GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | CHEMISTRY AND TECHNOLOGY OF MACROMOLECULAR COMPOUNDS, PG_00064309 | | |
| Field of study | Chemical Technology | | |
| Date of commencement of studies | February 2027 | Academic year of realisation of subject | 2026/2027 |
| Education level | second-cycle studies | Subject group | Optional subject group<br>Specialty subject group |
| Mode of study | Full-time studies | Mode of delivery | blended-learning |
| Year of study | 1 | Language of instruction | Polish |
| Semester of study | 1 | 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 | dr hab. inż. Justyna Kucińska-Lipka | |
| | Teachers | | |

**Lesson types**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 30.0 | 0.0 | 45.0 | 0.0 | 0.0 | 75 |

E-learning hours included: 30.0

**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 | 75 | 10.0 | 40.0 | 125 |

**Subject objectives**

The aim of the course is to apply laboratory and industrial methods in issues related to the chemistry and synthesis of oligomeric and macromolecular substances

**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 | is able to responsibly and thoughtfully select processing methods appropriate for a given group of polymers, describe methods for their production using flow charts (including identification of basic equipment), and explain the necessity of applying specific temperature and pressure conditions in polymer synthesis and processing. | [SU1] Assessment of task fulfilment<br>[SU3] Assessment of ability to use knowledge gained from the subject |
| [K7_W01] defines the phenomena, processes and laws of nature used to produce consumer goods and provide services | knows and is able to list and describe methods of polymer synthesis (including stages and necessary raw materials) and selected biopolymers. | [SW3] Assessment of knowledge contained in written work and projects |
| [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 estimate the final effect in the form of properties of the obtained semi-finished product and the final product based on knowledge in the field of polymer chemistry and technology. | [SU2] Assessment of ability to analyse information |
| [K7_W02] selects appropriate apparatus and materials for the manufacture and processing of consumer goods | knows and is able to select laboratory equipment and chemical raw materials necessary for polymer syntheses | [SW1] Assessment of factual knowledge |

<table>
<tr><td>Subject contents</td><td>Course content – lecture<br>• Mechanisms of synthesis of macromolecular compounds<br>• Laboratory and industrial methods of polymer synthesis.<br>• Criteria for selecting the synthesis method and the method for product isolation and purification<br>• Review of industrial methods for obtaining selected oligomers and polymers, e.g. polyolefins, vinyl polymers, polyamides, polyesters, polyurethanes, epoxy resins, phenol-formaldehyde resins and their derivatives, silicones, biodegradable and biomedical polymers<br><br>Course content – laboratory<br>• Synthesis of elastomers and polyurethane foams<br>• Synthesis of epoxy resin from bisphenol A and epichlorohydrin<br>• Synthesis of unsaturated polyester resin<br>• Synthesis of polyamide (nylon)<br>• Synthesis of siloxanes (silicones)<br>• Mass polymerization of methyl methacrylate<br>• Emulsion polymerization of methyl methacrylate<br>• Suspension polymerization of methyl methacrylate or vinyl acetate<br>• Solution polymerization of styrene, methyl methacrylate, or vinyl acetate<br>• Synthesis of phenol-formaldehyde resin</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></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>lecture (written exam)</td><td>60.0%</td><td>60.0%</td></tr>
<tr><td>laboratory (entry tests, reports, activity)</td><td>60.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>• Chemia polimerów, tom I,II,III, praca zbiorowa pod red. Z. Florjańczyka i S. Penczka, Oficyna Wyd. Pol. Warszawskiej, 1995-98.<br>• J. Pielichowski i A. Puszyński Technologia tworzyw sztucznych,WNT, Warszawa 2003.<br>• Nicholson J. W., Chemia polimerów WNT, Warszawa 1996.</td></tr>
<tr><td>Supplementary literature</td><td>G. Odian, Principles of Polymerization, John Wiley & Sons, 2004<br>G. Moad, D.H. Solomon, The Chemistry of Free Radical Polymerization</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>• Present the IUPAC classification of polymerization methods.<br>• Describe the mechanism of radical polymerization of methyl methacrylate using benzoyl peroxide as an initiator.<br>• Describe two reactions for obtaining poly(ethylene terephthalate).<br>• List industrial methods for conducting radical polymerization.<br>• Discuss the similarities and differences between suspension and emulsion polymerization.<br>• Discuss the industrial production of poly(vinyl alcohol).</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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