



## Subject card

Subject name and code	Closed loop economy (as an implementation of sustainable development), PG_00069298						
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	Industrial Doctoral School -> Vice-Rector For Research						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. Ewa Klugmann-Radziemska				
	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	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_U02] carries out experiments using properly selected techniques and apparatus, taking advantage of new developments in technology and related fields		The student is able to conduct experiments using properly selected techniques and equipment.		[SU1] Assessment of task fulfilment		
	[K7_W01] defines the phenomena, processes and laws of nature used to produce consumer goods and provide services		The student is able to describe the phenomena, processes and laws of nature used to produce utility goods and provide services.		[SW1] Assessment of factual knowledge		
	[K7_K02] understands the non-technical aspects and implications of graduate activity, including the impact on the environment		The student understands the non-technical aspects and effects of the graduate's activities, including the impact on the environment.		[SK5] Assessment of ability to solve problems that arise in practice		

Subject contents	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.		
	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			
SEMINAR			
discussion on Product life cycle management - selected examples			
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	test	60.0%	33.0%
	projekt	80.0%	33.0%
	prezentation	80.0%	34.0%

Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. J. Adamczyk. Założenia gospodarki okrężnej w zakresie produkcji, E. Milewska (red.). Systemy Wspomagania w Inżynierii Produkcji, No. 2(14), 2016, s. 11-19.</li> <li>2. A. Bartl. Withdrawal of the circular economy package: A wasted opportunity or a new challenge?. Waste Management, nr 44, 2015, s. 1-2.</li> <li>3. D. Benton, J. Hazell, J. Hill. The Guide to the Circular Economy: Capturing Value and Managing Material Risk, Do Sustainability, Oxford 2015, UK.</li> <li>4. Ellen MacArthur Foundation, Toward the circular economy, opportunities for the consumer foods sector, Part 2, Ellen MacArthur Foundation 2013, p. 30.</li> <li>5. Kompleksowe zarządzanie gospodarką odpadami, P. Janczarski (red.) Polskie Zrzeszenie Inżynierów i Techników Sanitarnych. Oddział Wielkopolski, Poznań 2015, s. 25-36.</li> <li>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.</li> <li>7. P. Lacy, J. Rutqvist. Waste to Wealth: The Circular Economy Advantage, Macmillian Publishers Limited, Palgrave Macmillan 2015, UK, pp. 3-24.</li> <li>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.</li> <li>9. Strategia wdrażania w Polsce Zintegrowanej Polityki Produktowej, Ministerstwo Środowiska, Komitet Europejski Rady Ministrów, Warszawa 2005.</li> </ol>
	Supplementary literature	<ol style="list-style-type: none"> <li>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.</li> <li>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.</li> <li>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.</li> <li>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</li> </ol>
	eResources addresses	<p>Basic</p> <p><a href="https://www.google.com/url?sa=t&amp;source=web&amp;rct=j&amp;opi=89978449&amp;url=https://www.parp.gov.pl/storage/publications/pdf/2011_wzp_analizadanych.pdf&amp;ved=2ahUKEwjW9te34fyMAXVLgP0HH;ye8kdwS-yMIYwMkvMnD-">https://www.google.com/url?sa=t&amp;source=web&amp;rct=j&amp;opi=89978449&amp;url=https://www.parp.gov.pl/storage/publications/pdf/2011_wzp_analizadanych.pdf&amp;ved=2ahUKEwjW9te34fyMAXVLgP0HH;ye8kdwS-yMIYwMkvMnD-</a> - 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</p>
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Assumptions of the Integrated Product Policy.</li> <li>2. Instruments of state policy in the implementation of sustainable production patterns in Poland.</li> <li>3. Closed-loop supply chain.</li> </ol>	
Work placement	Not applicable	

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