GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Separation techniques, PG_00057695		
Field of study	Green Technologies		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
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	assessment
Conducting unit	Department of Analytical Chemistry -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Agata Kot-Wasik	
	Teachers	prof. dr hab. inż. Agata Kot-Wasik prof. dr hab. inż. Andrzej Wasik dr inż. Paweł Kubica dr hab. inż. Weronika Hewelt-Belka dr inż. Tomasz Majchrzak	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	15.0	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	The aim of the course is to present issues in the field of classic and modern techniques for separating mixtures, taking into account aspects of green and white chemistry and sustainable technology management.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U05] can formulate and solve engineering tasks analytical methods, simulation as well as experimental, able to apply knowledge of basic physics and mathematics to analyze the results of experiments, is able to analyze and assess existing technical solutions	Student can formulate and solve engineering tasks analytical methods, simulation as well as experimental.	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	[K6_W01] has a basic knowledge from some branches of mathematics and physics useful for formulating and solving simple problems in the field of environmental technologies and modern analytical methods	The student has basic knowledge in some areas of mathematics, physics and chemistry useful for formulating and solving simple tasks in the field of environmental protection technologies and modern analytical methods.	[SW3] Assessment of knowledge contained in written work and projects
	[K6_U01] is able to obtain information from literature, databases and other sources, is able to integrate the information obtained, to make their interpretation, as well as draw conclusions and formulate and justify opinions, take part in the discussion	The student is able to obtain basic information from literature, databases and other sources, is able to integrate the obtained information and interpret it	[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task
	[K6_U02] is able to operate equipment and perform typical analyzes of studies of environmental pollution, is able to carry out an analysis of typical environmental pollution and simple devices according to specification	The student is able to operate typical equipment and perform basic analyzes related to environmental pollution research	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
	[K6_W03] has a basic knowledge of soil, air and water pollutants, design and supervision of environmentally friendly technologies and technologies which do not produce waste, knows technology of cleaning and neutralization of industrial waste and wastewater management, has a basic understanding of the theoretical basis of methods and types of apparatus used in chemical analysis of environmental pollutants	Student has a basic knowledge concerning separation techniques involved nowadays, for example in soil, air and water pollutants determination, design and supervision of environmentally friendly technologies.	[SW3] Assessment of knowledge contained in written work and projects

Subject contents	Theoretical basic of separation, extraction, chromatography and electromigration. Green and white chemistry. Pro-environmental technologies. Practical aspects of separation processes used in systems: gas-liquid, gas-solid, liquid-solid, liquid-liquid, solid-supercritical fluid. Extraction techniques (LLE, SPE, SPME, SFE). Filtration, centrifugation, absorption, adsorption, distillation, condensation, crystallization. Membrane techniques. Laboratory and industrial applications. Chromatographic techniques (GC gas chromatography, HPLC liquid chromatography, supercritical fluid chromatography) - theoretical basis, optimization of the chromatographic separation process, applications. Electromigration techniques. Hyphenated techniques.
Prerequisites and co-requisites	Basic knowledge of chemistry, mathematics and physic.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Project</td><td>60.0%</td><td>34.0%</td></tr>
<tr><td>Lecture</td><td>60.0%</td><td>33.0%</td></tr>
<tr><td>Laboratory</td><td>60.0%</td><td>33.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. D. Wilson, E. R. Adlard, M. Cooke, C. F. Poole, Encyclopedia of Separation Science, Wiley 2000.

2. M. E. Prudich, J. Chen, T. Gu, R.B. Gupta, K.P. Johnston, H. Lutz, G. Ma, Z. Su, Perry's Chemical engineers handbook, 8th edition, The McGraw-Hill Companies, Inc. 2008

3. https://microbenotes.com/chromatography-principle-types-and-applications/

4. Journal: Trends in Analytical Techniques and Separation Science and Technology

5. Mitra, S. (red.) Sample Preparation Techniques in Analytical Chemistry; John Wiley & Sons Inc.:New York, 2003.</td></tr>
<tr><td>Supplementary literature</td><td>Scientific publications on the subject matter available at Gdańsk University of Technology.</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Techniki rozdzielania (ZT) - Moodle ID: 44960
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=44960</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Gas separation techniques.Techniques for separation of non-volatile substances.What does retention depend on in liquid chromatography?The influence of temperature on elution in chromatography.Types of sorbents used to isolate substances from liquids.Types of filtration.Principles of green and white (analytical) chemistry.Separation of compounds based on size.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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