



Subject card

Subject name and code		Circular economy, PG_00068912						
Field of study		Cosmetic technologies						
Date of commencement of studies		October 2026	Academic year of realisation of subject			2026/2027		
Education level		first-cycle studies	Subject group			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study		Full-time studies	Mode of delivery			blended-learning		
Year of study		1	Language of instruction			Polish		
Semester of study		2	ECTS credits			2.0		
Learning profile		general academic profile	Assessment form			assessment		
Conducting unit		Department of Chemistry Technology and Biotechnology of Food -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)		Subject supervisor		dr hab. inż. Robert Tylingo				
		Teachers						
Lesson types		Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
		Number of study hours	15.0	0.0	0.0	0.0	15.0	30
		E-learning hours included: 7.0						
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 introduce students to circular economy principles and their application in the cosmetics industry. Students learn the interrelations between raw materials, formulation, manufacturing, packaging, use and end-of-life management, as well as basic environmental assessment tools, especially life cycle thinking and LCA. The course develops the ability to critically assess the opportunities, risks and trade-offs of CE solutions in cosmetics and prepares students for evidence-based technical debat						
Learning outcomes		Course outcome	Subject outcome	Method of verification				
		[K6_K03] understands the social role and importance of providing society with reliable information and opinions	The student formulates and communicates, in a responsible and evidence-based manner, arguments concerning circular economy solutions in the cosmetics industry; distinguishes environmental claims from evidence, identifies risks of greenwashing, and participates in substantive debate on the technical, environmental and social consequences of proposed solutions.	[SK1] Assessment of group work skills [SK4] Assessment of communication skills, including language correctness				
		[K6_K02] is aware of the potential threats and opportunities related to the development of science and technology for the natural environment and society	The student identifies and critically evaluates the opportunities and risks associated with implementing circular economy solutions in cosmetics, especially in raw materials, formulations, processes and packaging; indicates environmental hotspots, possible burden shifting across life-cycle stages, and justifies solution choices with regard to quality, safety and technological feasibility.	[SK2] Assessment of progress of work [SK5] Assessment of ability to solve problems that arise in practice				

Subject contents	<p>Course content – lecture Lecture: linear model versus circular economy; two material cycles; R-hierarchy; life cycle thinking, LCA and environmental hotspots; specificity of rinse-off and leave-on cosmetics; raw materials, green chemistry and safe-by-design; manufacturing processes, mass and energy balances, loss minimisation, CIP; cosmetic packaging: mono-materials, PCR, product-pack compatibility, pumps and atomisers, pigments, labels, emptiability, refill/reuse, design for recycling; business models, EPR, environmental claims and greenwashing, implementation barriers.</p> <p>Course content – seminar Seminar: mini Oxford-style debates based on literature and reports; preparation of arguments for and against, problem questions and short conclusions. Debate topics include, among others, refill versus recycling, producer responsibility for waste, product passport, reduction of consumption versus expansion of recycling, reusable packaging and hygiene issues, and banning the destruction of unsold products.</p>											
Prerequisites and co-requisites	No formal prerequisites. Recommended competences include a basic understanding of general and organic chemistry, introductory knowledge of materials and manufacturing processes, the ability to interpret simple numerical data, charts and diagrams, and readiness for teamwork, short source analysis and discussion.											
Assessment methods and criteria	<table border="1"> <thead> <tr> <th>Subject passing criteria</th> <th>Passing threshold</th> <th>Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Lecture-test</td> <td>60.0%</td> <td>60.0%</td> </tr> <tr> <td>Seminary-presentation</td> <td>60.0%</td> <td>40.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Lecture-test	60.0%	60.0%	Seminary-presentation	60.0%	40.0%
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Recommended reading	Basic literature	<p>Liu, L., Ramakrishna, S. (eds.), An Introduction to Circular Economy, Springer, Singapore, 2021. Fink, J.K., Food Safety, Plastics and Sustainability: Materials, Chemicals, Recycling and the Circular Economy, Wiley-Scrivener, Hoboken, 2023. Lacy, P., Rutqvist, J., Waste to Wealth. The Circular Economy Advantage, Palgrave Macmillan, London, 2015.</p>										
	Supplementary literature	<p>Heisel, F., Hebel, D.E., Building Better Less Different. Circular Construction and Circular Economy, Birkhäuser, Basel, 2022.</p> <p>Bigdeloo, M., Teymourian, T., Kowsari, E., Ramakrishna, S., Ehsani, A., Sustainability and Circular Economy of Food Wastes: Waste Reduction Strategies, Higher Recycling Methods, and Improved Valorization, Materials Circular Economy, 3, 2021.</p> <p>Dong, L., Liu, Z., Bian, Y., Match Circular Economy and Urban Sustainability: Re-investigating Circular Economy Under Sustainable Development Goals (SDGs), Circular Economy and Sustainability, 1, 2021.</p>										
	eResources addresses											
Example issues/ example questions/ tasks being completed	<p>Explain the differences between the linear model and the circular economy using a selected cosmetic product as an example. Identify environmental hotspots for a rinse-off product in a cradle-to-grave approach. Assess whether changing packaging from multi-material to mono-material always improves overall environmental performance. Compare PET, HDPE and PP as cosmetic packaging materials with regard to recycling, formulation compatibility and quality requirements. Propose a refill system for a selected cosmetic product and identify its technological, microbiological, logistical and consumer-related limitations. Prepare a debate position based on at least two sources and formulate 34 problem questions for the audience. Example motion: Waste management costs should be borne more by producers than by consumers or The destruction of unsold new cosmetics should be legally prohibited.</p>											
Practical activities within the subject	Not applicable											

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