GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Chemistry of consrtuction materials, PG_00059244						
Field of study	Civil Engineering						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2025/2026			
Education level	first-cycle studies		Subject group	Obligatory subject group in the field of study			
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	3.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department Of Environmental Engineering Technology -> Faculty Of Civil And Environmental Engineering -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Małgorzata Szopińska				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	10.0	15.0	0.0	0.0	40
	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	40		5.0	30.0		75
Subject objectives	1. To acquaint students with the basics of chemistry for civil engineers and general chemistry at the academic level 2. To acquaint students with the chemical characteristics of various building materials 3. Presentation of aspects related to the creation and destruction of various classes of building materials 4. Acquainting students with the chemical aspects of building materials protection against destruction (including corrosion protection) 5. Acquainting students with the laboratory research of building materials						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W05] Demonstrate knowledge and understanding of research methods (obtaining information, simulations, experimental methods) in the field of civil engineering.	01 -is able to apply the basic concepts and laws of general chemistry, discussed during classes to the description of chemical processes; 02 - is aware of the dangers of working in a chemical laboratory and knows the rules of occupational health and safety and observes them.	[SW3] Assessment of knowledge contained in written work and projects
	[K6_U02] Analyse & solve engineering issues & problems in the field of civil engineering by applying appropriate and relevant established analytical, numerical and experimental methods.	01 - can cooperate in a small team performing chemical determinations and prepare reports on the results obtained during the experiments; 02 - uses laboratory equipment, with which he performs and interprets simple quantitative determinations;	[SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment
	[K6_U01] Apply knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering to solve engineering problems and issues.	01 - can use the known laws and relationships for chemical calculations (in particular regarding concentrations of solutions, pH of solutions);	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject
	[K6_W01] Demonstrate knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering at a level necessary to achieve the other programme outcomes.	01 - knows and understands the basic concepts and laws of general chemistry, discussed during classes,	[SW1] Assessment of factual knowledge

Subject contents	**LECTURE** 1. The structure of materials, the built-up of molecules and atoms 2. Types of chemical bonds and their characteristics; Types of chemical reactions occurred in civil engineering 3. Characterization of homogenous and heterogenous material systems; dispersion systems. 4. Role of water in building materials (Chemical equilibriums. The concept of pH. Dissociation. Hydrolysis of salts) 5. Electrochemistry. Redox processes, corrosion of metals 6. Inorganic construction binders. Gypsum and lime 7. Inorganic construction binders. Cement 8. Inorganic construction binders. Factors influencing the binding of cement. Cement corrosion 9. Organic construction binders. (Polymers additives, resins etc.) 10. Chemia materiałów organicznych (chemia bitumów, chemia drewna) 11. Novelty in the filed of chemistry in civil engineering-new products and applications in the context of circular economy approach **LABORATORY** ACTIVITY 1: Determining the color of the water and determining the aggressive CO_2 ACTIVITY 2: Water hardness analysis ACTIVITY 3: Determining the acidity and alkalinity of water; pH measurement ACTIVITY 3: Determination of chloride and sulphate (VI) ions ACTIVITY 5: Morphology of building materials - microscopic analysis **EXERCISES** Computational tasks taking into account the following issues: mol, equivalents, percentage composition, reaction stoichiometry, writing chemical equations; molar and normal concentrations; percentages, balancing redox reactions; water hardness - conversion of indicators; electrolytic dissociation, pH;
Prerequisites and co-requisites	1. The student has basic knowledge of general chemistry (solves basic computational problems, correctly writes equations of simple chemical reactions reaction reaction stoichiometry) 2. The student knows the symbols of chemical elements as well as the molecular and structural formulas of basic acids, bases and salts 3. The student knows the basic physical and chemical phenomena (e.g. phase transitions of water, neutralization reaction) 4. Is aware of the importance of chemical phenomena in social life and the civil engineering.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
Report	60.0%	30.0%
Test	60.0%	30.0%
Test	60.0%	40.0%

Recommended reading	Basic literature	• T. Broniewski, L. Czarnecki, O. Henning Chemia w budownictwie, Wydawnictwo Arkady, Warszawa, 2018 • Edward Szymański Materiały budowlane Tom 1, Podręczniki Wyższej Szkoły Ekologii i Zarządzania, 2011

	Supplementary literature	Open AGH e-textbooks - peer-reviewed academic-level e-textbooks for science, developed by AGH employees for any use. Link: https://epodreczniki.open.agh.edu.pl/openagh-podreczniki.php?categId=82 **Chemistry for civil engineers:** https://emkhk.bme.hu/wp-content/uploads/2015/11/CHEMISTRY-FOR-CIVIL-ENGINEERS-Supplementary-Academic-Educational-Material.pdf
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	What is the pH of the solution in which the concentration of hydroxide ions is 3.5 * 10-5 mol / dm3. What are asphaltenes? What is the phenomenon of corrosion? How is an atomic bond different from an ionic bond?	
Work placement	Not applicable	

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