GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Engineering of Elastomers, PG_00061931		
Field of study	Materials Engineering, Materials Engineering		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2026/2027
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 Polymer Technology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Janusz Datta	
	Teachers	prof. dr hab. inż. Janusz Datta	

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

eNauczanie source address: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19200

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 components and factors on some properties of elastomers

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U02] Can operate typical laboratory equipment and analyze material tests	The student is able to operate standard laboratory equipment and perform analyses related to material research.	[SU4] Assessment of ability to use methods and tools
[K6_K01] Understands the need to improve professional and personal competencies; is conscious of own limitations and knows when to turn to experts, properly establishes priorities helping to accomplish tasks defined by oneself or others.	The student is able to identify their own needs for developing professional and personal competences and actively strives to improve them.	[SK2] Assessment of progress of work
[K6_U03] Can critically analyze and evaluate the functioning – particularly in the context of materials engineering –existing technical solutions, particularly equipment, objects, systems, processes.	The student is able to critically analyze and evaluate existing technical solutions (devices, facilities, systems, and processes) in relation to materials engineering.	[SU3] Assessment of ability to use knowledge gained from the subject
[K6_W06] Knows selected methods, techniques, tools and materials used in solving simple engineering problems within the scope of materials engineering.	The student knows selected methods, techniques, tools, and materials used in solving simple engineering tasks in the field of materials engineering	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>Course content – lecture
Definition of elastomers. Highly flexible condition. The theory of rubber elasticity. Mooney-Rivlin equations. Static mechanical properties of elastomers. Natural rubber and synthetic rubbers - chemical structure, production and properties. Vulcanization of rubbers and reconditioning of mixtures. Modern vulcanization teams. Cross-link density. Principles of elastomer calculations and formulation of technological recipes.Thermoplastic elastomers. Plasticizers. Softened plastomers: polyvinyl chloride. Fiber reinforced elastomers.
Course content – laboratory

Preparation of elastomeric compounds with a varied chemical composition and investigation of the influence of composition and type of additives on the physical, mechanical, and functional properties of materials. Analysis of property changes depending on the structure and degree of crosslinking of elastomers, as well as assessment of their suitability under different service conditions.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge of the methods of obtaining macromolecular compounds. Basic knowledge of impact the chemical structure of the polymer and its properties</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Laboratory: quiz, report</td><td>50.0%</td><td>50.0%</td></tr>
<tr><td>Lecture: written exam</td><td>50.0%</td><td>50.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>1) Koszelew F. F., Korniew A. E., N.S Klimow - Ogólna technologia gumy, WNT, Warszawa, 1972

2) Praca zborowa 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. Rzymski, Elastomery i przemysł gumowy, Piastów-Łodź 2006</td></tr>
<tr><td>Supplementary literature</td><td>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.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>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 chosen accelerator

3) Draw the volkametric 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.</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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