanizing/crosslinking agents, plasticizers, fillers, anti-aging agents, and more. Vulcanization.
- Theoretical fundamentals and properties of rubber materials: Highly elastic state. Theory of rubber elasticity. statistical thermodynamics of rubber elasticity. Mooney-Rivlin and Flory-Rehner equations. Static mechanical properties of elastomers. Stress relaxation and creep
- Machinery and equipment used in the processing of rubbers/rubber compounds
- Recycling of rubber materials

LABORATORY:

- Preparation of rubber mixtures and their vulcanization
- Characterization of rubber mixture properties: determination of the optimum vulcanization and Mooney viscosity
- Characterization of rubber vulcanizates properties: Shore hardness, Schob rebound elasticity, Schooper-Schlobach abrasion, and static tensile properties
- Equilibrium swelling test and determination of crosslink density
- Change of properties during accelerated thermal aging
- Thermoplastic elastomers
- Recycling of rubber materials: preparation of rubber mixtures with rubber powder

Prerequisites and co-requisites

Basic knowledge of polymer chemistry and technology

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
laboratory: attendance, class work and reports	100.0%	50.0%
lecture: test	50.0%	50.0%

Recommended reading

Basic literature	• J. Datta, M. Włoch: Inżynieria Elastomerów, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2018 • J. R. White: Poradnik Technologa Gum, Rapra Technology Ltd, 2003
Supplementary literature	• J.E. Mark, B. Erman, M. Roland (Eds): The Science and Technology of Rubber, Academic Press, 2013
eResources addresses	

Example issues/ example questions/ tasks being completed	• List three characteristics of elastomers. • List the components of the vulcanizing system. • List the types of accelerators used in the rubber industry. • Give examples of active and inactive fillers used in the rubber industry. • What is the physical state of elastomers at room temperature? • List the machines and equipment used in the production of car tires. • List the machines and equipment used in the recycling of car tires.
Work placement	Not applicable

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