



Subject card

Subject name and code	Rubber Chemistry and Technology, PG_00064345						
Field of study	Chemical Technology						
Date of commencement of studies	February 2027		Academic year of realisation of subject		2027/2028		
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 -> 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	15.0	0.0	30.0	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		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_U02] carries out experiments using properly selected techniques and apparatus, taking advantage of new developments in technology and related fields	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.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
	[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	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.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
	[K7_W04] recognises scientific, technological, organisational and economic opportunities and constraints in technology and related fields	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_K04] is aware of his/her responsibility for making decisions, respecting and developing principles of professional ethics and taking action to uphold these principles	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.	[SK5] Assessment of ability to solve problems that arise in practice [SK2] Assessment of progress of work
Subject contents	Course content – lecture <ul style="list-style-type: none"> • 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 		
	Course content – laboratory <ul style="list-style-type: none"> • 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: reports	100.0%	50.0%
	lecture: test	50.0%	50.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"> • J. Datta, M. Włoch: Inżynieria Elastomerów, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2018 • J. R. White: Poradnik Technologa Gum, Rapra Technology Ltd, 2003 	
	Supplementary literature	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.
Practical activities within the subject	Not applicable

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