GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| 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<br>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<br>dr inż. Marcin Włoch<br>dr inż. Krzysztof Formela<br>Joanna Brzoska<br>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<br>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<br>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

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|---|---|---|---|
| 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<br><br>2) Praca zborowa po red Z.Florjańczyka i S.Pęczka, Chemia polimerów, T2 i 3, Oficyna Wydawnicza Polit.Warszawskiej 1995<br>3)A.N.Gent, Engineering with Rubber, Hanser Publishers, Munich Viena New York Barcelona, 1992.<br>4) Praca zbiorowa: W Parasiewicz, W. Rzymski, Elastomery i przemysł gumowy, Piastów-Łodź 2006 | |
| | Supplementary literature | 1) B. Łączyński, Tworzywa wielkocząsteczkowe. Rodzaje i własności,WNT,Warszawa, 1982<br>2) I. Franta, Elastomers and Rubber Compounding Materials,ELSEVIER, Amsterdam-Oxford-NewYork-Tokyo, 1989.<br>3) J. A. Brydson, Rubbery Materials, Elsevier Applied Science, London and New York, 1988. | |
| | eResources addresses | Adresy na platformie eNauczanie:<br>Inżynieria elastomerów - WYKŁAD/LABORATORIUM - 2022/2023 - Moodle ID: 29652<br>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.<br><br>2) Describe the mechanism of active sulphide complex formation in the case of vulcanization with the accelerator T and ZnO.<br><br>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. Replace the possible components of the vulcanizing unit and indicate where in the volkametric curve their participation in the process can be seen | | |
| Work placement | Not applicable | | |