GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Chemistry of construction materials, PG_00061706		
Field of study	Civil Engineering		
Date of commencement of studies	October 2023	Academic year of realisation of subject	2023/2024
Education level	first-cycle studies	Subject group	Obligatory subject group in the field of study
Mode of study	Part-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Environmental Engineering Technology -> Faculty of Civil and Environmental Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Aneta Łuczkiewicz	
	Teachers	mgr inż. Filip Pawlak mgr inż. Anna Wilińska-Lisowska mgr inż. Emilia Bączkowska	

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	80.0	125

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;	[SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools
	[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);	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
	[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: Qualitative analysis of mixing water ACTIVITY 2: Determining the color of the water and determining the aggressive CO_2 ACTIVITY 3: Water hardness analysis Determining the acidity and alkalinity of water; pH measurement ACTIVITY 4: Determination of chloride and sulfate ions (VI), determination total alkalinity and calculation of the Larson-Skold index 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
Test	60.0%	40.0%
Test	60.0%	30.0%
Report	60.0%	30.0%

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	