GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Sustainable technologies and ecological footprint: low carbon in practice, PG_00069296		
Field of study	Chemical Technology		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry -> Wydziały Politechniki Gdańskiej		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Aleksandra Małachowska	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	15.0	15.0	45

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	45	5.0	25.0	75

Subject objectives

An interdisciplinary course combining elements of engineering, sustainable development, and environmental analysis. Students learn to identify, measure, and minimize the ecological footprint of selected technologies, products, and processes, and then propose solutions with a lower environmental impact. As part of the course, they also develop skills in communicating knowledge and promoting environmentally responsible technological solutions to broader audiences.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W01] defines the phenomena, processes and laws of nature used to produce consumer goods and provide services	The student defines physical phenomena, processes, and natural laws used in the production of goods and services.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
[K7_U101] is able to formulate complex research problems and adopts appropriate methods, obtaining innovative solutions, cooperating with other people, both as a leader and a team member	The student formulates complex problems and applies suitable methods to achieve innovative solutions while collaborating with others as a team member or leader.	[SU5] Assessment of ability to present the results of task [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools
[K7_W06] integrates knowledge from different disciplines, principles of intellectual property protection and patent law, relevant for appropriate interpretation and application in scientific, sustainable economic activities	The student integrates knowledge from various disciplines, understands principles of intellectual property and patent law, and applies them in scientific and business contexts, aligned with sustainable development	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_W04] recognises scientific, technological, organisational and economic opportunities and constraints in technology and related fields	The student identifies scientific, technological, organizational, and economic opportunities and limitations relevant to sustainable technologies and related fields.	[SW1] Assessment of factual knowledge
[K7_W03] selects methods of data analysis, including statistical and modelling, useful for solving scientific and technological problems	The student selects appropriate methods for data analysis, including statistical tools and modeling techniques, to solve scientific and technological problems.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

<table>
<tr><td>Subject contents</td><td>• Introduction to the concept of ecological footprint: carbon, water, and material footprints
• Fundamentals of Life Cycle Assessment (LCA) methodology, tools, interpretation of results
• Low-emission design strategies (eco-design, circular design, low-carbon technologies)
• Principles of environmentally responsible engineering design
• Technologies and processes with high and low environmental impact case studies from various industries
• Social and consumer phenomena influencing environmental footprint (e.g. fast fashion, digital energy consumption, greenwashing)
• Methods of popularizing knowledge and communicating eco-friendly solutions (visual language, storytelling, online platforms)
• Team-based project work from problem analysis to solution development and public presentation</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>No prior knowledge or additional qualifications are required to enroll in this course</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, Project, Seminar</td><td>60.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td><table><tr><td>Basic literature</td><td>Piotr Skubała Ślad ekologiczny jako narzędzie zmiany stylu życia 2023; zastosowanie śladu ekologicznego w edukacji ekologicznej i zmianie nawyków konsumenckich.

Mathis Wackernagel Ślad ekologiczny: Zarządzanie naszym budżetem biologicznym, 2019; Kompleksowe wprowadzenie do metodologii śladu ekologicznego, autorstwa twórcy tej koncepcji.

Małgorzata Burchard-Dziubińska, Zofia Stępniewska, Marcin Tarnawski Gospodarka niskoemisyjna 2017.
Jurand Skrzypek Transformacja polskiej gospodarki w kierunku niskoemisyjnym w świetle wyników wielosektorowego modelu energetycznego 2024.</td></tr><tr><td>Supplementary literature</td><td>Directions of Low-Emission Mobility Development</td></tr><tr><td>eResources addresses</td><td></td></tr></table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>• What is the carbon footprint of a typical logistics process, and how can it be reduced?
• How does digital technology (e.g. data storage, artificial intelligence) impact the environment?
• Which design decisions in the manufacturing process have the greatest effect on a products ecological footprint?
• Is a low-emission alternative possible for a popular technological solution?
• What are the most common mistakes in interpreting environmental data during the design process?
• Develop a simplified life cycle assessment (LCA) for a selected product (existing or of your own design).
• Design a low-emission alternative to an everyday object or service.
• Create an infographic or social media post presenting your team's solution.
• Discussion: How can engineers influence consumer choices toward more sustainable behaviors?</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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