



Subject card

Subject name and code	Chemistry of construction materials, PG_00059256						
Field of study	Civil Engineering						
Date of commencement of studies	October 2022	Academic year of realisation of subject	2022/2023				
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	dr inż. Małgorzata Szopińska					
	Teachers	dr inż. Alina Wargin dr inż. Małgorzata Szopińska mgr inż. Emilia Bączkowska mgr inż. Anna Wilińska-Lisowska					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	10.0	0.0	0.0	40
	E-learning hours included: 0.0						
	Additional information: The number of hours planned for the course is:[W] - 15h[CI] - 10h[L] -15h						
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. Familiarizing students with the basics of construction and general chemistry at the academic level2. To familiarize students with the chemical characteristics of various building materials3. Presentation of problems related to the creation and destruction of different classes of building materials4. Familiarizing students with the chemical aspects of protecting building materials against destruction(including corrosion protection)5. Familiarizing students with the methodologies of laboratory tests of building materials						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[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 known laws and dependencies for chemical calculations (especially regarding solution concentrations, pH);	[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 basics concepts and laws in the field of general chemistry, discussed during classes,	[SW1] Assessment of factual knowledge
	[K6_W05] Demonstrate knowledge and understanding of research methods (obtaining information, simulations, experimental methods) in the field of civil engineering.	01 - can apply basic concepts and laws z in the field of general chemistry, discussed during the course to describe the chemical processes 02 - is aware of the dangers during work in a chemical laboratory and knows the health and safety rules and respect it.	[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 small team by marking chemical experiments and prepare reports from the results obtained during the performed experiments; 02 - uses the laboratory equipmen, performs experiment and interprets simple quantification;	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task	
Subject contents	<p>LECTURE1. Structure of materials, structure of molecules and atoms2. Types of chemical bonds and their characteristics; Types of chemical reactions taking place in construction3. The role of water in construction (Chemical equilibrium. The concept of pH. Dissociation. Salt hydrolysis)4. Electrochemistry. Redox processes, corrosion of metals5. Inorganic building binders. Gypsum and lime6. Inorganic building binders. Cement7. Inorganic building binders. Factors affecting cement bonding. Cement corrosion8. Organic building binders. (Polymer additives, resins etc.)9. Chemistry of organic materials (chemistry of bitumen, chemistry of wood)LABAnalysis of mixing water and characterization of mineral materials through exercises:EXERCISE 1: Determination of water color and determination of aggressive CO 2EXERCISE 2: Water hardness analysisEXERCISE 3: Determining the acidity and alkalinity of water; pH measurementEXERCISE 4: Determination of chloride and sulfate ions (VI)EXERCISE 5: Morphology of building materials - microscopic analysisEXERCISESCalculation tasks taking into account the following issues: mole, gram equivalents, percentage composition, reaction stoichiometry, writing chemical equations; molar and normal concentrations; percentage concentrations, balancing redox reactions; water hardness - conversion of indicators; electrolytic dissociation, pH;</p>		
Prerequisites and co-requisites	<p>1. The student has basic knowledge of general chemistry (solves basic taskscalculations, correctly writes the equations of simple chemical reactions - reaction stochiometry)2. The student knows the symbols of chemical elements and the basic formulas and structural formulasacids, bases and salts3. The student knows the basic physical and chemical phenomena (e.g. phase changes of water, reactionneutralization)4. Is aware of the importance of chemical phenomena in social life and the construction industry.</p>		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lab report	60.0%	30.0%
	Practice colloquium conducted at the end of the course	60.0%	30.0%
	Lecture colloquium conducted at the end of the course	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	https://epodreczniki.open.agh.edu.pl/openagh-podreczniki.php?catelid=82 https://emkhk.bme.hu/wp-content/uploads/2015/11/CHEMISTRY-FOR-CIVIL-ENGINEERS-Supplementary-Academic-Educational-Material.pdf
	eResources addresses	
Example issues/ example questions/ tasks being completed	What is the pH of the solution in which the concentration of hydroxide ions is $3.5 \cdot 10^{-5} \text{ mol/dm}^3$. What are asphaltenes? What is the phenomenon of corrosion? What is the difference between an atomic bond and an ionic bond?	
Work placement	Not applicable	