



Subject card

Subject name and code	Engineering of Elastomers, PG_00039715						
Field of study	Materials Engineering, Materials Engineering, Materials Engineering, Materials Engineering						
Date of commencement of studies	October 2020	Academic year of realisation of subject			2022/2023		
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	6	ECTS credits			5.0		
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	prof. dr hab. inż. Janusz Datta dr inż. Marcin Włoch dr inż. Krzysztof Formela Joanna Brzoska dr inż. Ewa Głowińska					
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		60.0		125
Subject objectives	Teaching the basic principles of elastomer's calculation and the creation of technological formulations, as well indication of the influence of selected factors on some properties of elastomers						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	K6_U03	Can analyze the functioning and evaluate the existing technical solutions			[SU1] Assessment of task fulfilment		
	K6_U02	Knows the basics of selecting conditions machine settings used in elastomer technology			[SU3] Assessment of ability to use knowledge gained from the subject		
	K6_K01	Recognizes the influence of various factors on the properties of elastomers			[SK5] Assessment of ability to solve problems that arise in practice		
	K6_W06	Can calculate / choose the composition the formulation leading to elastomers			[SW1] Assessment of factual knowledge		
Subject contents	Definition of elastomers. Highly flexible condition. The theory of rubber elasticity. Statistical thermodynamics of rubber elasticity. Mooney-Rivlin equations. Static mechanical properties of elastomers. Retardation of tensile strains. Natural rubber and synthetic rubbers - chemical structure, production and properties. Vulcanization of rubbers and reconditioning of mixtures. Modern vulcanization teams. Cross-link density. Thermoplastic elastomers. Plasticizers. Softened plastomers: polyvinyl chloride. Fiber reinforced elastomers.						
Prerequisites and co-requisites	Knowledge of the methods of obtaining macromolecular compounds. Basic knowledge of impact the chemical structure of the polymer and its properties						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory: quiz, report	50.0%	50.0%
	Lecture: written exam	50.0%	50.0%
Recommended reading	Basic literature	1) Koszelew F. F., Korniew A. E., N.S Klimow - Ogólna technologia gumy, WNT, Warszawa, 1972 2) Praca zbiorowa po red Z.Florjańczyka i S.Pęczka, Chemia polimerów, T2 i 3, Oficyna Wydawnicza Polit.Warszawskiej 1995 3)A.N.Gent, Engineering with Rubber, Hanser Publishers, Munich Viena New York Barcelona, 1992. 4) Praca zbiorowa: W Parasiewicz, W. Rzymiski, Elastomery i przemysł gumowy, Piastów-Łódź 2006	
	Supplementary literature	1) B. Łączyński, Tworzywa wielkocząsteczkowe. Rodzaje i własności,WNT,Warszawa, 1982 2) I. Franta, Elastomers and Rubber Compounding Materials,ELSEVIER, Amsterdam-Oxford-NewYork-Tokyo, 1989. 3) J. A. Brydson, Rubbery Materials, Elsevier Applied Science, London and New York, 1988.	
	eResources addresses	Adresy na platformie eNauczanie: Inżynieria elastomerów - WYKŁAD/LABORATORIUM - 2022/2023 - Moodle ID: 29652 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=29652	
Example issues/ example questions/ tasks being completed	1) List the three basic properties of elastomers and indicate the research methods / techniques used to determine one of them. 2) Describe the mechanism of active sulphide complex formation in the case of vulcanization with the accelerator T and ZnO. 3) Draw the volkometric curve of the mixture based on natural rubber (sulfur vulcanization) with a clear vulcanization plateau and present the method of determining the optimal vulcanization time. Replace the possible components of the vulcanizing unit and indicate where in the volkometric curve their participation in the process can be seen		
Work placement	Not applicable		