GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Closed loop economy (as an implementation of sustainable development), PG_00069298		
Field of study	Chemical Technology, Chemistry, Biotechnology, Engineering and Technologies of Energy Carriers, Corrosion , Green Technologies, InfoBioChem		
Date of commencement of studies	February 2026	Academic year of realisation of subject	2026/2027
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	Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. Ewa Klugmann-Radziemska	
	Teachers		

Lesson types

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

eNauczanie source address: https://enauczanie.pg.edu.pl/2025/course/view.php?id=2331

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

The aim of the subject is to introduce the idea of a closed-loop economy, as one that allows for achieving greater profitability than in a processing economy, and at the same time serves to protect the natural environment through the multiple use of resources and the reduction of energy consumption and waste generated in production processes. It is a method of implementing the concept of sustainable development, which assumes the harmonious coexistence of economic, social and ecological activities, i.e. striving for a development model that meets the current needs of society, while not limiting the ability of future generations to meet their own needs. The subject is to - through the analysis of solutions used in sample plants - draw the attention of future engineers to the need to implement pro-environmental enterprise management models and the tools that allow this goal to be achieved.

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	knows and understands the phenomena that allow the implementation of the goals of the circular economy	[SW1] Assessment of factual knowledge
[K7_U02] carries out experiments using properly selected techniques and apparatus, taking advantage of new developments in technology and related fields	is able to conduct experiments leading to the development of new waste management technologies	[SU1] Assessment of task fulfilment
[K7_K02] understands the non-technical aspects and implications of graduate activity, including the impact on the environment	understands non-technical aspects and effects of human activities and influence on the environment	[SK5] Assessment of ability to solve problems that arise in practice

Subject contents	Course content – lecture Fundamentals of the Circular Economy: the concept of the circular economy, its importance for protecting the natural environment in the era of climate crisis. Circular model and linear model. Waste prevention and European law in this area Reuse and recycling. 3R, 4R and 6R principles - principles of waste management and product life cycle. EU regulations and strategic documents applicable in Poland. Challenges related to the implementation of legal regulations. The idea of sustainable development. Sustainable industrial production. Product and consumer in the circular model. Good practices: analysis of strategies and solutions used in production plants and institutions. Course content – project Project carried out in groups of 2, analysis for a selected company: Map of company processes and identification of places generating waste Analysis of the value chain - from raw materials to the final product The concept of closed circulation in the business model Course content – seminar Discussion on Product life cycle management - selected examples, individual student presentations.
Prerequisites and co-requisites	
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
passing the seminar - individual presentation of a selected example of the supply chain	80.0%	34.0%
report on a project carried out by a group of students	80.0%	33.0%
theoretical knowledge test (5 question, multiple choice test)	60.0%	33.0%

Recommended reading	Basic literature	1. J. Adamczyk. Założenia gospodarki okrężnej w zakresie produkcji, E. Milewska (red.). Systemy Wspomagania w Inżynierii Produkcji, No. 2(14), 2016, s. 11-19. 2. A. Bartl. Withdrawal of the circular economy package: A wasted opportunity or a new challenge?. Waste Management, nr 44, 2015, s. 1-2. 3. D. Benton, J. Hazell, J. Hill. The Guide to the Circular Economy: Capturing Value and Managing Material Risk, Do Sustainability, Oxford 2015, UK. 4. Ellen MacArthur Foundation, Toward the circular economy, opportunities for the consumer foods sector, Part 2, Ellen MacArthur Foundation 2013, p. 30. 5. Kompleksowe zarządzanie gospodarką odpadami, P. Janczarski (red.) Polskie Zrzeszenie Inżynierów i Techników Sanitarnych. Oddział Wielkopolski, Poznań 2015, s. 25-36. 6. E. Franconi, B. Bridgeland, K. Webster. A New Dynamic 2-Effective Systems in a Circular Economy. Cowes, Isle of Wight: Ellen MacArthur Foundation Publishing, 2016, UK. 7. P. Lacy, J. Rutqvist. Waste to Wealth: The Circular Economy Advantage, Macmillian Publishers Limited, Palgrave Macmillan 2015, UK, pp. 3-24. 8. K. Michalski, J. Sitko. Wybrane problemy minimalizacji wytwarzania odpadów, A. Gembalska-Kwiecień (red.). Systemy Wspomagania w Inżynierii Produkcji. No. 4(16), 2016, s. 81-89. 9. Strategia wdrażania w Polsce Zintegrowanej Polityki Produktowej, Ministerstwo Środowiska, Komitet Europejski Rady Ministrów, Warszawa 2005.
	Supplementary literature	1. COM(2014) 397 final, Directive of the European Parliament and of the Council, amending Directives 2008/98/EC on waste, 94/62/EC on packaging and packaging waste, 1999/31/EC on the landfill of waste, 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment, European Commission, Brussels. 2. COM(2014) 398 final, Ku gospodarce o obiegu zamkniętym: program zero odpadów dla Europy Załącznik do Komunikatu Komisji do Parlamentu Europejskiego, Rady Europejskiego Komitetu Ekonomiczno-Społecznego i Komitetu Regionów, Bruksela. 3. KOM(2011) 21. Europa efektywnie korzystająca z zasobów - inicjatywa przewodnia strategii Europa 2020. Komunikat Komisji do PE, Rady, Europejskiego Komitetu Ekonomiczno-Społecznego i Komitetu Regionów, Bruksela 2011. 4. KOM(2011) 571. Plan działania na rzecz zasobooszczędnej Europy 2011. Komunikat Komisji do PE, Rady, Europejskiego Komitetu Ekonomiczno-Społecznego i Komitetu Regionów, Bruksela 2011
	eResources addresses	Basic https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.parp.gov.pl/storage/publications/pdf/2011_wzp_analizadanych.pdf&ved=2ahUKEwjW9te34fyMAxVLgP0HHye8kdwS-yMIYwMkvMnD- - Sustainable Production Patterns (SPP) in business operations – a proposal of system solutions supporting the implementation of SPP in SMEs. Report on the analysis of existing data
Example issues/ example questions/ tasks being completed	1. Assumptions of the Integrated Product Policy. 2. Instruments of state policy in the implementation of sustainable production patterns in Poland. 3. Closed-loop supply chain.	
Practical activites within the subject	Not applicable	

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