GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Environmental impact of modern technology, PG_00060780						
Field of study	Wpływ nowoczesnych technologii na środowisko						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2027/2028			
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	4		Language of instruction	Polish			
Semester of study	7		ECTS credits	2.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Analytical Chemistry -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Bożena Zabiegała				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	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	30		2.0		18.0	50
Subject objectives	The aim of the course is to increase awareness of the impact that modern technological processes have on the environment, as well as the possibilities for their modification and modernization. The course encourages students to analyse the economic and environmental costs and benefits resulting from technological improvements, the shift to green technologies and from their effects on ecosystems. An important component is also the discussion of the need to reconcile the interests of technology and the environment in decision-making processes. During the course, students learn methods for assessing the environmental impact of technologies, tools for reducing negative industrial effects, as well as modern concepts of the circular economy and pro-environmental solutions used in industry. They also develop skills in the conscious design and selection of technologies in accordance with the principles of sustainable development.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_K05] is aware of the social role of a technical university graduate, and in particular understands the need to formulate and communicate to the public, in particular through the mass media, information and opinions on the achievements of technology and other aspects of engineering activity	The student is aware of the engineer's responsibility for the environment and human health and is able to critically evaluate information about technologies and their declared environmental impact (greenwashing).	[SK5] Ocena umiejętności rozwiązywania problemów występujących w praktyce
[K6_W02] has knowledge of inorganic, organic, physical and analytical chemistry useful for obtaining selected groups of compounds, determining their physical and chemical properties allowing for their quantitative and qualitative analysis, making measurements and determining the parameters of chemical reactions, phenomena and processes occurring in chemical technology	The student knows the principles of conducting environmental impact assessments of technologies and understands the mechanisms of transport, degradation, and bioaccumulation of new substances and materials (e.g., nanomaterials, biopolymers)	[SW3] Ocena wiedzy zawartej w opracowaniu tekstowym i projektowym
[K6_U05] recognises and identifies the relationship between technological issues, implemented in industrial practice, and their impact on various elements of the environment, in the context of mechanisms and conditions of sustainable development, recognizes their systemic and non-technical aspects	The student identifies and analyses environmental pressures generated by chemical and related technologies and is able to prepare a proposal for modifying a technology to minimize its environmental impact.	[SU4] Ocena umiejętności korzystania z metod i narzędzi
[K6_W05] has knowledge of chemical technology based on mineral or energy resources and modern energy sources, understands the concept of sustainable development, knows the principles of green chemistry and environmentally friendly process engineering, has knowledge of occupational safety in the chemical industry	The student is familiar with the main development directions of modern technologies and their potential impact on individual environmental components (water, soil, air, living organisms).	[SW2] Ocena wiedzy zawartej w prezentacji

Subject contents

Course content – lecture

The course covers issues related to sustainable development as well as the types of environmental pressures generated by technologies, including emissions, waste, noise, light and EMF pollution, and resource consumption. It discusses EU regulations concerning technologies, the environmental impact of modern technologiesincluding nanotechnology, advanced materials, energy technologies, biotechnology, and recycling processes. Students learn methods for assessing the environmental impact of technologies, such as LCA, SEA, ecological risk and toxicity assessment, as well as designing processes to minimize environmental burden.

Course content – project

Project

1. Analysis of the environmental impact of a selected technology
2. Identification and assessment of environmental risk for a selected substance or material
3. Modernization of technological process towards a circular economy
4. Case study: comparison of two alternative technologies from an environmental perspective
5. Presentation and defense of a group project

Prerequisites and co-requisites

Fundamental knowledge of environmental, analytical, and physical chemistry, as well as knowledge in the field of chemical technology and unit operations

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Environmental project + presentation	60.0%	40.0%
Participation and engagement	0.0%	10.0%
Lecture: Written test	60.0%	50.0%

Recommended reading

Basic literature

1. Wysokińska Z., *Zrównoważony rozwój i zielona gospodarka*.
2. Anastas P., Warner J., *Green Chemistry: Theory and Practice*.
3. Ustawa Prawo Ochrony Środowiska; wytyczne BAT.

	Supplementary literature	1. ISO 14040/14044 LCA. 2. Czasopismo RSC Sustainability. 3. Czasopismo - *Journal of Cleaner Production*, *Environmental Science: Processes & Impacts.* 4. Czasopismo - *Green Chemistry* 5. Czasopismo - *ACS Sustainable Chemistry and Engineering* 6. Raporty środowiskowe ECHA, EEA (przykłady studiów przypadków).
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Low-emission and negative-emission technologies, CCS/CCU,Carbon Capture and Storage/Carbon Capture and Utilization, DAC- Direct Air Capture 2. Case studies of green chemical technologies 3. Greenwashing identification and verification of actual environmental impact	
Practical activites within the subject	Not applicable	

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