



## Subject card

Subject name and code	, PG_00062304						
Field of study	Recycling and Energy Recovery						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2023/2024		
Education level	first-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	1	ECTS credits			8.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Chemistry, Technology and Biochemistry of Food -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Robert Tylingo					
	Teachers	dr hab. inż. Robert Tylingo dr inż. Szymon Mania					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	0.0	100.0	0.0	100
	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	100	10.0		90.0		200
Subject objectives	The aim of the course is to prepare students for the practical application of knowledge and skills essential for the efficient management of waste in the brewing industry, with an emphasis on innovative methods of recovery and utilization of resources. Students will understand the key processes and technologies used in beer production, considering the environmental and economic aspects of waste management. The subject highlights the importance of teamwork and business realities, preparing participants for creative problem-solving and effective collaboration within a team.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_K04] effectively, clearly and unambiguously communicates information, describes activities and communicates their results/outcomes to engineers or the wider public using appropriate communication methods and tools.	Effective communication, presentation of solutions and research findings, utilizing various forms of transmission.			[SK1] Assessment of group work skills [SK2] Assessment of progress of work		
	[K6_K02] cooperates with other people in the implementation of teamwork, both as a leader and a team member, effectively achieving the assumed goals.	Development of teamwork skills, both as a leader and a group member, in the context of process engineering.			[SK1] Assessment of group work skills [SK3] Assessment of ability to organize work		
	[K6_U05] plans, prepares and conducts engineering activities in the field of raw materials and energy recovery, applying practical knowledge and understanding of the specificity of materials, devices and tools, processes and technologies.	Practical skills in planning and implementing waste management strategies in the brewing industry.			[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information		
	[K6_W05] analyzes practical issues in the field of recovery of raw materials and energy, using knowledge and understanding of: materials, devices and tools, processes and technologies.	Understanding technological processes in brewing, identifying waste streams, and exploring their recovery opportunities.			[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation		

Subject contents	<p>The convention of conducting classes includes teaching methods, focusing on the implementation of group projects. During the last 5 weeks of the semester, students in teams of 3-5 engage in a project related to waste management from the brewing industry.</p> <ol style="list-style-type: none"> <li>1. Introduction to brewing technologies: Students visit a brewery to understand basic processes and operations used during beer production, with aspects related to waste included.</li> <li>2. Teamwork and project management: Learning effective team collaboration, time management, and coordination of activities necessary to achieve project goals.</li> <li>3. Research and development in recovery engineering: Participants use brewery facilities to conduct research and develop new technologies for recovering resources from waste.</li> <li>4. Project finalization: Teams prepare the final product along with complete technical documentation, presenting their work results in front of a panel of experts.</li> </ol> <p>The "Resource and Energy Recovery Engineering" course focuses on the practical application of knowledge in environmental protection, with an emphasis on modern recycling solutions. Responsible management of natural resources and the transformation of waste into valuable resources are keys to sustainable development.</p>														
Prerequisites and co-requisites															
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="454 770 794 801">Subject passing criteria</th> <th data-bbox="794 770 1141 801">Passing threshold</th> <th data-bbox="1141 770 1482 801">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="454 801 794 833">activity during classes</td> <td data-bbox="794 801 1141 833">50.0%</td> <td data-bbox="1141 801 1482 833">25.0%</td> </tr> <tr> <td data-bbox="454 833 794 864">presentation of project results</td> <td data-bbox="794 833 1141 864">60.0%</td> <td data-bbox="1141 833 1482 864">25.0%</td> </tr> <tr> <td data-bbox="454 864 794 896">group project evaluation</td> <td data-bbox="794 864 1141 896">60.0%</td> <td data-bbox="1141 864 1482 896">50.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	activity during classes	50.0%	25.0%	presentation of project results	60.0%	25.0%	group project evaluation	60.0%	50.0%
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Recommended reading	Basic literature	<p>Anderson, N.G., "Practical Process Research and Development", Academic Press, San Diego, California, USA, 2000. Synoradzki, L., Wisialski, J., "Podstawy projektowania procesów technologicznych. Od laboratorium do instalacji przemysłowej", OWPW, 2019. Filipkowski, P., Malinowska Pańczyk, E., Synowiecki, J., Tylingo, R., "Ćwiczenia laboratoryjne z technologii fermentacyjnych przemysłu spożywczego", Wydawnictwo Politechniki Gdańskiej, Gdańsk, 2011,</p>													
	Supplementary literature	<p>Lewis, Michael J., and Tom W. Young. Brewing. Springer, 2002.</p> <p>Hayes, Ted. Beer: Tap into the Art and Science of Brewing, Oxford University Press, 2003.</p>													
	eResources addresses	Adresy na platformie eNauczanie:													
Example issues/ example questions/ tasks being completed	<p>What are the methods for minimizing waste production in brewing? Designing an energy recovery system from brewing processes. Analysis of possibilities for recycling solid and liquid waste from breweries.</p>														
Work placement	Not applicable														