



## Subject card

Subject name and code	, PG_00070858						
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 Geotechnical and Hydraulic Engineering -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Paweł Więclawski					
	Teachers	dr inż. Paweł Więclawski dr inż. Mariusz Wyroślak					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	0.0	20.0	0.0	0.0	40
	E-learning hours included: 0.0						
	eNauczanie source addresses: Moodle ID: 4224 Wykorzystanie odpadów w budownictwie <a href="https://enauzanie.pg.edu.pl/2025/course/view.php?id=4224">https://enauzanie.pg.edu.pl/2025/course/view.php?id=4224</a> Moodle ID: 4224 Wykorzystanie odpadów w budownictwie <a href="https://enauzanie.pg.edu.pl/2025/course/view.php?id=4224">https://enauzanie.pg.edu.pl/2025/course/view.php?id=4224</a>						
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	40		0.0		0.0	40
Subject objectives	The aim of the course is to provide students with knowledge and to develop their practical skills in the rational, safe, and innovative use of waste materials in construction, in accordance with the principles of the circular economy and sustainable development.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[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 is familiar with the basic legal regulations concerning construction waste, recycling technologies, and the properties of materials containing recycled raw materials.	[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 plan and develop a concept for the technological use of selected waste materials in construction, selecting appropriate processing methods, research tools, and material solutions.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	[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 understands the importance of sustainable development and environmental responsibility in construction.	[SU2] Assessment of ability to analyse information
	[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.	The student recognizes the physicochemical phenomena affecting the feasibility of waste utilization, identifies risks related to durability, pollutant emissions, and safety of use, and formulates conclusions regarding the suitability of a given material for application.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
Subject contents	<p>Course content – lecture</p> <ol style="list-style-type: none"> <li>1. Legal aspects of construction waste management.</li> <li>2. Construction materials, sustainable construction.</li> <li>3. System-based and traditional construction.</li> <li>4. Demolition and dismantling of structures.</li> <li>5. Sorting, transport, disposal, and storage of construction waste.</li> <li>6. Life Cycle Assessment (LCA) of selected construction materials.</li> </ol> <p>Course content – laboratory</p> <ol style="list-style-type: none"> <li>1. Review of waste materials mineral, organic, and polymeric.</li> <li>2. Testing of the physical properties of mineral waste.</li> <li>3. Testing of the strength parameters of mineral waste.</li> <li>4. Testing of the deformability of mineral waste.</li> <li>5. Physical, strength, and deformation testing of mineralpolymer composites.</li> <li>6. Assessment of the influence of waste content on the properties of a construction product.</li> </ol>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratory Test Report	50.0%	50.0%
	Lecture Examination	50.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Sybilski D.; Zastosowanie odpadów gumowych w budownictwie drogowym. Przegląd budowlany 5/2009.</li> <li>2. Zabielska-Adamska K., Osady ściekowe spalane w piecu rusztowym jako materiał do budowy nasypów. Materiały Budowlane 7/2015, s. 97-99</li> <li>3. Gajewska B., Grzegorzewicz K., Kłosiński B., Wzmacnianie podłoża gruntowego z zastosowaniem lekkich wypełnień. Drogownictwo, 1/2011.</li> <li>4. Batóg A., Hawrysz M., Wykorzystanie do budowy nasypów drogowych kruszyw z recyklingu odpadów budowlanych. Geoinżynieria 3/2011.</li> <li>5. A. Rawska-Skotniczy, A. Margazyn. Rozbiórki budynków i budowli. PWN, Warszawa 2016.</li> </ol>	

	Supplementary literature	<ol style="list-style-type: none"> <li>1. Poneta P., Jurczyk J., Kabala M., Wykorzystanie odpadów pochodzących ze zużytych opon samochodowych w konstrukcji nasypów drogowych. Drogownictwo, 3/2012.</li> <li>2. OCENA I BADANIA WYBRANYCH ODPADÓW PRZEMYSŁOWYCH DO WYKORZYSTANIA W KONSTRUKCJACH DROGOWYCH. Instytut Badawczy Dróg i Mostów w Warszawie. 2004.</li> <li>3. Pisarczyk S., Grunty nasypowe. Właściwości geotechniczne i metody ich badania. Oficyna Wyd. PW, Warszawa, 2004.</li> <li>4. Jastrzębska M.; Rozwiązania ekologiczne w geotechnice. Inżynier budownictwa. 2024</li> <li>5. Ustawa Prawo budowlane Dz.U. 2025 poz. 418</li> <li>6. Ustawa o odpadach Dz.U. 2023 poz. 1587</li> <li>7. Ustawa Prawo ochrony środowiska Dz.U. 2025 poz. 647</li> <li>8. Ustawa o wyrobach budowlanych Dz.U. 2021 poz. 1213</li> <li>9. Ustawa o ochronie przyrody Dz.U. 2026 poz. 13</li> <li>10. Rozporządzenie (WE) nr 1907/2006 Parlamentu Europejskiego i Rady z dnia 18 grudnia 2006 r. w sprawie rejestracji, oceny, udzielania zezwoleń i stosowanych ograniczeń w zakresie chemikaliów i utworzenia Europejskiej Agencji Chemikaliów (REACH). EUR-Lex.</li> </ol>
	eResources addresses	
Example issues/ example questions/ tasks being completed		<ol style="list-style-type: none"> <li>1. Define construction and industrial waste and present their classification.</li> <li>2. Discuss the waste management hierarchy in the circular economy (CE).</li> <li>3. Characterize the physical and mechanical properties of recycled concrete aggregates.</li> <li>4. What are the possibilities for using fly ash in concrete technology?</li> <li>5. Discuss the application of metallurgical slags in road construction.</li> <li>6. What environmental risks may result from the improper use of waste materials?</li> <li>7. Explain the process of recycling concrete rubble.</li> <li>8. Propose a technology for managing concrete waste from the demolition of a residential building.</li> <li>9. Assess the possibility of using plastic waste in road construction.</li> <li>10. Compare the environmental impact of conventional concrete and concrete containing waste materials.</li> <li>11. Is the complete replacement of natural aggregate with recycled aggregate technically justified? Justify your answer.</li> <li>12. Develop a laboratory assessment scheme for determining the suitability of industrial waste for concrete production.</li> </ol>
Practical activities within the subject	Not applicable	

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