



Subject card

Subject name and code	, PG_00071160						
Field of study	Recycling and Energy Recovery						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2025/2026		
Education level	first-cycle studies	Subject group					
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	3	Language of instruction			Polish		
Semester of study	6	ECTS credits			2.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Bartosz Szulczyński					
	Teachers	dr inż. Aleksandra Małachowska dr inż. Bartosz Szulczyński					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	10.0	0.0	20.0	0.0	0.0	30
	E-learning hours included: 0.0						
	eNauczanie source addresses: Moodle ID: 5390 Technologie separacji i rozdrabniania odpadów https://enauzanie.pg.edu.pl/2025/course/view.php?id=5390						
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	0.0		0.0	30	
Subject objectives	<p>The aim of the course is to familiarize students with the theoretical foundations and practical aspects of technologies used in waste shredding and separation processes within circular economy systems. Students learn about the physical and mechanical properties of different waste streams and methods of their preparation for further recovery of materials and energy. The course discusses technologies of mechanical waste processing, including shredding, classification, and separation processes (e.g., screening, magnetic, pneumatic, and optical separation). The subject aims to develop the ability to select appropriate technological methods and equipment depending on the characteristics of the processed materials, as well as to understand their role in increasing the efficiency of material recovery.</p>						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W03] identifies problems and phenomena related to the recovery of raw materials and energy as well as applicable concepts, standards and design methods and is aware of their limitations.	Student knows the basic problems and phenomena occurring in waste shredding and separation processes and understands the importance of the methods and technologies used in preparing waste for material and energy recovery, as well as their technological and operational limitations.	[SW1] Assessment of factual knowledge
	[K6_W07] demonstrates knowledge and understanding of Polish and European law in the field of entrepreneurship, waste management, circular economy, health and safety rules and industry standards.	The student knows the basic legal regulations and standards related to waste management, including waste processing, shredding and separation processes, and understands the importance of occupational health and safety (OHS) principles and environmental requirements in the design and operation of material and energy recovery installations.	[SW1] Assessment of factual knowledge
	[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.	The student is able to select and propose appropriate methods and equipment used in waste shredding and separation processes, taking into account the properties of processed materials, technological requirements, and the possibilities of their use in material and energy recovery processes.	[SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
[K6_U07] creates solutions aimed at implementing legal regulations and managing raw materials/ waste on the premises of the company, as well as organizing work in accordance with legal standards and health and safety regulations.	The student is able to propose organizational and technological solutions for the implementation of waste shredding and separation processes in an enterprise, taking into account applicable legal regulations, industry standards, and occupational health and safety (OHS) requirements.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject	
Subject contents	<p>Course content – lecture Basic concepts and definitions related to the processes of waste material shredding and separation. Characteristics of the physical properties of materials affecting shredding processes. Overview of equipment used for crushing and grinding (including crushers and mills). Basic methods of solid material separation used in waste processing, including screening, magnetic, gravity, and pneumatic separation.</p> <p>Course content – laboratory Laboratory classes include practical familiarization of students with the processes of shredding and separation of waste materials. During the classes, students perform an initial characterization of materials and select appropriate methods for their preparation for further processing. As part of the exercises, material size reduction processes are carried out using selected equipment such as a jaw crusher, ball mill, and a mill for plastic materials. Students perform granulometric analysis using sieve analysis and a sieve shaker. In the next stage of the classes, solid material separation processes are conducted, including density separation (e.g., separating mineral fractions from light materials such as wood, plastics, or polystyrene) and magnetic separation to remove metallic contaminants. The classes also include issues related to the separation of suspensions, such as coagulation, sedimentation, and filtration processes, in the context of managing mineral suspensions generated during material processing. Additionally, students become familiar with selected methods of material analysis after shredding and separation processes, including cryogenic grinding as well as spectroscopic and microscopic analysis.</p>		
Prerequisites and co-requisites	Basic knowledge of the waste management system and general principles of the circular economy.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written test	60.0%	60.0%
	Laboratory course completion – test	60.0%	40.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> G. Tchobanoglous, H. Theisen, S. Vigil, <i>Integrated Solid Waste Management: Engineering Principles and Management Issues</i>, McGraw-Hill. K. W. B. Kramer, H. J. J. Pruyers, <i>Handbook of Recycling: State-of-the-art for Practitioners, Analysts, and Scientists</i>, Elsevier. A. S. Wills, T. J. Napier-Munn, <i>Wills Mineral Processing Technology</i>, Elsevier. 	
	Supplementary literature	<ol style="list-style-type: none"> L. G. Austin, R. R. Klimpel, P. T. Luckie, <i>Process Engineering of Size Reduction: Ball Milling</i>, Society for Mining, Metallurgy & Exploration. D. W. Fuerstenau, K. N. Han, <i>Principles of Mineral Processing</i>, Society for Mining, Metallurgy & Exploration. 	
	eResources addresses		

<p>Example issues/ example questions/ tasks being completed</p>	<p>Basic concepts and parameters characterizing material size reduction (shredding) processes.</p> <p>Classification and operating principles of crushing and grinding equipment (e.g., jaw crushers, ball mills).</p> <p>Factors affecting the efficiency of size reduction processes for waste materials.</p> <p>Methods of solid material separation used in waste management (screening, magnetic, gravity, and pneumatic separation).</p> <p>Selection of appropriate separation methods for a given waste stream (e.g., construction waste, municipal waste, plastic waste).</p>
<p>Practical activities within the subject</p>	<p>Not applicable</p>

Document generated electronically. Does not require a seal or signature.